THE STATE OF FOOD AND AGRICULTURE 1966

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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FOREWORD

Any remaining complacency about the food and agriculture situation must surely have been dispelled by the events of the past year. As a result of widespread drought, world food production, according to FAO's preliminary estimates, was no larger in 1965/66 than the year before, when there were about 70 million less people to feed. But for good harvests in North America, world production would almost certainly have declined. In fact, in each of the developing regions except the Near East, food production is estimated to have fallen by 2 percent in total and by 4 to 5 percent on a per caput basis.

Because agriculture depends so much on the weather, there is always the danger of a setback like this. But the poor harvests of 1965/66 are all the more serious since they come, not in the midst of plenty, but after a long period in which production has only barely kept up with the rapidly mounting population. When many millions of people are already inadequately nourished, there is little if any margin against the effects of a bad season.

Until recently, such a margin has been provided by the large stocks of grain that have been in existence, mainly in North America, since the early 1950s and which have already contributed greatly to the food supplies of the developing countries. Large-scale emergency shipments from these stocks made it possible to avert disaster in India and other drought-stricken areas in 1965/66. However, these shipments, together with the large recent import requirements of China (Mainland) and the U.S.S.R., and the greater success of United States policies in limiting production, have reduced North American grain stocks to their lowest level in well over a decade.

Thus the world food situation is now more precarious than at any time since the period of acute shortage immediately after the second world war. Because of the depletion of the stocks, the world has become much more dependent on current production and hence on weather conditions. It is therefore with some anxiety that we await the outcome of the 1966/67 harvests.

These developments give greater urgency to the rethinking already under way about the role of food aid and its provision on a surer basis than that of chance surpluses. While the wider aspects are being discussed in a number of international forums, the United States Government has already taken steps to put back into production some of its reserve of unused farmland, and the proposed Food for Freedom Act would make its food aid independent of existing surpluses and also conditional on self-help measures to improve food production in the recipient country.

It has always been emphasized by FAO that, invaluable as food aid may be (and the events of 1965/66 provide an outstanding example of this), in the long run greater production in the developing countries themselves is essential for any lasting improvement in their food situation. The problem of agricultural development in these countries and the efforts made to this end during the second postwar decade were a main theme of the ten-year review of world agriculture to which, so as to mark the twentieth anniversary of the foundation of FAO, last year's issue of this annual report was devoted.

This year The state of food and agriculture *returns to its usual pattern, and a review of the current situation is followed by two special chapters dealing with subjects of longer term interest. One of these concerns rice in the world food economy. This was undertaken because 1966 has been designated as International Rice Year, but a study of a crop which is the staple food of half of mankind is also particularly appropriate in a*

year when food production in the developing countries is causing so much concern. The chapter emphasizes that, if rice production in the developing countries is to be increased sufficiently to meet their needs, it will be necessary to speed up greatly the process by which technical improvements are transmitted to, and put into practice by, the farmer. As has been brought out in so many FAO studies, this involves not only research, education, extension, and an adequate supply of fertilizers and other production requisites, but also remunerative prices, better credit and marketing facilities, and improvements in land tenure systems. It is all these factors that determine the economic climate within which farmers work, and whether or not they will follow the advice on new methods provided by the extension services and purchase the fertilizers and other requisites needed to increase their productivity.

It has become increasingly apparent in recent years that, in addition to its effect on food supplies, lagging agricultural production can retard a country's economic development in a variety of other ways. This is illustrated by the special chapter concerning agriculture and industrialization. The chapter brings out the close interdependence of the agricultural and industrial sectors, in particular the role in both agricultural and industrial development of industries based on agricultural raw materials, and the way in which industry contributes to the expansion of agricultural production by supplying both the consumer goods needed to provide the incentive and the inputs required to provide the means for increased production. In line with the increased emphasis being given in FAO's work to assisting governments in the establishment of efficient industries using agricultural raw materials, the chapter pays special attention to the problems encountered in some of the main industries of this type in the conditions prevailing in the developing countries.

A clearer idea of the contribution needed from agriculture for the sound growth of the economy will be provided by the Indicative World Plan for Agricultural Development, which is now being elaborated in FAO. This plan will also make it easier to assess the amount and the most appropriate forms of aid needed for the agricultural development of the developing countries. FAO is itself becoming increasingly involved in the direct provision of aid to agriculture. It has long furnished technical assistance in a variety of ways, both through its own regular program and as the executive agent for the United Nations Development Program. Through the United Nations/FAO World Food Program, it has for some time been engaged in the multilateral provision of food aid. Recently, through the Co-operative Program established with the International Bank for Reconstruction and Development, the Organization has become more directly concerned in obtaining financial aid for agricultural projects. I am now proposing the institution of yet another kind of assistance for agricultural development, namely a Food Production Resources Program, which would be established under the Freedom from Hunger Campaign to make available, on a bilateral and multilateral basis, supplies of the fertilizers and other production requisites needed to ensure a more rapid increase in the food and agricultural production of the developing countries. The urgent need for all these different forms of aid is amply demonstrated by the latest developments in the world food and agriculture situation.

B.R. SEN

Director-General

Chapter I. Summary

CHAPTER II. WORLD REVIEW AND OUTLOOK

Agricultural production

According to FAO's preliminary estimates, world food production, excluding China (Mainland), was approximately the same in 1965/66 as the year before. Thus there was a fall of about 2 percent on a per caput basis.

There were good harvests in North America, where food production rose by about 4 percent. But western Europe, with a rise of less than 1 percent, is the only other region where there was any increase in food production in 1965/66. In the other developed regions food production fell slightly in eastern Europe and the U.S.S.R., and by 6 percent in Oceania.

In the developing regions, adverse weather was widespread. It was only in the Near East that food production did not actually decline in 1965/66, and even here it failed to increase over the previous year. In each of the other developing regions, Africa, Latin America and the Far East, excluding China (Mainland), food production is estimated to have fallen by about 2 percent in total and by 4 to 5 percent on a per caput basis. For China (Mainland) once again there are no official statistics, but it is believed that food-grain production declined slightly in 1965.

The preliminary estimates for 1965/66 indicate that per caput food production in the developing regions dropped back to the same level as in 1957/58, which in turn is the same as the inadequate prewar level. In the Far East, Latin America and Africa, per caput food production in 1965/66 was a good deal less than before the war. The Near East appears now to be the only developing region where per caput food production is higher than before the war, and even here it has recently fallen considerably below earlier peak levels.

Among the main agricultural commodities, there were falls of between 4 and 8 percent in 1965/66 in the world production, excluding China (Mainland), of wheat, barley, rice, sugar, apples, groundnuts, cocoa and tobacco, and smaller falls for a number of fibers. The most serious development was the estimated decline of more than 2 percent in total grain production, which accounts (on a price-weighted basis) for about a third of world agricultural production. For most other products there was a small increase in production in 1965/66, but for olive oil, soybeans and coffee increases ranged from 15 to almost 50 percent.

World fish production, excluding China (Mainland), is estimated to have increased, on a price-weighted basis, by almost 4 percent in 1965. The increase in Peruvian production, which has been such a major factor in the recent expansion of the world catch, was relatively small, and in Chile there was a drastic reduction. The difficulties in these countries helped to encourage Scandinavian producers to expand their fisheries for fish meal raw material, and South Africa also increased its catch of fish for reduction. Both the Japanese and the U.S.S.R. catches continued to expand. Catches also increased in the United States and most other major fishing countries.

World roundwood removals rose by about 1 percent in 1965. Most of the increase in industrial roundwood occurred in North America. In Europe, the U.S.S.R. and Japan, fellings were little different from the level of 1964, and in several west African countries removals of hardwood logs for export declined. There was a small increase in sawnwood production. The production of wood-based panel products continued to expand to meet the rapidly growing demand. World production of wood pulp increased by about 5 percent. The output of paper and paperboard continued to rise in 1965, but at a rate slightly below that of 1964.

In view of the poor harvests in so many areas in 1965/66, even more than usual interest attaches to the prospects for the 1966/67 production season. Only piecemeal information is so far available, and

it is not yet possible to assess the extent to which production is likely to recover, particularly in the developing regions. In Europe and the U.S.S.R., excess rainfall reduced winter wheat plantings, and in the United States wheat production was expected to be 7 percent below the large crop of 1965/66. In the Far East, drought affected the wheat crops in India and Pakistan, and widespread drought is also reported in China (Mainland). In northwestern Africa and a number of Near Eastern countries, wheat production is expected to be reduced by inadequate rainfall. It should be emphasized however that, especially for the developing countries, the early information often tends to consist very largely of droughts and other disasters, and it is only later that reports on average or good harvests start to come in.

Changes in stocks

The year 1965/66 witnessed some important developments in the world stock situation. There was a further large fall in the stocks of wheat, as the import requirements of India and the U.S.S.R. rose sharply and those of China (Mainland) remained large. The combined grain stocks held by the major exporters are no longer considered excessive in relation to requirements, and United States stocks of wheat are now less than "the maximum amounts justifiable for strategic stockpiles." Stocks of a number of other products, including cotton, coffee and sugar, rose in 1965/66.

Economic activity and the demand for agricultural products

The growth of the world economy as a whole appears to have slowed down slightly in 1965. The combined gross national product (GNP) of the industrial countries rose less than in 1964, and the expansion in the volume of world trade was well below the unusually large increase in 1964. While there was substantial economic growth in several of the rather few developing countries for which data are available, progress was held up in a number of them by the poor harvests and other factors.

The continuation of the economic expansion in the United States, now in its sixth year, is an outstanding development. To what extent this continued boom has affected the overall demand for agricultural products is difficult to determine. As might be expected, among agricultural imports sensitivity to recessions has been greatest in the case of the agricultural raw materials. Both the volume and price of these imports have been more stable since 1961, but for the other main groups of agricultural products the absence of recessions appears to have had little effect.

Food supplies and consumption

The effect on food supplies and consumption of the poor harvests in 1965/66 was generally at least partly mitigated by increased imports and reduced exports and by drawing on stocks, but how far this made it possible to maintain food consumption levels is still too early to say. In India, on whose food shortage world attention was particularly focussed during the period under review, there were for some time fears of an extremely serious famine situation, but it proved possible to avoid mass starvation. Grain imports (largely concessional supplies under United States Public Law 480) were stepped up to the maximum level that could be absorbed by the ports and the internal distribution network. Even so, there were severe local shortages.

International trade in agricultural products

The preliminary FAO indices indicate that the value of world trade in agricultural, fishery and forest products, which in 1964 had risen steeply as a result of increases in both volume and prices, declined slightly in 1965. This stability in the value of trade was the combined result of a more or less stable volume of trade and a slight fall in the average level of prices (export unit values). In "real" terms, the unit value and total value of exports were rather lower than in 1965, as there was a 2-percent increase in the average export unit value of manufactured goods, reflecting the inflationary pressures prevailing in most major industrial countries.

The regional pattern of changes in agricultural imports in 1965 reflects mainly the course of imports of foods and feedstuffs, the only group of agricultural commodities to show a larger volume of trade in 1965. In western Europe, there was a 6-percent increase, which was, as often in the past, due principally to larger imports of feedstuffs. Larger imports of grains were a major reason for an expansion

in the agricultural imports of the Near East and Africa. Wheat imports also increased in the Far East, especially in India, but this was offset by reduced imports of a number of other foodstuffs. In Latin America, less wheat was imported by the grain deficit countries. Only fragmentary data are available for eastern Europe and the U.S.S.R., but their imports are likely to have been smaller than in 1964, when the poor harvests of 1963/64 necessitated large purchases from the rest of the world (the effect of the poor harvests in 1965/66 will be reflected chiefly in the 1966 trade).

Imports of beverages and tobacco were stable in 1965, despite very much larger cocoa imports in both western Europe and North America, following a record crop and low prices. Less agricultural raw materials were imported overall; imports into North America and Japan were greater, but those of western Europe fell by 5 percent, with smaller purchases of rubber and especially cotton.

The total volume of trade in fishery products appears to have declined slightly in 1965, for the first time for a decade. Imports of forest products, which have expanded steeply for many years, increased only moderately in 1965, as shipments into western Europe failed to increase.

The renewed fall in the average price level of agricultural products that started in early 1964 continued through most of 1965. For the year as a whole, export unit values averaged 2 percent lower than the year before. Much of this decrease was, however, offset by higher average export unit values for forest products and particularly fishery products, so that the overall level of average export unit values for agricultural, fishery and forest products combined fell only slightly. In terms of their purchasing power for manufactured goods the prices of these products were less satisfactory, as the unit value index of manufactured goods has in the past two years risen by 4 percent.

Among the main commodity groups, the average price level for food and feedstuffs fell by 1 percent. The price of most commodities in this group rose in 1965, but prices were much lower for a number of important products, including sugar and wheat. The index for beverages and tobacco fell fractionally. The export unit value for coffee was slightly higher, as exports were restricted under the International Coffee Agreement, but the unit value of cocoa exports was down by a fifth, and tobacco prices were also lower. Average export unit values for agricultural raw materials fell by 6 percent, because of lower prices for wool, sisal and rubber. Fishery products averaged 9 percent higher than in 1964, with rapidly growing demand and some supply shortages. The upward movement in prices of forest products that had started in 1963 was halted in 1965, but the average for the year was higher than in 1964.

The combined result of the small changes in the overall volume and unit values was a fractional reduction in the total value of world exports of agricultural, fishery and forest products in 1965. There was little difference in the course of export earnings as between the developed and the developing countries as a whole, though the earnings of the individual geographical regions varied substantially. The growth of exports, small as it was, was greatest in western Europe (4 percent). The only other region to show any significant increase in the value of exports was Latin America, where it was almost entirely due to a larger volume of trade. There was a small increase also in the value of exports from the Near East, but the agricultural export earnings of all other regions were smaller. The 2 percent fall in the agricultural exports of North America, however, was caused very largely by a reduction of 18 percent in the United States government-financed exports in 1965; commercial exports were greater than the year before.

The disappointing results obtained by agricultural exporting countries in 1965, and the vicissitudes in certain commodity markets, served as a reminder of the continued seriousness and difficulty of solution of agricultural commodity problems. Most of the international machinery on trade and development that has been set up following the first United Nations Conference on Trade and Development (UNCTAD) started to function in 1965. Efforts to conclude commodity agreements for products in particular difficulties, such as cocoa and sugar, however, did not produce concrete results. Much attention was given to problems of international development assistance, including food aid, where the disappearance of much of the surplus element in the United States stocks of agricultural products has brought the prospect of some important changes.

Farm prices and incomes

Indices of prices received by farmers rose in 1965 in almost all of the countries (most of them developed) for which data are available. In general, the greatest increases were in prices of livestock and horticultural products, and there were only moderate increases in grain prices. Smaller harvests and the

pressure of demand on available supplies account in large part for the rise in agricultural prices, although price indices were also significantly affected by the upward adjustment of officially supported or stabilized prices in many countries.

Prices paid by farmers for production requisites, wages and various expenses have also gone up steadily. But in most of the countries for which there are data, the ratio of prices received to prices paid by farmers either improved slightly in 1965 compared with 1964, or showed hardly any change.

Despite the higher prices and more favorable price relationships in a number of countries, the increase in gross returns was often insufficient, because of lower harvests, to offset the increase in farm expenses, so that net income declined. In the developed countries, however, the number of farms and farmers is likely to have continued to fall during the year, so that changes in income per farm unit and per farmer were probably more favorable than the overall figures suggest.

Consumer prices

Retail food prices have continued to rise in almost all countries. In a good many European countries and in Australia, partly as a result of the poor harvests, the increase in retail food prices appears to have accelerated in 1965. Increases in the overall cost of living were equally widespread, and in many cases the rise in food prices appears to have led the way, for in almost half of the countries for which there are data food prices rose faster in 1965 than the overall cost-of-living index.

Agricultural policies and development plans

During the period under review there have been few changes in national agricultural policies. As usual a large number of new development plans have been embarked on in the developing countries. An encouraging development is the increasing amount of information that is now becoming available on the implementation of past and current plans. Although this all too often reveals shortfalls in the performance of the agricultural sector, it should contribute greatly to making future planning more effective.

The same problem of lagging agricultural production that plagues so many developing countries is still faced by the U.S.S.R. This is made clearly apparent by the extent to which agricultural production fell behind planned targets in the seven-year plan just completed, and the new five-year plan sets targets that are actually below those in the previous plan.

In western Europe the trend away from price measures has continued. As for some years past, more and more attention is being paid to measures to increase efficiency, in particular through improvements in the farm structure.

Following a period of stalemate, progress has been resumed in the elaboration and implementation of the common agricultural policy of the European Economic Community (EEC). In the developing regions, further progress has been made with most of the proposed and existing schemes for regional economic co-ordination and co-operation.

In the United States, the Food and Agricultural Act of 1965 extends further the more flexible approach to farm support begun earlier with the feedgrains program. The Food for Freedom Act, which has been proposed to replace Public Law 480, introduces a radically new approach to food aid, under which such aid would no longer be dependent on existing surpluses and would also be conditional on efforts by the recipient countries to improve their own agricultures. Related to this proposed program are measures to increase the United States grain acreage in 1966/67 and 1967/68 for the first time for many years.

CHAPTER III. AGRICULTURE AND INDUSTRIALIZATION

Interdependence of agriculture and industry

The interrelationships between agriculture and industry are complex. Agriculture's basic role as supplier of food for the industrial labor force and of many of the raw materials for industry is only one element, although perhaps the most essential. In most of the developing countries, agricultural exports must provide the bulk of the foreign exchange earnings for the import of the capital goods required for industrialization. Agriculture releases labor and often finance to industry. The agricultural population

provides a market for industrial products, not only for consumer goods but also for a wide range of equipment and materials used in agricultural production.

Agriculture's contributions are essential for industrial development. As a result, the agricultural sector is subject to considerable strain during a period of rapid industrialization, and the rate of growth of agricultural output is usually a critical determinant of the rate at which industrialization can proceed. Similarly, agriculture depends on industry both for the consumer goods that give producers the incentive to raise their production for the market and for the inputs that are needed for the modernization of production.

In the conditions of the developing countries, which are in effect trying to achieve an agricultural revolution and an industrial revolution simultaneously, there is much to be said for greater attention to what may be termed "agro-oriented" industrialization. This would concentrate particularly on the consumer goods and inputs needed by the agricultural population, who would thus be assisted and stimulated to produce the increasing quantities of food and other agricultural products demanded by the industrial population and would in turn, as a result of having higher incomes, become better customers for the products of industry.

Industries using agricultural raw materials

A very large part of agricultural production undergoes some degree of transformation between harvesting and final use. The industries based on agricultural raw materials comprise a very varied group, ranging from simple preservation (such as sun drying) and operations closely related to harvesting, on the one hand, to the production by modern, capital-intensive methods, of such articles as textiles, pulp and paper at the other extreme.

Because of the great variety of these industries, it is difficult to generalize about their characteristics. Nevertheless, it does appear that many of them have characteristics that make them particularly suitable for the circumstances of the developing countries. Many of them have a lower capital intensity than other industries, and their requirement of skilled labor also is often lower. There is evidence that they have an especially high degree of linkage with other industries, so that their establishment has beneficial repercussions throughout the economy, including feedback effects on agriculture itself. For a good many agricultural industries a small plant may be economically efficient and profitable, which is another important factor in developing countries where the domestic market is limited by low purchasing power and also sometimes by the small size of the population.

Processing is only one link in a continuous chain between raw material production and final consumption. In the case of crops, livestock, fish and forest products, the need for a close integration of raw material production and processing is reinforced by the biological nature of the raw material. The seasonality of agricultural production, the perishability of many products, and the possibility of controlling their quality make it desirable for there to be close contact and advance planning between producer and processor. Thus for some commodities, especially fruit and vegetables for canning and freezing, raw material production and processing are increasingly "vertically integrated" in the developed countries through various forms of contract farming.

In most developing countries, agricultural products are the most readily available raw materials for industrialization. Where, as in many cases, the raw material represents a large proportion of total costs, its ready availability at reasonable cost can often to a large extent offset such disadvantages as the lack of infrastructure or skilled labor in these countries.

The factors determining the most economic location for a processing industry are complex, but transport is generally a main factor. Most agricultural products either lose weight and bulk in processing, so that they can be transported more cheaply after they have been processed, or they are perishable and can more easily be transported in processed form.

Even in the most advanced countries, the industries using agricultural raw materials represent a large part of total industrial activity. It may be roughly estimated that in 1958 these industries accounted for 33 percent of the value added and 48 percent of total employment in world manufacturing industry (excluding the U.S.S.R. and eastern Europe). In the less industrialized countries their share was 51 percent of the value added and 64 percent of employment in manufacturing industry, as against 31 percent for value added and 39 percent for employment in industrialized countries.

For the world as a whole, the share of these industries declined from 44 percent of value added in manufacturing industry in 1938 to 33 percent in 1958.

This does not reflect a decline in absolute terms but a greater proportionate rise in heavy manufacturing, which in turn reflects the changing pattern of demand as incomes rise.

In the world as a whole, the value added in the industries using agricultural raw materials rose by about a quarter in the period 1953-58. The rise in the numbers engaged has been very much smaller and, in fact, considerably less than the growth of population, indicating that in general the recent expansion of these industries has contributed little to total employment.

The food processing industries, which in terms of value added are the largest of those using agricultural raw materials, have continued to expand considerably faster than population growth since, as their incomes rise, consumers tend to demand an increasing proportion of processed food, while the processing is also gradually shifted from the farm and the household to the factory. The value added in the world's textile industries increased by only about 7 percent between 1953 and 1958, but for this group of industries there has been a particularly rapid growth in the developing countries (28 percent). Among the main forest industries, the value added in wood products and furniture increased by about a fifth during this period, and in paper and paper products by somewhat more than a third, which was the fastest increase for any group of industries using agricultural raw materials; in both cases the expansion was much more rapid in the developing than in the developed countries.

In most cases, industries based on agricultural raw materials played a crucial role in the early stages of the industrialization and general economic development of the developed countries. The production and export of woollen textiles was the basis of England's industrialization in the 16th and 17th centuries. Textiles played a major part in the industrialization of the United States, a number of western European countries, and Japan, largely through their pioneering role in the mechanization of production and the development of factories in place of handicraft production. Food processing and a wide variety of other industries based on agricultural raw materials were also of considerable importance in the earlier stages of economic development in these and many other countries that are now highly industrialized.

An important potential contribution to economic development of industries using agricultural raw materials is the earning and saving of foreign exchange. When a product formerly exported in raw form is processed before export, or when a processed commodity previously imported is produced locally, a country can obtain for itself the value added that formerly accrued elsewhere. Because of the need to import much of the processing equipment and also some of the current inputs for agricultural processing industries, not all of this value added amounts to a net gain in foreign exchange, but there generally is a net gain. At present only a small proportion of the agricultural exports of these countries is shipped in processed form, but in the last few years exports of many processed agricultural products from the developing countries have increased rapidly.

In this section of the chapter, an attempt is made to indicate, on the basis of practical experience, the key factors involved for individual industries or groups of industries in the successful establishment and operation of an economically efficient enterprise, especially in the conditions of the developing countries. The industries that have been selected are those for which FAO has made case studies or has accumulated substantial practical experience in its operational work, including those concerned with wheat, rice, sugar, oilseeds, fruit and vegetables, meat, milk, fish, fibers, hides and skins, and forest products. The account of these industries is already so highly summarized as to make a further summary here unnecessary.

Industries serving agriculture

Agricultural production uses as inputs a great variety of industrial products. Although they originate from many different branches of industry, they have a certain unity in that they are all destined for the same final consumer. It is therefore of interest to examine them together as the industries serving agriculture.

Current inputs of industrial origin in the agricultures of the developing countries are generally small at present. However, the high figure for some of these countries, such as China (Taiwan), suggests that intensive efforts at raising output and productivity will, especially if land resources are limited, necessitate industrial inputs of comparable magnitude with those in developed countries. Thus, while the share of agriculture in the economy falls as development proceeds, this is likely to be largely offset, as regards agriculture's demands on industry, by the increase in industrial input requirements per unit of output as farming techniques are improved.

Only for fertilizers and tractors is it possible to present worldwide tabulations which provide some indication of the growth of agriculture's demand for industrial inputs. These are, however, two of the most important production requisites that industry provides for agriculture. Fertilizers are a major source of increased production and productivity, and tractor numbers give a rough indication of the general level of mechanization.

World fertilizer consumption doubled between the mid-1950s and the mid-1960s; the increase has been most rapid in the developing countries where the level of consumption is still very low. With tractors, also, the increase in numbers has been very much faster in the developing countries. The broad similarity in trends in fertilizer consumption and tractor use suggests that, because of the complementary nature of many of them, the adoption of modern techniques of production tends to move forward simultaneously on a broad front.

The first requirement for the use of fertilizers is knowledge of the most agronomically and economically efficient kinds of fertilizers and their rates of application with various crops and soils. Before embarking on the domestic production of fertilizers, it is also essential to develop an effective demand by means of an efficient organization for the demonstration of the benefits from their use, for distribution and marketing, and for the provision of credit facilities. The limited number of developing countries possessing chemical fertilizer industries, however, is a reflection of the many difficulties involved in their establishment.

The demand for tractors in most developing countries is still too limited to make a domestic industry economic. For the manufacture of a great many other industrial products needed in agriculture, however, there are no overriding economies of scale, and the production of such requisites is very much more widespread.

Many developing countries exporting particular agricultural products in processed form have developed new industries in response to the domestic demand for machinery and intermediate inputs required in their processing, and in many cases they have even built up an export of these items.

Main problems

Because of their interdependence, the integrated planning of agriculture and industry is necessary, if each is to make its full potential contribution to economic growth. This is only a beginning, however, and, within the framework provided by this macroeconomic planning, detailed planning and feasibility studies are also necessary at the enterprise level if viable industrial projects are to be established.

Market research forms a basic part of such a study, together with an assessment of the supply of raw material for processing. An assessment must also be made of the marketing organization that will be required, including the extent and form of vertical integration that is desirable. Concerning the plant itself, determination of the most appropriate location and capacity are particularly crucial. The choice of technology depends to a large extent on the raw material and the type of finished product. The success of a processing plant depends very heavily on the efficiency of its management and administration. Particular attention must be given to training, as the lack of qualified and experienced personnel is often the most serious limiting factor.

The developing countries face a difficult problem in the choice of the technology they should adopt in their industrial development. On the one hand, the use of the modern technology developed in the high-income countries holds out the promise of a significant reduction in the time and sacrifices needed to achieve a high rate of growth. On the other hand, these production techniques appear ill-adapted to the factor availabilities in developing countries, where unskilled labor is plentiful and capital and skilled labor scarce. Developing countries can increase the degree of labor intensity by choosing either labor-intensive industries, or labor-intensive techniques within a given industry, or a combination of the two; in each case, however, the degree of flexibility appears to be less than is often supposed.

An expansion of exports in processed form was one of the principal ways singled out by UNCTAD in which developing countries could increase their foreign exchange earnings. There are, however, a number of circumstances which tend to hinder the expansion of exports of processed agricultural products from developing to developed countries. These are mainly: the presence of tariff and nontariff barriers in developed countries; difficulties of marketing processed products in developed countries and other new markets; and the weak initial competitive position, in terms of both price and quality, of the products of the developing countries.

In some cases the governments of developing countries have themselves participated directly in the establishment and operation of industrial enterprises.

More often, however, government activities in this regard are confined to various measures of assistance to the private sector. One of the most important areas of government responsibility is research. The provision of industrial training is an essential prerequisite for the development of industries in primarily agricultural countries without an industrial tradition and a pool of industrial labor. Governments may also need to take special measures to assist new industries with credit and finance. In some cases they may find it advantageous to seek investment from foreign sources which also bring in technical knowledge, business management, and top level supervisory personnel. Governments must also supply the necessary infrastructure, particularly marketing, transport and power facilities.

A considerable amount of international assistance is now available to back up these efforts. Many different industrial enterprises using agricultural raw materials or producing requisites for agricultural production have been established in developing countries in recent years with financial and technical assistance from the various bilateral aid programs. Among the multilateral agencies, FAO is itself providing increasing assistance in the establishment of such industries. Training and demonstration have always been major elements in this assistance, while research is promoted through a wide range of projects, including the establishment of permanent research institutes in various subjects. Preinvestment surveys, feasibility studies and pilot projects are carried out for industries using agricultural raw materials. A recent development has been the setting up of the FAO/Industry Co-operative Program, through which it is hoped that private industry in the developed countries will make a greater contribution to the establishment of agricultural processing industries and industries serving agriculture in developing countries. On the input side, FAO and the fertilizer industry have for some years conducted a joint program, whereby fertilizer trials have been promoted and pilot schemes of fertilizer distribution to farmers carried out. The possibility is at present being explored of establishing a Food Production Resources Program, under which international assistance would be available for the provision to the developing countries of supplies of fertilizers and other needed inputs.

CHAPTER IV. RICE IN THE WORLD FOOD ECONOMY

Main features of the world rice economy

Rice is the staple food of approximat ly half of the human race. For over 1,400 million people in the Far East, where nine tenths of the world's supply is grown and consumed, it provides the main dietary source of energy. The value of the world output probably amounts to at least U.S.$20,000 million. The crop occupies between half and two thirds of the arable land available in major producing countries and a much heavier share of the most fertile soils. It is a major source of foreign exchange for a number of developing countries. Today, rice is cultivated under a wider variety of conditions and by more varied methods than any other major crop.

More than half of the world harvest of over 250 million tons of paddy is retained on the farms where it is grown. This makes the task of increasing rice production more difficult, because of the low responsiveness of the farmers to monetary incentives. Nevertheless, during the past decade rice production has increased on an average by 3.5 percent per annum, an expansion which can be attributed equally to increases in area and in yields. The part played by yields is a new and encouraging development, but the extension of the area has sometimes reflected the availability of more land under irrigation rather than the planting of new land. In absolute terms, the bulk of the increase in production has been in the Far East excluding China (Mainland), but in Latin America producers have maintained a much faster rate of growth, mainly due to the extension of the rice area.

In recent years, as opposed to the mid-1950s, exporters have achieved a more rapid growth rate than importers, reflecting, in the one case, the relative profitability of rice as a cash crop and its priority as a source of foreign exchange and, in the other, the enormous earlier expansion of the rice area and the extent of rice cultivation as a subsistence crop.

The disparities in the productivity of rice lands have widened further in the past decade. These disparities are due partly to differences in the systems of cultivation but also to differences in ecological and economic conditions, particularly the stage of economic development. There is considerable potential for increasing yields in most of the less developed areas, especially if the varieties of rice now being developed are introduced on a large scale and if water control is improved.

On the consumption side, demand is increasing, partly because of the growth of population but also because of improved levels of living and more urbanization (especially in Africa and Latin America) which often favors the replacement of coarse grains or starchy roots by rice. Conversely, there is a shift in demand toward wheat, which is relatively cheaper. The Far East wheat imports are today double those of rice. China (Mainland), previously a major rice importer, has become the fourth largest exporter, although its imports of wheat have increased substantially. While the Far East remains the main rice exporter, it has lost its virtual prewar monopoly. Non-Asian exporters (particularly the United States and the United Arab Republic) have considerably increased their share of the total trade.

The net result of the changes in production and consumption is that the trade balance of developing countries has been reversed since the early 1950s and now shows a deficit, while the opposite has occurred in the case of developed trading countries. For world trade as a whole, exports are still below the prewar volume, having been kept down by widespread government control of exports, restriction of imports to save foreign exchange and ample supplies of wheat on concessional terms. The international rice trade is still effected largely between developing countries.

Demand and consumption

Rice eaters are either habitual consumers who rely on rice for most of their nutrient intake, or consumers who are shifting from an inferior food to rice or wheat, or, lastly, people — mainly in developed countries — who eat rice only occasionally as a special dish. These three groups react in different ways to changes in the price of rice. The world rice market is therefore not homogeneous.

As incomes increase, rice eaters in the first group tend first to improve the quality of their supplies and later to place more emphasis on sugar, meat and other nonstarchy foods. However, since rice remains at all income levels the principal dish round which meals are planned, it is unlikely to become supplementary in the way that bread and potatoes tend to be in high-income countries. The income elasticity of demand also varies widely as between different countries. The demand for rice is affected both by its real cost and by variations in cost, but here again the impact on different groups of consumers varies considerably.

Prices of rice on retail markets do not necessarily reflect prices on international markets, since nearly all the major rice-importing countries closely control the size of their imports and since domestic costs of production are sometimes high. Consumer subsidies on rice are used sparingly, because of their heavy cost. Changes in food price relationships and price disparities, therefore, have not so far had a marked impact on rice consumption. Food habits and general living customs govern demand. These, together with ecological conditions in tropical areas, tend to favor the consumption of rice as opposed to wheat, despite government efforts to reduce consumer resistance to alternative foods, especially in times of rice shortages.

In its natural state the nutritive value of rice is good, but when milled and polished it loses some of its food value and even more if cooked in an excess of water. The most satisfactory approach to this problem in the long run will be to improve the dietary pattern as a whole, but this takes time. More short-term measures include an increase in the production and yield of rice, its partial replacement by wheat and millet, and the addition to the diet of such high-protein foods as fish.

Production and productivity

Rice has a wider range of cultivation than any other staple cereal, and between latitude 48°8′ N and 37°2′ S it can be grown wherever sufficient water is available. Infertility of soil and lack of water are probably the two most common causes of low yields. Differences in environment are also important.

The rice-growing areas can be divided broadly into the subtropics and tropics where *indica* rice is grown, and the temperate zones, where *japonica* rice thrives. Since ecological factors such as length of daylight, temperature and rainfall play such an

important role in rice cultivation, the crop in the temperate zones (with mild temperatures and long days) will usually outyield that grown in the tropics.

Plant breeding work seeks to counter "natural" disadvantages by introducing into the rice seed such desirable characteristics as indifference to photothermal sensitivity, greater response to fertilizer and shorter growing periods. In most developing countries a more stable or regular water supply and efficient drainage of excess water are prerequisites of any substantial increase in productivity or output.

Mechanization requires heavy initial capital investment, large units of cultivation and engineering and workshop facilities, but it could prove economic both in sparsely populated areas and in "dry land" rice production. Though yield improvements depend on a whole complex of improved practices, the response of rice to fertilizer — particularly to nitrogen — can be striking and speedy, as the examples of Japan and China (Taiwan) show. In other countries, little fertilizer is used on rice, however; greater utilization depends on appropriate cost-price relationships, as well as adequate supplies of fertilizer.

Encouraging progress is being made in the understanding of many pests and diseases and in the development of more effective control measures.

Processing and storage

The amount and quality of the crop which becomes available for consumption largely depends on the efficiency of the preprocessing, milling and storage operations. Considerable milling losses are incurred because of the numerous small mills or crude hand-pounding equipment. In view of the rising demand for rice, a balanced expansion is needed in processing, milling and storage. Losses in harvesting can be diminished if the optimum time is chosen. It appears that the lack of effective water control in the developing countries will make it necessary to continue hand-harvesting for many years. More immediate benefits could therefore be gained from improvements in the threshing and drying phases.

In many countries there is excess milling capacity and, although this is often a transitional problem, it has led governments to limit the building of new mills. Modernization is slowed down also by the shortage of foreign exchange, but several governments are now establishing mills within the public sector.

Losses of stored rice vary in amount and character under different storage conditions and practices. It is generally believed that half of the storage losses are usually caused by insects, but heavy demage is also attributable to rodents.

The existence of unused large-scale modern storage facilities in developing countries underlines the need for thorough preinvestment studies, including cost-benefit analysis, before additional facilities are constructed.

Economic and institutional factors

The application of technological innovations to rice farming in developing countries is closely related to the entire process of economic and social development. Consequently, the selection of alternative farm practices or of particular inputs must be adapted to the specific conditions of the farmer and must, in particular, be profitable.

The choice of methods of cultivation, therefore, requires information not only on the potential contribution of a particular input, but also on the cost or effort required to achieve the output growth.

The adverse effects of variations in production in the more developed countries are largely cushioned by efficient marketing systems, but in developing countries the fluctuations in output have an immediate effect on producers' incomes. In the developing countries, since most of the rice output is grown by subsistence farmers and never enters commercial channels, there are great difficulties in improving marketing.

Many governments take extensive measures to try and secure better and more stable prices. Thus, they have taken import-export control measures involving price fixation and market regulation, operated buffer stock schemes, encouraged co-operatives, implemented incentive prices to farmers and buttressed prices immediately after the harvest by a combination of credit, storage, transport and marketing facilities. Governments have sought to increase the volume and efficiency of institutional credit, which will lower interest rates and break the hold of the moneylender and landlord on credit and marketing. In addition, efforts have been made to give farmers better incentives by improving land tenure conditions through preventing excessive fragmentation of farms, stimulating joint farming and through breaking up large estates and regulating tenure, including sharecropping.

The outlook

The paramount part played by rice as a basic food is unlikely to diminish in the foreseeable future. Its role in world trade is more uncertain, even though demand for imported rice should be well sustained for some years to come. The central rice problem is a production problem. Its solution will depend on greater success, not only in diagnosing the cause of inadequate growth, but equally in applying in the paddy field the already known results of scientific research and in giving farmers the necessary economic incentives. Action must also be taken to prevent avoidable wastage by improving handling, marketing, processing and storage.

World demand for rice during the next decade should show a considerably faster rate of growth than other cereals, but the level of actual consumption will be conditional on improved production and marketing. Most of the absolute increase in consumption anticipated by 1985 will be in the traditional rice-eating areas of the Far East, but the greatest relative growth is likely to be in Latin America and in west Africa. However, since rice diets are nutritionally unbalanced in most developing countries, it is essential to improve them by, for example, developing low-cost food products which are rich in proteins, minerals and vitamins.

A considerable group of countries will remain heavily dependent on rice exports as a source of foreign exchange. A continuation of present trends in production and consumption would lead to a sharp increase in the net import deficit of developing countries, concentrated in the Far East but also affecting Latin America and Africa. Unless special arrangements are made, however, world rice trade will continue to be limited by the lack of purchasing power of developing importing countries, and possibly by an inadequate growth of production in exporting countries.

The world will not be able to grow enough rice to satisfy its needs unless fuller use is made of available resources. Production problems vary, but generally productivity in the traditional growing areas can best be improved in the short run by the spread of better techniques of cultivation on existing rice lands, with particular emphasis on the availability of water. In this connection, the extension services have an important role but it is equally necessary to provide the farmer with a favorable economic climate.

The expansion of rice production has to be systematically planned within the context of the local resources, the costs and the implications for other sectors of the economy. A technical revolution in rice production is required. For this, international collaboration in research will continue to be necessary as well as the special country programs being arranged during 1966, which has been designated as International Rice Year, within the framework of the Freedom from Hunger Campaign in order to focus attention and stimulate action on the world's rice problems.

Chapter II. World review and outlook

AGRICULTURAL PRODUCTION

World agricultural production suffered a setback in 1965/66. According to FAO's preliminary estimates, the combined production of crops, livestock, fishery and forest products increased only fractionally, so that per head of the population there was a decline. Fishery production was the only one of these major sectors to show a substantial increase (Table II-1).

Regional data for agricultural production proper (crops and livestock)[1] indicate that the setback mainly affected the developing regions, where adverse weather was widespread, and that it was more serious for food products than for total agricultural production (Table II-2). For the world as a whole, excluding China (Mainland) for which official production statistics are still not available, it is estimated that food production was approximately the same in 1965/66 as the year before, which implies a fall of about 2 percent on a per caput basis.

That there was not a sharp fall in total production was due very largely to the good harvests in North America, where food production rose by 4 percent, part of which represented recovery from the low level of 1964/65. Western Europe, with a rise of less than 1 percent, is the only other region where there was any increase in food production. In the other developed regions, food production fell slightly in eastern Europe and the U.S.S.R. and by 6 percent in Oceania as a result of the Australian drought.

In the developing regions, it is only in the Near East that food production did not actually decline in 1965/66, and even here it failed to increase over the previous year. In each of the other developing regions, the Far East, Latin America and Africa, which between them contain some 60 percent of the world's population outside China (Mainland), food production is estimated to have fallen by about 2 percent in total and by 4 to 5 percent on a per caput basis. Even in a good season the diets of much

[1] Regional indices are not yet available for fishery and forest production.

TABLE II-1. – INDICES OF WORLD [1] PRODUCTION OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS

	Prewar average	Average 1948/49-1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Indices, average 1952/53-1956/57 = 100														
TOTAL PRODUCTION	...	...	98	99	103	107	107	113	116	119	120	124	127	130	131
Agriculture	76	88	98	98	102	107	107	114	117	119	121	125	128	131	132
Fisheries [2]	[3]85	86	95	100	104	109	110	111	115	119	125	132	135	141	146
Forestry [2]	...	...	95	100	105	106	105	105	111	112	111	113	114	118	119
POPULATION	80	93	98	100	102	104	106	108	110	112	114	117	119	121	124
PER CAPUT PRODUCTION	...	...	99	99	101	103	101	105	106	106	105	106	106	107	106
Agriculture	96	95	100	99	101	103	101	105	106	107	105	107	107	108	106
Fisheries [2]	[3]107	92	97	100	102	105	105	103	105	106	110	113	114	116	118
Forestry [2]	...	...	96	100	103	102	100	98	101	100	97	97	96	97	96

NOTE. For details of the methodology and coverage of these indices, see the explanatory note to the Annex tables.
[1] Excluding China (Mainland). – [2] Calendar years. – [3] 1938 only

TABLE II-2. – INDICES OF WORLD [1] AND REGIONAL AGRICULTURAL PRODUCTION IN RELATION TO POPULATION

	Prewar average	Average 1948/49-1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Indices, average 1952/53-1956/57 = 100														
Total production															
ALL AGRICULTURAL PRODUCTS															
Western Europe	82	87	101	101	101	102	106	108	112	117	117	123	127	129	130
Eastern Europe and U.S.S.R.	81	86	94	96	104	116	118	129	132	132	135	139	134	146	146
North America	68	93	99	97	101	103	98	105	108	109	108	112	119	117	121
Oceania	78	90	97	98	103	105	102	117	119	123	126	132	138	142	133
Four above regions	76	89	98	98	102	107	106	113	116	119	119	124	126	129	131
Latin America	74	88	96	100	103	107	113	118	122	121	126	128	132	135	138
Far East [1]	83	87	98	100	104	108	107	112	116	120	124	126	129	133	131
Near East	73	85	99	97	101	109	112	118	121	123	123	132	135	139	140
Africa	67	88	98	101	102	106	106	110	114	122	118	125	129	132	130
Four above regions	77	87	97	100	103	107	109	114	118	121	123	127	131	134	134
ALL ABOVE REGIONS	76	88	98	98	102	107	107	114	117	119	121	125	128	131	132
FOOD PRODUCTS ONLY															
Western Europe	82	87	101	101	101	102	106	109	112	118	117	124	127	129	130
Eastern Europe and U.S.S.R.	82	87	95	96	104	116	119	130	133	134	138	141	135	148	147
North America	66	92	98	97	101	104	101	109	110	111	110	113	121	119	124
Oceania	82	92	99	98	103	100	99	117	115	122	124	134	139	145	135
Four above regions	76	89	98	98	102	107	107	115	117	120	120	125	127	131	133
Latin America	70	88	96	100	102	109	112	117	117	118	121	124	130	137	134
Far East [1]	81	87	98	100	104	108	106	112	118	122	124	126	130	134	132
Near East	73	84	100	97	100	109	113	118	120	121	122	130	133	134	134
Africa	69	89	98	101	101	106	104	109	112	119	116	122	125	127	125
Four above regions	75	87	98	100	102	108	108	113	117	120	122	126	130	134	132
ALL ABOVE REGIONS	76	88	98	99	102	107	108	114	117	120	121	125	128	132	132

of the population of these regions are far from adequate. In a number of developing countries in 1965/66, most notably India and certain parts of Africa, disaster was only narrowly averted with the help of massive emergency supplies of food, mainly from the stocks of grain accumulated in North America, which have now been reduced to their lowest level for more than a decade.

Longer term trends in agricultural production

Because of agriculture's dependence on the weather, bad seasons like 1965/66 are always liable to occur. The FAO index series indicate, however, that this is the first postwar season in which total food production in the developing regions actually fell. World food production increased only very slightly in 1954/55, 1957/58 and 1961/62, but except in 1957/58, when there was no increase in the developing regions as a group, the setback was primarily in the developed regions.

The widespread bad harvests of 1965/66 would be less serious if they represented only a break in a steady upward trend in the production of food per head of the population. However, the last year in which there was any substantial increase in per caput food production in the developing regions as a group

TABLE II-2. – INDICES OF WORLD [1] AND REGIONAL AGRICULTURAL PRODUCTION IN RELATION TO POPULATION (*concluded*)

	Prewar average	Average 1948/49-1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Indices, average 1952/53-1956/57 = 100														
Per caput production															
ALL AGRICULTURAL PRODUCTS															
Western Europe	93	89	102	101	101	101	104	105	108	112	110	115	117	118	117
Eastern Europe and U.S.S.R.	83	92	96	96	103	113	113	122	123	121	123	124	119	128	126
North America	88	100	101	97	99	100	93	98	98	98	96	97	102	99	101
Oceania	103	99	99	98	101	100	95	107	106	107	107	111	113	114	104
Four above regions	85	94	100	98	101	104	102	108	109	110	109	111	112	114	114
Latin America	111	98	98	100	101	101	104	106	107	104	105	103	103	103	102
Far East [1]	109	94	100	100	102	103	104	103	105	106	107	106	106	107	103
Near East	93	94	102	97	98	104	104	108	108	106	104	108	108	108	106
Africa	98	97	100	101	99	101	98	100	101	105	100	103	104	104	100
Four above regions	104	95	99	100	101	103	102	104	106	106	105	106	106	107	104
ALL ABOVE REGIONS	96	95	100	99	101	103	101	105	106	107	105	107	107	108	106
FOOD PRODUCTS ONLY															
Western Europe	93	89	102	101	100	101	104	105	108	112	110	115	117	118	118
Eastern Europe and U.S.S.R.	84	92	96	96	103	112	114	123	124	123	124	126	119	129	127
North America	85	99	100	97	99	101	96	101	100	100	97	99	103	101	104
Oceania	108	102	102	98	101	95	92	106	102	106	106	112	113	116	107
Four above regions	85	94	100	98	101	104	103	109	110	111	110	113	113	115	116
Latin America	105	98	98	100	99	103	103	105	102	101	101	100	102	104	99
Far East [1]	107	94	100	100	102	104	100	103	106	108	107	106	107	108	104
Near East	93	93	103	97	98	104	105	107	107	105	103	107	107	104	101
Africa	100	98	101	101	98	101	97	99	99	103	98	101	101	100	96
Four above regions	102	95	100	100	100	103	102	104	105	105	104	105	105	106	102
ALL ABOVE REGIONS	95	95	100	99	100	103	102	106	107	107	106	107	108	109	107

NOTE. For details of the methodology and coverage of these indices, see the explanatory note to the Annex tables.

[1] Excluding China (Mainland).

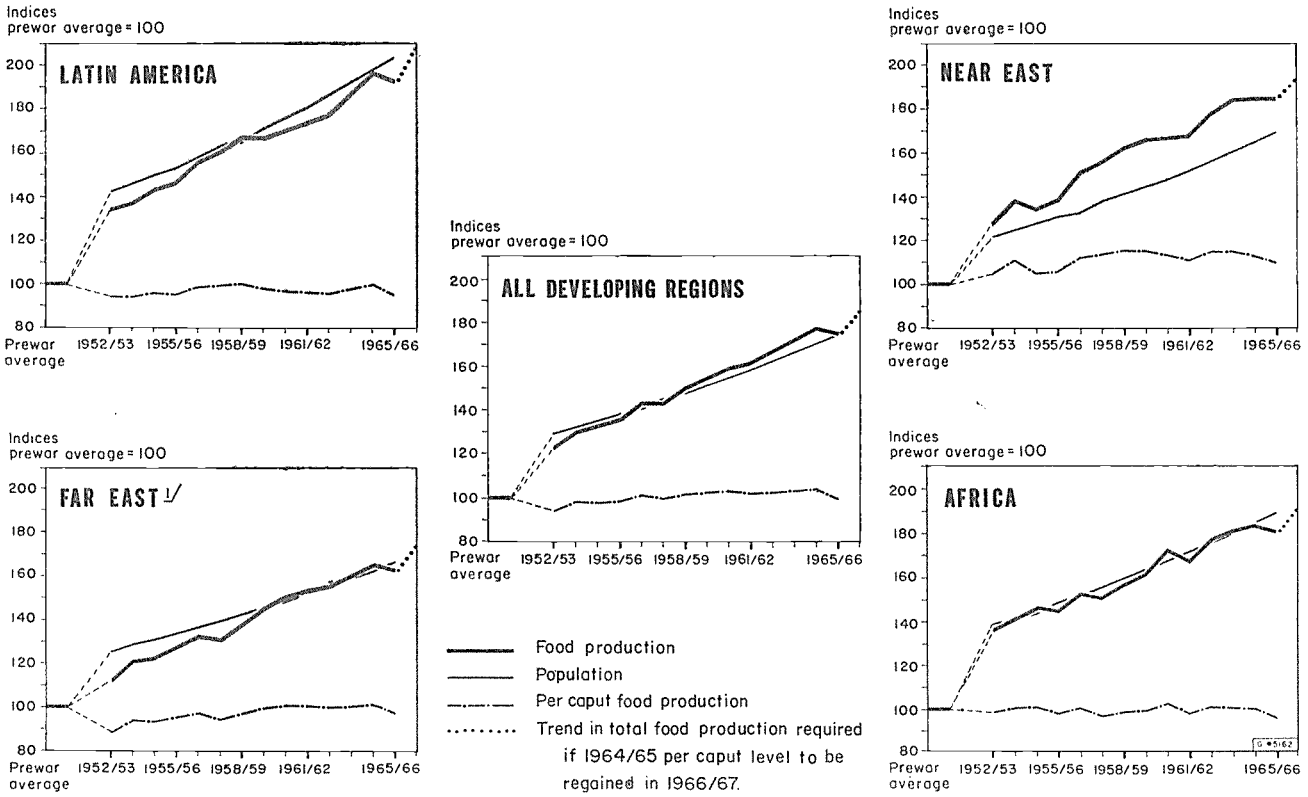
was 1958/59. Even in the world as a whole there has been very little increase since that time.

The preliminary estimates for 1965/66 indicate that per caput food production in the developing regions dropped back to the same level as in 1957/58, which in turn is the same as the inadequate prewar level. By 1964/65 per caput food production in these regions had reached a level about 4 percent more than before the war. With the population of the developing regions now increasing by an average of about 2.5 percent a year, an increase of almost 7 percent in their total food production would be needed next year to regain even the meager per caput level achieved by 1964/65.

In the Far East, Latin America and Africa, per caput food production in 1965/66 was a good deal less than before the war. If the prewar level of per caput food production were to be regained in 1966/67, this would entail the expansion of total food production by about 6 percent in Latin America, 7 percent in Africa and 5 percent in the Far East (Figure II-1). The difficulty of achieving production increases of such magnitude needs no emphasis.

The Near East appears now to be the only developing region where per caput food production is more than before the war, and even here it has recently fallen a good deal below earlier peak levels. In Africa it has tended to fluctuate around the prewar

FIGURE II-1. – TRENDS IN FOOD PRODUCTION AND POPULATION IN THE DEVELOPING REGIONS



[1] Excluding China (Mainland).

level, but in 1965/66 dropped to the lowest level recorded in the FAO index series. In Latin America, the prewar level of per caput food production was regained only in the single year 1958/59. In the Far East, according to the latest estimates, it was generally close to the prewar level from 1959/60 to 1964/65, but has now dropped back again.

TRENDS IN INDIVIDUAL COUNTRIES

Annex tables 1 and 2 show the FAO country index numbers of agricultural production. Unfortunately these are not yet available for 1965/66,[2] but it is clear both from the Annex tables and from the rates of growth shown in Table II-3 that the regional averages discussed above conceal a wide range of situations in different countries.

Table II-3 indicates that, in the 55 countries for which FAO indices are prepared, the average annual rate of change (compound interest) in total agricultural production between 1952/53-1954/55 and 1962/63-1964/65 ranged from a slight decrease in Algeria, Sweden (where the policy is to reduce production) and Uruguay, to increases as large as 4 to 6 percent in Brazil, China (Taiwan), Greece, Guatemala, Malaysia, Mexico, Syria, Thailand, Venezuela and Yugoslavia, and about 10 percent in the somewhat exceptional case of Israel.

Although the countries where the increase in production has been slowest include some developed countries, where policy aims to keep production in line with the slow rise in their domestic demand, they also include a number of developing countries, where, on the contrary, the objective is a rapid increase. In fact, in no less than 11 of the developing countries covered in the table, population growth exceeded the rise in production during the period 1952/53-1954/55 to 1962/63-1964/65. Population growth is now so rapid in some of these countries (more than 3 percent per year in several countries of Latin America and the Far East) that a very large increase in agricultural production is needed merely to keep pace with it from year to year, quite apart from any margin for increased per caput consumption and better nutrition.

The question naturally arises whether there are any specific factors associated with the high rates

[2] The FAO country index numbers of agricultural production are published each year in the March issue of the *Monthly Bulletin of Agricultural Economics and Statistics*. Those for 1965/66 will therefore be available in March 1967.

TABLE II-3. – AVERAGE ANNUAL CHANGE IN AGRICULTURAL PRODUCTION AND POPULATION IN INDIVIDUAL COUNTRIES, 1952/53-1954/55 TO 1962/63-1964/65

	Production	Population
	Average annual percentage change[1]	
Production increased		
4.0 PERCENT OR MORE		
Israel	9.9	3.9
Mexico	6.3	3.1
Guatemala	5.8	3.1
Thailand	5.2	3.0
Venezuela	5.1	3.5
Yugoslavia	5.1	1.1
Greece	4.7	0.8
Syria	4.7	3.1
China (Taiwan)	4.3	3.4
Malaysia: Malaya	4.2	3.1
Brazil	4.0	3.0
3.0 - 3.9 PERCENT		
Australia	3.7	2.2
United Arab Republic	3.7	2.5
Turkey	3.5	2.9
Japan	3.4	1.0
Panama	3.4	2.8
Iran	3.3	2.5
Korea, Rep. of	3.3	2.6
Austria	3.2	0.3
Philippines	3.2	3.2
South Africa	3.2	2.5
Ceylon	3.1	2.6
Ethiopia	3.1	1.7
Honduras	3.1	3.1
Spain	3.1	0.8
United Kingdom	3.1	0.6
New Zealand	3.0	2.2
2.0 - 2.9 PERCENT		
India	2.7	2.2
Burma	2.5	2.2
France	2.5	1.2
Netherlands	2.5	1.3
Colombia	2.4	2.8
Finland	2.4	0.9
Germany, Fed. Rep. of	2.4	1.2
Peru	2.4	2.6
Belgium-Luxembourg	2.3	0.6
Chile	2.2	2.6
Pakistan	2.2	2.4
Canada	2.0	2.3
Ireland	2.0	–0.3
0.1 - 1.9 PERCENT		
Denmark	1.8	0.7
Argentina	1.7	1.7
Italy	1.7	0.6
Morocco	1.6	2.8
United States	1.6	1.6
Portugal	1.4	0.6
Tunisia	1.1	1.8
Indonesia	1.0	2.2
Switzerland	0.8	1.8
Cuba	0.7	2.2
Iraq	0.6	2.8
Norway	0.4	0.8
Production declined		
Sweden	– 0.2	0.6
Algeria	– 0.4	1.8
Uruguay	– 0.4	1.5

[1] Compound interest; minus sign denotes decrease.

of agricultural growth achieved in some countries, or which, conversely, have tended to retard this growth in the countries where it has been slow. Some recent studies by the United States Department of Agriculture (USDA) and FAO have therefore tried to find out whether there is any clear link between particular technical, economic, institutional and political variables and the rate of growth of agricultural production.[3]

As might be expected, these studies confirm that there is no universally valid prescription for rapid agricultural development. This reflects not only the widely varying pattern of human, natural and capital resources and of social, economic and political institutions met with in different countries, but also the varying combinations that are possible of such factors as land, labor, better seeds, fertilizers, skills, and improved organization in the expansion of production. The consequent flexibility is in itself a hopeful element, as it implies a wide choice of alternatives for application in differing situations.

In fact it is clear that far more important than the physical, social and economic conditions in the different countries are the responses and adaptations that have been made to these conditions. Thus a major finding of the USDA study is that: "Rapid rates of increase in crop output have not happened just as a consequence of normal economic and social processes in societies organized on a laissez-faire basis. Rather, they have been undergirded by aggressive group action, generally national in scope, directed specifically to improving agricultural production conditions."[4] Activity in such fields as land development, land reform, agricultural research, education and extension, and the improvement of credit and marketing facilities was found generally to have been greater where there has been a rapid growth of agricultural production.

Regional agricultural production in 1965/66

Returning to the immediate production situation, further details are given below of agricultural production in 1965/66 in each of the main regions of the world. For statistics of regional production of the major commodities, reference should be made to Annex table 3.

WESTERN EUROPE

Weather conditions were exceptionally unfavorable in most countries of western Europe in 1965/66 and agricultural production is estimated as less than

[3] The results of the USDA study are published in *Changes in agriculture in 26 developing nations, 1948 to 1963*, Foreign Agricultural Economic Report No. 27, Washington, D.C., 1965. The FAO studies, which have not been published separately, were carried out in conjunction with this project and are in broad agreement with its findings.

[4] USDA. Op. cit.

1 percent greater than the year before. Crop production declined in some countries by as much as 10 percent but livestock production generally increased.

The region's grain production was about the same as the year before, slight increases in wheat and barley being roughly matched by lower production of maize, oats and rye. The quality of the wheat harvest was adversely affected by the weather in many countries. Sugar production dropped sharply in the northwestern part of the region because of lower beet harvests as well as a decline in sugar content. Potato production fell for the second year in succession but this was due mainly to reductions in area. Fruit and vegetable production was particularly severely affected by the cold and rainy summer in many countries. The region's production of vegetable oils and oilseeds, on the other hand, was boosted by the biennial upswing in the olive harvest.

Because of the abundant rainfall, fodder supplies were generally sufficient, and the production of meat, milk and eggs rose in 1965/66. The expansion in meat production was due mainly to increases in pig meat and poultry meat (the latter has doubled since 1957/58), but the decline in beef and veal production appears to have been checked. The increase in milk production followed a fall in the two previous seasons and led to big increases in the production of butter, cheese, and especially dried skim milk, the output of which is provisionally estimated as 40 to 60 percent more in 1965 than the year before. Egg production declined during 1965 but has since recovered, so that the 1965/66 output is estimated to have shown a further small increase.

Eastern Europe and the U.S.S.R.

Unfavorable weather was also widespread in eastern Europe and the U.S.S.R., and it is estimated that agricultural production failed to increase in 1965/66 over the level of 1964/65, when, however, there had been a substantial recovery from the poor crops of the year before.

In the U.S.S.R., crop production is reported to have decreased by 10 percent in 1965/66, as against an increase of 16 percent in livestock production. Grain production fell by more than 20 percent. Droughts in the eastern parts of the U.S.S.R. contributed to a decline of 20 percent in wheat production, which remained, however, considerably more than in the disastrous season of 1963/64. The production of potatoes, vegetables, sunflowerseed and sugar beet was also considerably lower than the previous year. Milk production, on the other hand, was higher than ever before, and meat production showed a partial recovery from the effect of the heavy slaughterings in 1963.

Among the eastern European countries, production is estimated to have declined in Czechoslovakia and Hungary, and to have increased slightly in Bulgaria and Romania, and considerably in eastern Germany and Poland. There were large increases in the production of grain, forage crops and meat. The production of potatoes, vegetables and fruit, however, fell sharply.

North America

In contrast to so many other parts of the world, climatic conditions were favorable in North America in 1965/66, bringing a rise of 3 percent in the region's total agricultural production and 4 percent in its food production. Although part of the increase represented recovery from the low level of 1964/65, the production both of food and of agricultural products as a whole was about 2 percent higher in 1965/66 than the previous record of 1963/64.

In the United States agricultural production is estimated to have increased by 4 percent in the calendar year 1965, the combined result of an increase of 6 percent in crop production and a fall of 1 percent in livestock production. Record yields offset lower acreages for many crops. For wheat, both yield and production increased by only 2 to 3 percent, but record yields brought an increase of 17 percent in the production of coarse grains. Other large increases were in the production of soybeans and citrus fruit. For both the main nonfood crops, cotton and tobacco, however, additional restrictions brought a sharp reduction in area although in the case of cotton this was almost offset by higher yields. Meat production declined slightly, as further increases for beef and veal and poultry meat were more than counterbalanced by lower production of pigmeat, mutton and lamb.

Canada's agricultural production is estimated to have increased by 9 percent in 1965. Potatoes and sugar beet were the only main crops for which production did not increase. The wheat crop was 13 percent higher than the year before and the second largest on record. There was a large increase in beef production but milk production declined slightly.

Oceania

A serious drought in much of eastern Australia caused, according to FAO's preliminary estimates, a decline of 6 percent in Oceania's agricultural production in 1965/66, which was much bigger than the fall in production in any of the other main regions of the world. Although this region's production tends to fluctuate as a result of variable weather conditions, the drop in 1965/66 will, if confirmed by later estimates, be the largest during the whole period covered by the FAO index numbers of agricultural production.

Wheat was the crop most affected by the Australian drought and production is estimated to have dropped by more than 30 percent in 1965/66. Sugar production, however, reached a new record. As a result of good pasture conditions in New Zealand, it is likely that the region's milk production increased somewhat and that there was only a small decline in meat production. A fall of about 6 percent is expected in the Australian wool clip.

Latin America

The agricultural production situation in Latin America in 1965/66 was dominated by developments in respect of only two major crops, wheat and coffee. As a result of drought in Argentina the region's wheat production is estimated to have fallen by more than 30 percent, which in turn was the main cause of a reduction of 2 percent in food production. That total agricultural production, on the contrary, increased by about 2 percent, was almost solely the result of the recovery of Brazil's coffee crop from the frost and fire damage of the last few years. Coffee production was probably about three times as great as the year before in Brazil and the increase was almost 80 percent in the region as a whole.

The production of maize, the region's main grain crop, is estimated to have increased by about 5 percent in 1965/66. Sugar production rose by about 4 percent, a slight fall in Cuban output (which had shown a big rise in 1964/65) being more than offset by larger harvests in Brazil and Mexico. For almost all of the other main products, however, there appears to have been very little change in output at the regional level in 1965/66.

Far East

The decline of 2 percent in agricultural production in the Far East, excluding China (Mainland), in 1965/66 was to a great extent caused by disappointing rice harvests in large numbers of countries, including India, Japan, Malaysia, Pakistan, the Republic of Viet-Nam, and Thailand. This was in spite of gains in wheat production, especially in India, Japan and Pakistan.

India's difficult food situation calls for special comment. A widespread failure of rains caused the total output of food grains to fall from 88.4 million tons in 1964/65 to an estimated 75 million tons in 1965/66. This mainly reflected a deficit of over 8 million tons in rice production, but also considerable losses in coarse grains. While large imports, combined with increased controls, made it possible to avert mass starvation, there were severe local shortages in a number of states.

The region's sugar production showed a substantial increase, partly because of a record crop in India. The production of pulses is estimated to have recovered sharply from the low 1964/65 level, but to have remained much less than in several earlier years. The production of groundnuts and, among nonfood crops, cotton declined, in each case mainly reflecting the conditions in India.

China (Mainland)

As in every year since 1959 no official production figures have been published for China (Mainland), but most reports agree that total "food-grain" production (including potatoes and sweet potatoes) amounted to about 180 million tons in 1965, as against 183 million tons in 1964 and 179 million in 1963. Rice production appears to have increased by about 3 percent in 1965, but wheat is estimated to have fallen by 7 percent and coarse grains by 3 percent, mainly because of prolonged drought in the north. Most other products are reported to have increased, except soybeans, which, being a northern crop, also suffered from the drought.

Near East

Although the Near East did better than the other developing regions in 1965/66, even here there appears to have been no increase in overall agricultural production.

Grain production is estimated to have increased, with good crops of wheat, barley and rice in most of the region. The grain crop in Iraq was one of the best ever. Sugar production, however, declined sharply. The production of cotton, the region's principal export crop, increased by about 4 percent; production was close to the 1964/65 level in Sudan

but there was a large expansion in Iran and the United Arab Republic. Tobacco production declined by more than 20 percent.

AFRICA

There is estimated to have been a decrease of about 2 percent in agricultural production in Africa in 1965/66. Severe drought affected many areas in the central, eastern and southern parts of the region, in particular Bechuanaland, Chad, Somalia, and parts of South Africa.

The region's wheat production appears to have fallen by about 4 percent; the drought-affected South African crop was to some extent counterbalanced by good crops in northwest Africa, including a record one in Morocco. Barley production, mainly confined to northwest Africa, also increased but the production of maize, of which South Africa is the largest producer, dropped sharply. Sugar production is expected to have declined by up to 30 percent in South Africa, but at the regional level this may have been offset by increases in Mauritius and most other producing countries. Groundnut production recovered, particularly in Nigeria. Coffee harvests were at about the same level as in 1964/65, but cocoa production fell back from the record set in that year.

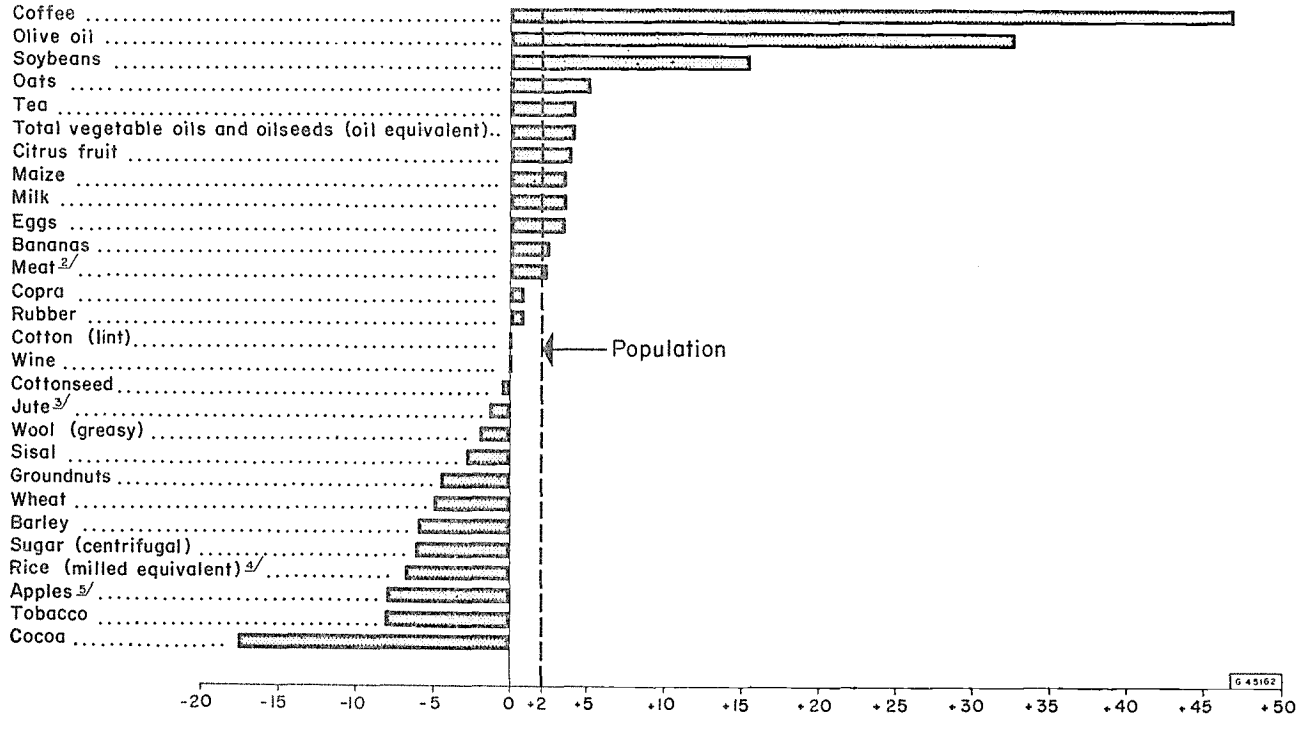
Production of main agricultural commodities [5]

World production of the main agricultural commodities showed a remarkable diversity of trends in 1965/66 (Figure II-2 and Annex table 3). Not only did the production of a large number of commodities decline, but for several there were increases of quite exceptional magnitude. In the world, excluding China (Mainland), there were falls of between 4 and 18 percent in the production of wheat, barley, rice, sugar, apples, groundnuts, cocoa and tobacco, and smaller falls for a number of fibers. For most other products there was a small increase in production in 1965/66, but for olive oil, soybeans and coffee increases ranged from 15 to almost 50 percent.

The most serious development in 1965/66 was the estimated decline of more than 2 percent in the production of grains, which account (on a price-weighted basis) for about a third of world agricultural production. Among the main grains, the biggest drop, estimated at about 7 percent, was for rice, which reflected chiefly the poor harvests in the Far East, particularly in India, but also lower production in a number of other countries, including

[5] For a detailed review of the commodity situation, see *FAO Commodity Review, 1966*, Rome. 1966.

FIGURE II-2. – CHANGES IN WORLD [1] PRODUCTION OF MAIN AGRICULTURAL COMMODITIES IN 1965/66 IN RELATION TO 1964/65



[1] Excluding China (Mainland). – [2] Beef and veal, mutton and lamb, pork, poultry meat. – [3] Including allied fibers. – [4] Paddy converted at 65 percent. – [5] Excluding U.S.S.R. as well as China (Mainland).

Brazil, the United Arab Republic, and most of the European producers.

The production of wheat fell only slightly less than that of rice. Most of the decline was caused by the lower crops in the U.S.S.R., Argentina and Australia. These reductions were so great as to be only partly offset by the good crops in North America and much of the rest of the world.

World production of barley also declined sharply, again largely because of the poor crops in the U.S.S.R., Argentina and Australia. However, substantial increases in the production of maize and sorghum, mainly in the United States, helped to limit the fall in total world grain production. The long-term downward trend in the production of oats was temporarily reversed in 1965/66.

Sugar production, which had climbed by almost 20 percent the year before, is estimated to have dropped back by about 6 percent in 1965/66. Beet sugar production in the U.S.S.R., Europe, Turkey and the United States declined, generally from record levels. The cane crop fell sharply in South Africa and there was some reduction in Cuba from the high level of 1964/65.

Apple production is estimated to have fallen by about 8 percent from the record level of the previous season, most of the decline resulting from the unfavorable weather in Europe. The production of citrus fruit, however, showed a further increase of about 4 percent, mainly because of continued recovery in the United States from the frost damage of 1962/63. Among the main dried fruits, raisin production rose by 7 percent but currant output was below average and that of prunes declined. The expansion of banana production appears to have continued in 1965/66.

A rise of about 4 percent in the total production of vegetable oils and oilseeds resulted from divergent trends for the main products. As usual the biggest change was for olive oil, which increased by a third, mainly reflecting the upswing in the two-year production cycle in southern Europe. Soybean production also showed a large increase (16 percent), chiefly because of the continued rapid expansion in the United States. Lack of rainfall in Ceylon was the main factor which limited the increase in world copra production to about 1 percent. Groundnut production decreased by about 4 percent, as heavier production in Nigeria was more than offset by the contraction in India.

Coffee production registered an unprecedented expansion of nearly 50 percent and slightly exceeded the record crop of 1959/60. The main factor was the recovery of Brazilian production, but crops were also markedly higher in most other producing countries. Cocoa production, in contrast, fell by almost a fifth from the 1964/65 record, when there had been an expansion of about a quarter; the main cause of the decline was unfavorable weather in west Africa. Tea production is estimated to have risen by about 4 percent. Wine production hardly changed from the level of the previous year. Tobacco harvests dropped by some 8 percent from the record of 1964/65, principally owing to intensified restrictions in the United States, where the acreage was the lowest since 1891.

Cotton production was about the same as the record level reached the year before. The production of jute and allied fibers fell for the second year in succession, because of the Indian drought. The wool clip also declined for the second year, reflecting severe losses in the drought-stricken areas of Australia. Sisal production fell by about 3 percent. The production of natural rubber rose slightly, largely because of progress in smallholders' output in Indonesia and Malaysia.

In contrast to so many of the major crops, world production of all of the main livestock products appears to have expanded in 1965. The biggest increases in meat production were in western Europe and in the U.S.S.R.; beef and veal production was lower in western Europe and Latin America. Milk production increased, especially in western Europe, the U.S.S.R. and Oceania. Egg production also established a new record.

Fishery production

World fish production, excluding China (Mainland), is estimated to have increased on a price-weighted basis by almost 4 percent in 1965 (see Table II-1 above). Catch data for the main regions of the world are shown in Table II-4 and for individual countries in Annex table 4.

The increase in Peruvian production, which has been such a major factor in the recent expansion of the world catch, was relatively small, but Peru succeeded in maintaining its position as leading fish-producing country in the world. Total catches of anchoveta, which, as raw material for the country's fish meal industry, represent the bulk of the Peruvian production, were estimated at 9 million tons, slightly in excess of the production of the preceding year.

TABLE II-4. – ESTIMATED WORLD[1] CATCH OF FISH, CRUSTACEANS, AND MOLLUSKS

	1938	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons													
Western Europe	5.63	6.31	7.42	7.54	7.98	7.54	7.43	7.82	7.68	7.91	8.12	8.39	9.09	9.9
Eastern Europe and U.S.S.R.	1.62	1.94	2.50	2.76	2.90	2.83	2.91	3.09	3.42	3.64	4.03	4.48	5.05	5.6
North America	3.11	3.50	3.83	3.79	4.13	3.80	3.76	3.99	3.79	4.01	4.15	4.02	3.90	3.9
Oceania	0.09	0.09	0.11	0.10	0.10	0.12	0.11	0.13	0.13	0.13	0.13	0.13	0.13	0.1
Latin America	0.28	0.60	0.80	0.97	1.09	1.33	1.87	3.20	4.70	6.59	8.61	8.77	11.51	10.5
Far East[1]	8.44	6.85	8.41	9.01	9.22	10.21	10.30	10.41	11.20	12.84	13.28	13.53	13.55	13.4
Near East	0.31	0.35	0.40	0.38	0.41	0.39	0.38	0.38	0.38	0.40	0.42	0.47	0.48	0.5
Africa	0.47	1.06	1.59	1.63	1.81	1.91	1.97	2.08	2.19	2.33	2.43	2.54	2.78	3.0
WORLD TOTAL[1]	20.00	20.70	25.10	26.20	27.60	28.10	28.74	31.10	33.50	37.80	41.20	42.30	46.50	46.90

[1] Excluding China (Mainland).

In Chile, which fishes the southern part of the anchoveta resources also exploited by Peru, there was a drastic reduction in catch results in 1965. Total catches for the year were only about two fifths of 1964 production.

The difficulties in the South American fish-meal industries helped to encourage Scandinavian producers to expand their fisheries for fish meal raw material. Some of these countries, notably Norway and Iceland, were assisted in these efforts by exceptionally good results in their herring fisheries which provide the principal source of raw material for their fish-meal industries. Norway's herring fishery landed about 50 percent more fish than in the preceding year and the production of herring meal which, with the exception of a small fraction, is exported primarily to the United Kingdom, was of the order of 250,000 tons. Norway's total production of fish and shellfish rose by 50 percent. Iceland, with a production of 1.2 million tons, exceeded 1964 catch results by about 20 percent. As in Norway, the boost in production was primarily due to improved yields in the herring fishery. In contrast, catches of the higher priced groundfish, particularly cod, declined to some extent. Over the last ten years, catch results in the cod fishery have decreased by 22 percent, while catch capacity has risen by 87 percent.

Another country which has benefited from the steadily growing demand for fish meal is South Africa (including South West Africa). Altogether, about 1.3 million tons of pilchard and anchovies for fish meal and fish oil reduction were taken in 1965, about 5 percent more than in the preceding year. While, until recently, pilchard constituted the bulk of the fish meal raw material, the South African enterprises are now, to an increasing extent, depending on anchovy as a result of reduced availability of pilchard.

Japan and the U.S.S.R. continued to expand their large-scale, highly integrated, fishing expeditions operating in all waters of the world. Since 1950, U.S.S.R. fish production has tripled. Japan continued to seek agreements with foreign countries and foreign enterprises for the joint operation of fishery undertakings. With its far-flung and diversified operations, it produced the most valuable fisheries crop in the world, although in quantity terms its catches were, as in recent years, exceeded by those of Peru.

In the United States, a steadily increasing demand for high unit value fishery products increased fishermen's proceeds from the sale of their catches to record levels. Total catch value was in the neighborhood of $440 million, about 11 percent higher than in 1962, the previous record year. Shrimp production represented nearly one fifth of this total. Income from other high value products such as lobster, halibut and salmon, was also considerably above that of the preceding year.

Very satisfactory catch results were reported, with only a few exceptions, by other countries with highly developed fishery industries. Spain and the United Kingdom reported substantially increased catches, with sea-frozen fish representing a growing share of landings. Spain caught about 1.3 million tons in 1965, or about 200,000 tons more than in 1964. The United Kingdom's catches were close to 1 million tons, the largest since 1956.

Apart from Peru and Chile, the difficulties of whose fishing operations (in the fish meal and fish oil sector of the industry) were expected to be of a temporary rather than a long-term nature, most developing countries were able to make encouraging advances in the development of their fishery industries in 1965. Other countries in Latin America (for instance, Mexico, Venezuela, Guyana, Ecuador and the Central American republics) concentrated to a large extent on shrimp production for export. On the other hand, Argentina and Uruguay have been trying to raise domestic consumption levels to release additional quantities of meat for the export trade. In Peru, the industry agreed to a levy on fish meal exports to promote the marketing of groundfish products for consumption in Lima and other population centers.

Among the developing countries of Africa, the two largest fish producers, Morocco and Angola, experienced difficulties in their fish canning and fish meal operations, which represent the backbone of their important export-oriented fishery industries. A tidal wave destroyed a large part of the Moroccan sardine fleed, and Angola was among the few major fish meal producing countries unable to expand operations in the wake of the difficulties in the competing South American industries. In most other African countries catches continued to increase in 1965.

India is estimated to have landed about 1.5 million tons of fish in 1965, placing it in third place, after Japan and China (Mainland), among fish-producing countries in the Far East region. Even this substantial production, representing an increase of about 80 percent since 1955, was considered only a modest fraction of the country's eventual catch potential, put by some sources at close to 10 million tons. Indonesia, the Philippines, the Republic of Korea and Thailand, each of which in recent years has produced in excess of 500,000 tons of fish annually, succeeded in increasing their catches further in 1965, and other important fish-producing countries of the region also reported favorable results.

Forest production

World roundwood removals rose by about 1 percent in 1965 to a new record level of approximately 1,870 million cubic meters (Table II-5 and Annex table 5). A rise in fuelwood removals in the developing regions, which account for nearly three quarters of the world total of this category, was partly offset by the continued decline in developed countries, caused by its replacement by other fuels and the transfer of fuelwood qualities to pulping. Most of the estimated 17 million cubic meters increase in industrial roundwood occurred in North America, with both large-sized logs and pulpwood recording gains. In some European countries there was also some increase in fellings, but for Europe as a whole, the U.S.S.R. and Japan they were little different from the level of 1964. Among developing countries, the removals of hardwood logs for export declined in several west African countries in 1965. The production of hardwood logs for export was substantially higher in Malaysia, but for the rest of the Far East it is estimated that industrial roundwood removals were only slightly higher than in 1964.

World output of sawn softwood, still by far the most important single assortment in the forest pro-

TABLE II-5. – INDICES OF WORLD[1] ROUNDWOOD PRODUCTION

	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1952-56 = 100													
INDUSTRIAL WOOD														
Saw and veneer logs	90	95	101	107	106	103	107	115	118	116	120	120	125	126
Pulpwood and pitprops	94	89	96	106	115	114	107	112	119	121	122	122	130	136
Other	107	87	101	98	107	112	103	108	99	92	92	97	95	95
Total	93	93	100	106	108	106	107	114	116	114	117	117	122	124
FUELWOOD	99	99	101	101	100	102	101	102	100	101	101	102	104	105
TOTAL ROUNDWOOD	95	95	100	105	106	105	105	111	112	111	113	114	118	119

[1] Excluding China (Mainland).

ducts sector, rose fractionally in 1965. The increase was almost wholly due to a rise of roughly 1.5 million cubic meters in North America. In the other main producing regions, the U.S.S.R. and Europe, output in 1965 was about the same as in the previous year. Sawn hardwood production increased by nearly 1 million cubic meters to a peak of about 76.3 million cubic meters. The largest rise was in North America, whose output made a partial recovery after a sharp fall in 1964.

Production of wood-based panel products continued to expand to meet the rapidly growing demand. World output of plywood rose by 7 percent in 1965 to nearly 24 million cubic meters. Output fell in Canada but continued to rise in the United States. Production of plywood also increased in the U.S.S.R., Finland and Japan, all of which are major exporting countries. On the other hand, in several central European countries output in 1965 was below levels recorded in previous years, in some cases due to shortage of suitable raw materials, in others to competition from particle board. World output of particle board itself rose by approximately 20 percent in 1965. Of this total about two thirds is still concentrated in Europe and a further one fifth in North America. The rapid growth of this industry has been a feature in virtually all producing countries, while the industry is being introduced into more countries each year. There was a noticeable drop in the rate of growth of fibreboard production in 1965 in both main producing regions, Europe and North America.

The pulp and paper sector continued to expand in 1965 although, as with panel products, certain imbalances were apparent. World production of woodpulp in 1965 is estimated at about 78 million tons, an increase of 5 percent compared with 1964. In North America, the industry worked at operating ratios higher than at any time since the mid-1950s. In Europe, on the other hand, the chemical pulp market became more difficult during the course of 1965, partly because of stagnant paper output in a few importing countries, and the rate of growth of pulp output dropped from 9 percent in 1964 to 3 or 4 percent in 1965. Although the rate at which the massive new wave of pulping capacity expansion is coming into production is slower than anticipated, it is still probable that world capacity, and particularly that of sulfate pulp in North America, will outstrip growth in demand for a few years.

World output of paper and paperboard continued to rise in 1965, but at a rate slightly below that of 1964. In the case of newsprint, an increase in Canadian output was the chief factor in the 4 percent growth of world production. The rest of the increase in newsprint output in 1965 came mainly from Europe, notably Finland, and there was a slight decline in the United States.

A somewhat reduced rate of growth of production of other paper and paperboard in 1965 was attributable to stagnant output in Japan and France, and slower growth in northern European countries.

Agricultural production outlook for 1966/67

In view of the poor harvests in so many areas in 1965/66, even more than usual interest attaches to the prospects for the 1966/67 production season. Unfortunately, at the time of writing (mid-July), only piecemeal information is available and it is not yet possible to assess the extent to which production is likely to recover, particularly in the developing regions.

In western Europe, excess rainfall reduced winter wheat plantings in almost all countries except Italy, although to some extent this was compensated by larger plantings of barley, especially in France and the United Kingdom. Italian production may equal the 1965/66 bumper level, and favorable moisture conditions in southern Europe in general may offset to a great extent the reduced acreages of the north. Winter wheat sowings were also adversely affected by excessive rain in eastern Europe, and the area of winter grain in the U.S.S.R. is reported to be 12 percent smaller than planned.

The July forecasts of United States wheat production indicated a decline of 7 percent below the large crop of 1965/66 as a result of frost, drought and tornado damage. Maize production was expected to increase by about 1 percent, to a new record, but declines were expected in the production of barley and oats. There was a further rise of about 6 percent in the soybean acreage which, given favorable weather, may result in yet another record crop. As a result of heavy participation in the 1966/67 upland cotton acreage diversion program, the United States cotton area was expected to decline by about a quarter to its lowest level since the 1870s. Wheat plantings in Canada were expected to be close to the record of 1964/65, and moisture conditions were reported to be favorable for planting the spring crop, which comprises almost all of Canada's wheat.

In Australia, expectations are for a larger acreage planted to wheat. Meat output is expected to decline

in 1966 as a result of the small 1965 calf and lamb crop and the large numbers of young animals slaughtered which would normally have been marketed in 1966. Cattle numbers should increase, however, since herds are expected to be built up in 1966 and 1967.

There are even fewer indications for the developing regions. In Latin America, crops in Argentina are expected to recover substantially from the drought-affected levels of 1965/66, and increased support prices for wheat should result in an increase of 10 to 20 percent in plantings.

In the Far East, drought unfavorably affected wheat crops in India and Pakistan during the latter part of 1965 and, although rain brought some relief in India in 1966, May estimates were for a 5-percent decline in Indian output, and for a substantial deficit (1 to 2 million tons) in Pakistan. Barley output is also expected to be smaller in both countries. Floods caused serious damage to the rice crops in East Pakistan and northeast India, but it is still too early to evaluate the effect on the harvest. Widespread drought is reported in China (Mainland), and the wheat crop is expected to be below last year's reduced level. In Japan, a continuation in the long-term decline in soybean acreage is expected; wheat acreage is estimated to be almost 10 percent less than in 1965/66, and a decline of almost 20 percent in production is forecast.

In the Near East, inadequate rainfall is expected to reduce wheat production significantly below 1965/66 levels in Iraq, Israel, Jordan, and Syria. Weather conditions have been favorable in Iran, however, and a record wheat crop of 3 million tons is anticipated, as well as record production of sugar beet. In the United Arab Republic the cotton crop is again threatened by leaf worm.

In northwestern Africa, wheat seeding was completed under unfavorable weather conditions, and continuing drought makes the outlook unpromising. The situation in eastern and southern Morocco is particularly serious, and it is estimated that the crop will be only about two thirds of the record harvest of 1965/66. In Algeria, the wheat crop is expected to be the smallest since 1961/62, and in Tunisia about half of the bumper 1965/66 harvest.

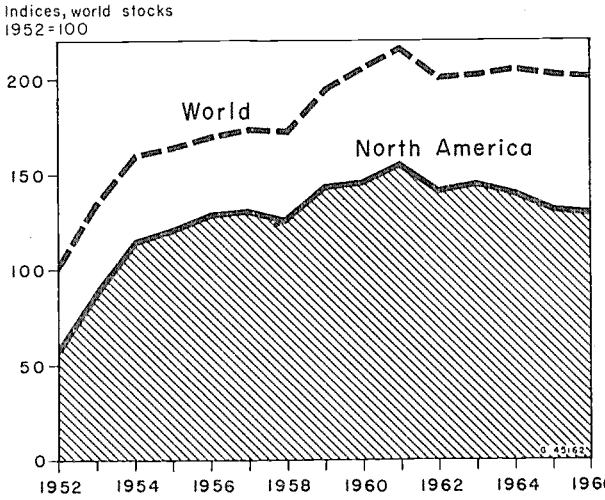
CHANGES IN STOCKS

The year 1965/66 witnessed some important developments in the world stock situation. In retrospect, it may turn out to represent something of a turning point in the postwar history of agricultural surpluses.

The overall indices of the volume of agricultural stocks shown in Figure II-3 did not, it is true, change much in the course of the year, whether for the world as a whole or for North America, where the major part of the stocks are held.[6] This comparative stability, however, hides some divergent movements, in particular a further substantial fall in the stocks of wheat, and increases in those of a number of other products, including coffee, cotton and sugar. (Annex table 6).

The exporters' stocks of all grains combined fell in 1965/66 by 8 percent to about 88 million tons. This was caused by a steep fall in the expected carry-overs of wheat, to only 31 million tons, their lowest level since 1953 and 45 percent less than the peak level of 1961, reflecting mainly the large import requirements of India, U.S.S.R. and China (Main-

FIGURE II-3. – INDICES[1] OF THE MAIN STOCKS OF AGRICULTURAL COMMODITIES IN THE WORLD AND IN NORTH AMERICA



[1] Price-weighted indices of the stocks shown in Annex table 6 (excluding forest products).

[6] As is indicated in Annex table 7, however, the total value of the holdings of the United States Commodity Credit Corporation was approximately 12 percent lower on 30 April 1966 than a year earlier. The difference between the two sets of data is mainly because United States stocks of maize and sorghum fell sharply over the period May-April, but for the October-September period to which the data for these commodities in Annex table 6 refer, they are expected to show little change.

land). The decline in wheat stocks would have been even greater but for the postponement of some Canadian shipments owing to dock strikes.

Coarse grain stocks increased slightly over 1965, but in that year they were already the lowest since 1957 and a third less than the peak level of 1961. In view of the substantial expansion in the world grain trade, on both commercial and concessional terms, as well as the precariousness of the food situation in many developing countries, the combined grain stocks now held by the major exporters are no longer considered excessive in relation to requirements.[7]

How permanent will be the new state of near equilibrium in the world grain markets is, however, as yet uncertain. The increased import requirements of China (Mainland) seem likely to last for some time, but the more recent heavy purchases by the U.S.S.R. and India are to a large extent the result of poor harvests. On the other hand, a number of other factors suggest that the equilibrium may be more than just a passing phase. Thus, on the supply side, those features of the United States farm price and income support policies which in recent years have succeeded in bringing about a better balance in the country's grain production will continue in force at least until the 1969/70 crop year, when the Food and Agricultural Act of 1965 expires. During this period the Government will have even greater powers than before to regulate the grain acreage (either up or down) in accordance with the estimated requirements. Moreover, on the demand side, as was pointed out in the *FAO Commodity Review 1966*, the steadily increasing net grain imports of the centrally planned and developing countries are nothing new, but part of a longer term trend that has been in evidence through much of the postwar period. In the U.S.S.R., vigorous steps are being taken to increase grain output, but this will naturally take time, and in any case it remains uncertain whether the U.S.S.R. can resume its earlier position as a source of imports for the eastern European grain deficit countries. The grain production targets in the U.S.S.R.'s latest development plan suggest that, for the next few years at least, its import requirements will remain large. As for the developing countries, current indications suggest that they are likely to remain major net importers of cereals for several years to come. Finally, the recent decisions of the European Economic Community (EEC), discussed later in this report, which have made it possible for the Community countries to agree on a common position in the GATT Kennedy Round of trade negotiations, enhance the possibility of progress toward an international grains agreement. In line with current thinking, several governments would like such an agreement to embody elements of international supply management, and to embrace not only commercial trade, but also transactions on concessional terms.

Grains may lend themselves better to international market organization than some other commodities currently suffering from excess supplies, such as coffee, sugar, cocoa and cotton. Further experience may lead to improved arrangements for these products also, but so far there has been little evidence that their surplus problems are on the way to being solved. In 1965/66, the stocks of all of these products increased further, reaching postwar record levels in the case of coffee, sugar and cotton. Coffee production had recovered steeply in Brazil, while trade fell. Stocks, held mainly by exporters (particularly Brazil), probably rose by almost 20 percent, and are far in excess of the annual trade of some 2.7 to 2.8 million tons. Sugar output had been a record in 1964/65, and although production was smaller in 1965/66 it still exceeded consumption. Stocks of sugar, which had almost doubled in the preceding year to 15 million tons, increased still more in 1965/66.

Cotton stocks, too, had reached a new postwar peak in 1964/65 and a further increase was expected in 1965/66, to some 6.25 million tons. A reduction in output in the United States, where most of the increase took place, is expected, however, in 1966/67. Support prices for the new crop have been set lower, near the world market price, and the new policy of setting the loan rates at or near the world market price will continue to have its disincentive effect also in 1967/68-1969/70. A reduction in cotton stocks is therefore likely in the coming years.

In addition, stocks of cocoa, which are not included either in Figure II-3 or in Annex table 6 for lack of sufficient information, apparently rose in 1965/66, following a new record crop and despite an increase in consumption.

The stock levels of a number of forest products also showed some changes in 1965. In Europe, importers' stocks of sawn softwood were already high at the beginning of 1965 and, because of a falling

[7] In 1964, the United States reserve levels of grains "representing the maximum amounts justifiable for strategic stockpiles" were estimated at 17 million tons of wheat and 41 million tons of coarse grains (*Report of Subcommittee on Food and Fiber Reserves for National Security to the National Agricultural Advisory Commission*, October 1964). In mid-1966, the United States total carry-overs of wheat were expected to be only about 15.5 million tons, and those of coarse grains 51 million tons (Annex table 6).

off in consumption in some countries, stocks were at record levels by the end of the year. European importers of chemical woodpulp reduced their stockholdings during 1965, which led to a considerable accumulation in northern European exporting countries. European importers of tropical hardwood logs succeeded in reducing their high stock levels during 1965 by curtailing their imports, leaving this market in better balance. North American end-1965 stocks of newsprint were the lowest for ten years, reflecting the present tight supply position there and in some other regions.

ECONOMIC ACTIVITY AND THE DEMAND FOR AGRICULTURAL PRODUCTS

The growth of the world economy as a whole appears to have slowed down slightly in 1965. The combined gross national product (GNP) of the industrial countries rose by some 4.5 percent, compared with an expansion of about 5.5 percent in 1964. The volume of world trade, which in 1964 had shown an unusually large increase of 12 percent, expanded in 1965 by about 8 percent.

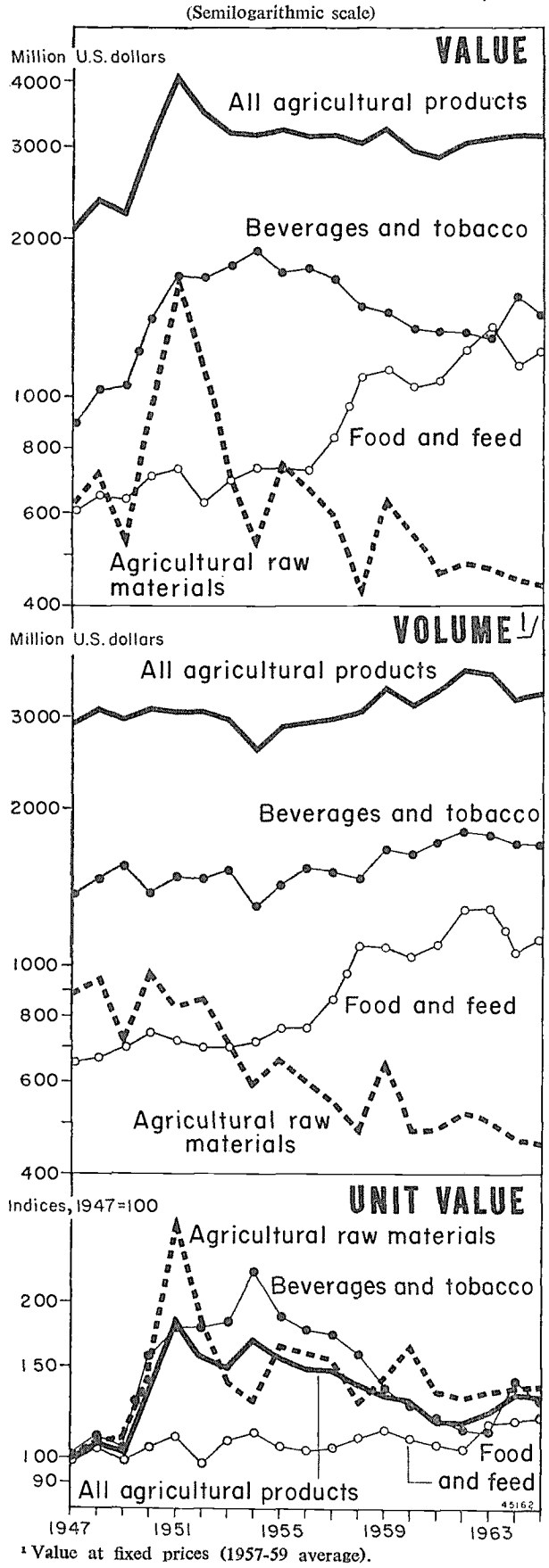
Among the industrialized countries there was an increase of 5.5 in GNP in the United States in 1965. The growth continued in 1966, when the United States entered its sixth year of continuous economic expansion. The GNP in the first quarter of the year exceeded expectations but there were some signs of a decrease in the rate of growth in the following months. The expansion in the United States was in part offset by a slower growth in Japan and most European countries in 1965. Signs of economic revival appeared in France, Italy and Japan toward the end of the year and were reinforced in early 1966, but output in Sweden and the United Kingdom failed to increase, and economic growth began to slow down in the Federal Republic of Germany.

Investment in plant and machinery was the main contributing factor in countries where the rates of expansion were most rapid, namely Canada and the United States. It was also important in the Federal Republic of Germany where increases in both GNP and industrial production, although considerably below those of the previous year, were still high. In all three countries, a decline in unemployment (though reversed in the United States in May 1966), generally tight utilization of manufacturing capacity, some acceleration in the rise of wage rates, and a tendency for the growth of productivity to slow down somewhat, have contributed to rising prices and growing concern over inflation. Higher public expenditures also contributed to the growth of demand in the United States and the Federal Republic of Germany in 1965, although they were expected to decline in the latter country in 1966. In the United States, the wholesale price index, which had not changed at all during the previous four years, rose by 2 percent in 1965, and continued to rise slowly in early 1966. Throughout most of 1965 the government fiscal policy remained expansionary, although credit rates were tightened somewhat. Measures designed to restrain the economy were introduced in the 1966/67 budget. In the Federal Republic of Germany, retail prices rose by over 4 percent in 1965; here too, credit terms were restricted, but prices were still rising in April.

In countries where the growth of demand was slowing down in 1965, notably France, Japan and the United Kingdom, the slower growth of investment in plant and equipment was a main cause. In France and Japan such expenditures were virtually unchanged over the previous year, and in Italy they continued to fall, although less rapidly than before. With the exception of France, low levels of construction activity also contributed to the slow rates of growth in these countries. In all of them, on the other hand, a rapid increase in exports stimulated total demand.

Preliminary estimates of the United States balance of payments show a deficit of $1,300 million in 1965 on an "overall liquidity" basis. Although $1,500 million less than in 1964, the deficit was more than had been expected, and there appeared to be little likelihood of a further reduction in 1966. The United Kingdom balance of payments deficit was also cut substantially in 1965, to about half of the 1964 figure of more than £750 million, partly as a result of the import surcharge imposed in October 1964, but the seamen's strike has made prospects for 1966 uncertain. In continental western Europe, both France and Italy continued to accumulate reserves, though toward the end of 1965 in both countries imports were rising faster than exports. The balance of payments of the Federal Republic of

FIGURE II-4. – CHANGES IN THE VALUE, VOLUME, AND UNIT VALUE OF UNITED STATES IMPORTS OF AGRICULTURAL PRODUCTS, 1947-65
(Semilogarithmic scale)



[1] Value at fixed prices (1957-59 average).

Germany, however, deteriorated sharply in 1965, with a rapid increase in imports and no acceleration in the growth of exports.

Among the developed primary exporting countries, economic expansion continued rapidly in New Zealand, but slowed down in Australia and South Africa.

The information on developing countries is sketchy. In the Far East, economic growth was disturbed by military activities and civil disorder in several countries, by the temporary cessation of much of the foreign economic aid to India and Pakistan, and by the serious Indian food situation. In June 1966, the Indian Government announced a substantial devaluation of the rupee. For a number of countries, however, including China (Taiwan), Malaysia and Thailand, early data indicate increases of 6 to 8 percent in GNP. In Latin America, too, the GNP appears to have risen substantially in real terms in several countries, among them Argentina, Mexico, Peru, Venezuela, and the Central American republics, as a result of relative political stability, good export earnings, and a substantial influx of public development capital. Brazil and Chile made progress toward more stable price levels, but in some countries, including Argentina, Colombia and Uruguay, prices continued to rise rapidly. In Africa, many countries were hampered by internal disturbances, but others showed good economic progress. Severe drought affected a number of countries in eastern and central Africa.

The trading position of the developed primary producers (Australia, New Zealand, South Africa) deteriorated in 1965. The value of their exports decreased, because of lower export prices, and their trade balances fell, although there was some improvement in late 1965 and early 1966. In contrast, several developing countries were able to raise their reserves, largely by reducing imports. This was the case particularly in Latin America, where Brazil had an especially large increase in reserves.

Effects of continued economic expansion in the United States

Of the developments described above, the continuation of the economic expansion in the United States, now in its sixth year, is outstanding. Although the recent growth has been no faster than in earlier postwar growth periods between the recessions (falling in 1949, 1954, 1958 and 1960/61),

the long absence of slumps since early 1961 has made a significant contribution to the country's long-term economic growth, and indirectly to the expansion of the world economy.

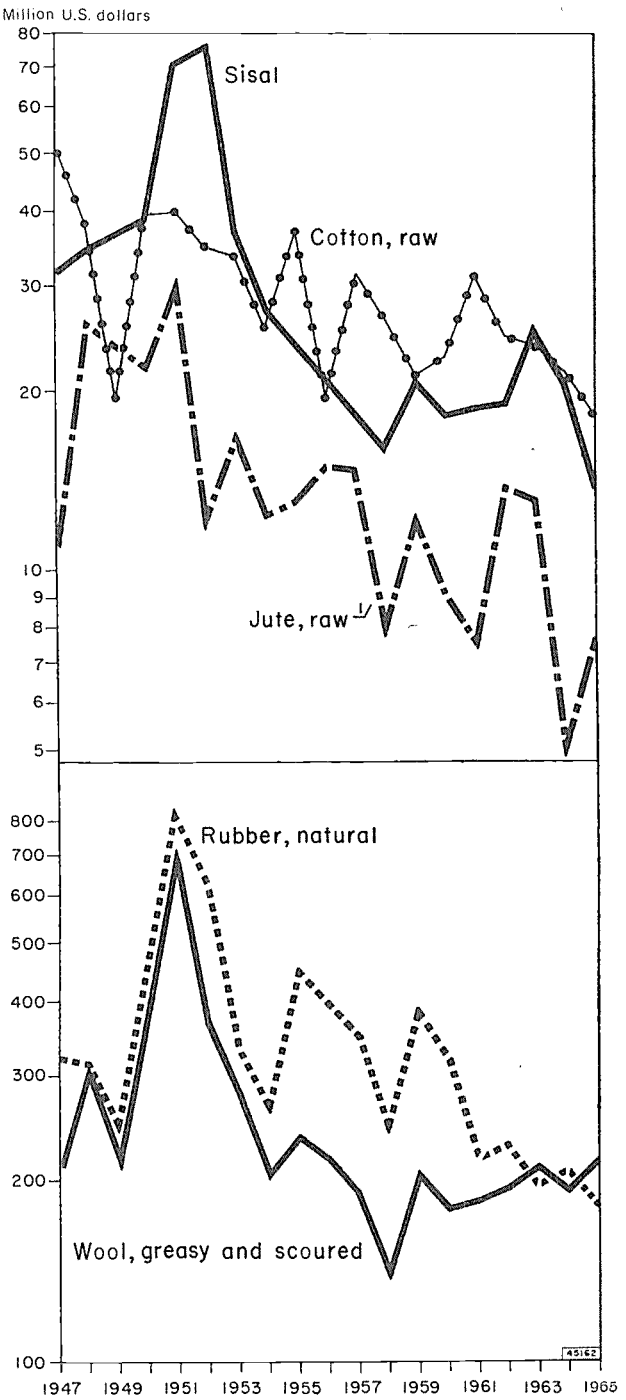
To what extent this continued boom has affected the overall demand for agricultural products is difficult to determine. Within the country itself, personal consumption expenditure on durable and nondurable goods was, even prior to 1961, one of the more stable sectors, and on an annual basis it has, in fact, never ceased growing since 1946. The national indices of per caput food consumption have fluctuated, in most years, within a range of no more than 1 or 2 percent, and there is little evidence that even these minor fluctuations have been the result of changes in the tempo of economic activity.

The influence of recessions on the country's import trade has been greater. The value of its total imports of all products, nonagricultural as well as agricultural, has shown regular dips in recession years, by amounts ranging from 1.5 percent in 1958 to over 7 percent in 1949, while showing a continued growth in virtually all other years. In the majority of cases, reductions in the value of imports have been due principally to changes in volume. The trend of average import prices (unit values) has been little influenced by the recessions, though falling ever since 1951.

The effect of these setbacks in imports on the trade partners of the United States has been widespread. Particularly sensitive to recessions have been imports from Canada, Latin America, and Asia (other than Japan). Imports from Europe also fluctuated in response to recessions, though the temporary setbacks were to an unusual degree overshadowed by the steep long-term increase. Imports from Africa and Oceania hardly increased between 1951 and 1960, but have since shown a rather more rapid increase. Least sensitive to recessions have been the rapidly rising imports from Japan.

The above discussion refers to trade in all products, nonagricultural as well as agricultural. The influence on trade in agricultural products alone is less clear. Figure II-4 (which covers the same commodities as the FAO indices of international trade in agricultural products) indicates, as might be expected, that among agricultural products sensitivity to recessions has been greatest in the case of agricultural raw materials. The value of imports of these products has fallen in all recession periods, along a long-term downward trend. The value of imports of the other two main groups of agricultural products (food and feedstuffs, and beverages and tobacco) has fluctuated less, at least in the short run, and such reductions as have taken place in recession years appear to have been largely coincidental, for example, for food and feedstuffs in 1960, when increasing domestic meat output led to smaller im-

FIGURE II-5. – CHANGES IN THE VALUE OF UNITED STATES IMPORTS OF THE MAIN AGRICULTURAL RAW MATERIALS, 1947-65
(Semilogarithmic scale)



[1] Including allied fibers.

ports of cattle, beef and veal. The recession dips in the value of imports of all agricultural products combined have thus been almost entirely the reflection of the movements in imports of agricultural raw materials.

The indices of the volume of imports in Figure II-4 show the same situation. As with the value indices, the occasional coincidences of reductions in imports of groups other than raw materials with recession years can be explained by special factors, such as the very high prices of beverage crops, especially coffee, in 1954. The 1958 drop in the imports of the same group of products reflects reductions in coffee stocks and a steep increase in cocoa prices. The indices of average import unit values show that the effect on the value of imports of fluctuations in their volume has, in the case of agricultural raw materials, been reinforced by changes in prices. This suggests that changes in the United States import demand have been an important price determining factor for these products in world markets, spreading the trade effects of the United States recessions to the exporters' trade with other countries as well.

Thus there is little evidence of United States agricultural imports fluctuating in response to changes in the country's economic conditions, except in the case of agricultural raw materials, a commodity group of declining importance in the total.[8] This, of course, is not surprising, both because of the small share of imports in the country's total consumption of agricultural products other than tropical products, and because of the many other factors which influence the imports, such as fluctuations in domestic output of the same or competing products (including cattle cycles), changes in national legislation affecting trade (for example, changes in the proportion of total supply reserved for domestic sugar producers) and exogenous changes in import prices.

Among the individual agricultural raw materials, sensitivity to recessions has been nearly universal (Figure II-5). Fluctuations have, on the whole, been somewhat wider and more irregular in the case of jute and sisal. The value of their imports is, however, relatively small and their effect on the group as a whole has been overshadowed by the fluctuations in the two major imports, wool and rubber.

As for the period since 1961, it would appear that the absence of recessions has had little stabilizing effect on United States agricultural imports. Imports of food and feedstuffs and of beverages and tobacco have continued to fluctuate, though the fluctuations in these two groups have tended to offset one another and have therefore had little effect on the total value of agricultural imports. Imports of agricultural raw materials as a group have been stable, in both volume and value as well as in price, and the longer term downward trend in the imports appears to have been slowed down. An examination of the individual products shows, however, that the apparent stability in imports of raw materials since 1961 is not the expression of a general tendency among the group. Rather, it is the combined result of a continuing falling trend in the imports of most of them, largely offset by an increase in the value of imports of wool, reflecting mainly the movement of prices.

FOOD SUPPLIES AND CONSUMPTION

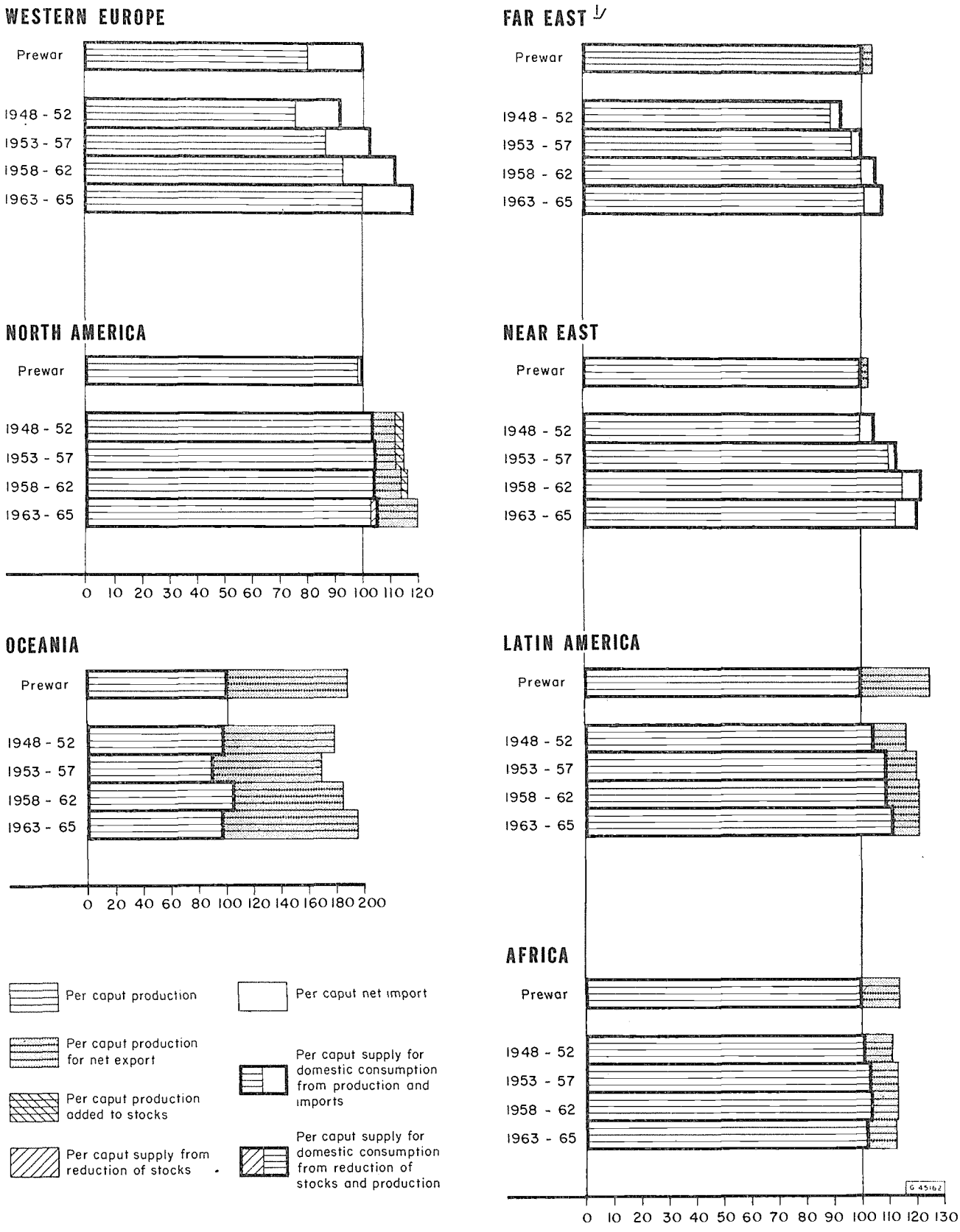
The effect on food supplies and consumption of the poor harvests in 1965/66 was generally at least partly mitigated by increased imports and reduced exports and by drawing on stocks. How far this made it possible to maintain food consumption levels, however, it is still too early to say. Data on per caput food supplies are set out in Annex table 8 for those countries for which FAO calculates food balance sheets, but they are not yet available for the most recent period.

In India, on whose food shortage world attention was particularly focussed during the period under review, there were for some time fears of an extremely serious famine situation, but it proved possible to avoid mass starvation. Grain imports (largely concessional supplies under United States Public Law 480) were stepped up to the maximum level that could be absorbed by the ports and the internal distribution network. Internal procurement was strengthened, controls on private trade were increased, and rationing was introduced in urban areas. Even so, there were severe local shortages, and con-

[8] Its share in the total value of the products covered in Figure II-4 fell from 27 percent in 1952-53 to only 14 percent in 1964-65.

FIGURE II-6. – ESTIMATED PER CAPUT FOOD PRODUCTION, NET TRADE AND SUPPLIES, BY REGION

(Indices, prewar supplies = 100)



[1] Excluding China (Mainland).

sumption levels must have dropped very low in many areas, at least for part of the year, although data are not yet available to indicate the consumption levels that actually prevailed. While the immediate cause of the shortages was the poor rice crop of 1965/66, an additional factor was the very low level of grain stocks, which are estimated to have declined from 2.8 million tons at the end of 1960 to only 940,000 tons at the end of 1964, largely because of the considerable slowing down in recent years in the rate of increase of grain production.

Even at the regional level it is not possible to assess the changes in per caput supplies that took place in 1965/66. Stock changes are generally not known, and it is difficult to match production and trade seasons, quite apart from the difficulty of obtaining complete statistics of production and trade for so recent a period.

Some of these difficulties are minimized by considering averages for several years instead of single years, and it is believed that the averages in Figure II-6 provide a roughly valid indication of the broad evolution of food supplies since before the war in the main regions of the world. From these it appears that, in the three-year period 1963-65, per caput food supplies were at or above the prewar level in each of the developing regions. In making these comparisons, however, it should be borne in mind that the prewar level of food consumption, although providing a convenient benchmark, by no means represents an adequate level of nutrition in the developing countries.

In the Far East, excluding China (Mainland), per caput food supplies in 1963-65 averaged somewhat more than before the war, almost entirely because of a steady increase in net imports (in place of the prewar net export of food). In Latin America, per caput supplies were above the prewar level because of lower net exports. In the Near East, supplies were considerably more than before the war, because of increases in both production and net imports (replacing the prewar net export) per caput. Africa's production and net exports of food both appear, however, to have stagnated close to the prewar level.

Since the indices in Figure II-6 are on a price-weighted basis, an increase in food supplies may mean either an increase at a given dietary pattern or a shift to more expensive foods. Thus the substantial increases in per caput supplies in western Europe, for instance, must chiefly represent a shift from cheap starchy foods to more expensive livestock products.

INTERNATIONAL TRADE IN AGRICULTURAL PRODUCTS

The preliminary indices for 1965 [9] suggest that the value of world trade in agricultural, fishery and forest products combined, which in 1964 had risen steeply as a result of increases in both volume and prices, declined slightly in 1965. The value of exports (excluding those of agricultural products from eastern Europe and the U.S.S.R., for which data are not yet available) fell back slightly, and that of imports remained virtually stationary.[10] This stability was the combined result of a more or less stable volume and a slight fall in the average level of export unit values. If confirmed by the final data, it will constitute the first setback in the growth of world agricultural trade since 1958 (Table II-6).[11]

Both the developed and the developing countries were affected. For the former, however, there was no decrease in actual export earnings, as all of the decline was accounted for by a steep fall in the United States government-financed exports. The effects on the developing countries as a group, on the other hand, were substantial, not only because of their continued heavy reliance on agricultural exports to finance their growing import requirements, but also because of the 2 percent increase that took place in the prices of internationally traded manufactured products. Reflecting the inflationary pressures that are being felt in most major industrial countries, the prices of manufactured goods have risen more in the past two years than in the preceding six.

[9] Data on international trade in agricultural products in 1965 are even less complete than is usually the case at the time of writing (mid-July). The present account is therefore highly tentative.

[10] The discrepancy between the indices for exports and imports is accounted for mainly by the changes in the trade of the centrally planned countries with the rest of the world. The agricultural imports of the U.S.S.R. and eastern European countries from the rest of the world were reduced in 1965 following better domestic grain harvests. The more recent increases in their grain imports will affect mainly the 1966 indices.

[11] The complete set of regional and world indices of volume, value and average unit value of trade are shown in Annex tables 12-14. Actual volume figures are shown in Annex tables 9-11.

TABLE II-6. – INDICES OF THE VOLUME, UNIT VALUE AND TOTAL VALUE OF WORLD [1] TRADE IN AGRICULTURAL, FISHERY AND FOREST PRODUCTS

	Average 1948-52	Average 1953-57	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	Change 1964 to 1965
	Indices, 1957-59 = 100										*Percent*
VOLUME OF EXPORTS	...	90	97	104	111	117	119	126	132	132	—
COMMERCIAL	...	91	98	104	110	117	120	126	132	133	+ 1
Agricultural products	77	90	97	103	110	116	118	124	128	128	—
Commercial	...	92	98	104	109	116	118	124	128	130	+ 1
Fishery products [2]	60	84	100	108	111	118	130	132	146	142	— 3
Forest products [2]	...	90	96	106	118	122	126	139	151	153	— 1
AVERAGE EXPORT UNIT VALUE	...	106	99	96	97	94	93	99	102	101	— 1
Agricultural products	113	107	99	96	97	93	92	99	102	100	— 2
Fishery products	94	94	100	100	101	102	108	109	113	123	+ 9
Forest products	...	101	99	97	98	97	95	94	97	98	+ 2
TERMS OF TRADE [3]	...	110	99	97	96	92	91	96	98	95	— 3
Agricultural products	120	111	99	96	96	91	90	97	98	94	— 4
Fishery products	100	98	100	101	100	99	105	106	109	115	+ 6
Forest products	...	105	99	98	97	94	93	92	93	92	— 1
VALUE OF EXPORTS IN CURRENT PRICES	...	95	96	100	107	110	111	123	134	133	— 1
COMMERCIAL	...	96	97	100	107	109	111	124	134	134	—
Agricultural products	86	97	96	99	106	108	109	122	132	129	— 2
Commercial	...	98	96	99	105	108	109	122	132	131	— 1
Fishery products [2]	55	79	101	107	109	115	135	138	156	164	+ 5
Forest products [2]	...	91	96	103	115	118	119	129	146	149	+ 2
REAL VALUE OF EXPORTS [3]	...	99	96	101	106	107	109	120	129	125	— 3
COMMERCIAL	...	100	97	101	105	107	109	120	129	126	— 2
Agricultural products	92	100	96	100	104	106	106	119	126	121	— 4
Commercial	...	102	96	100	104	105	106	119	126	122	— 3
Fishery products	58	81	101	108	108	112	132	134	150	154	+ 3
Forest products	...	94	96	104	114	115	116	126	140	140	—
AVERAGE EXPORT UNIT VALUE OF MANUFACTURED PRODUCTS [4]	94	96	100	99	101	102	102	103	104	107	+ 2
TOTAL VALUE OF WORLD TRADE (Agricultural and non-agricultural) [5]	61	85	97	103	114	120	126	137	154	167	+ 8

[1] Excluding U.S.S.R., eastern Europe and China (Mainland). – [2] Excluding China (Mainland) only. – [3] Deflated by the United Nations index of export unit value of manufactured goods. – [4] United Nations index adjusted to 1957-59 base. – [5] United Nations data, expressed in index form.

The volume of imports expanded in all developed regions and also in the Near East and Africa. Imports into Latin America and the Far East (other than Japan) were stable, though in the latter region there was a steep increase in the imports of cereals other than rice, which were destined to increase still further in 1966 as the emergency shipments to relieve the food scarcity in India got under way.

The renewed fall in the average price level of farm products in world trade, which had started in early 1964 after a substantial but short-lived rise, continued through most of 1965, though at a much reduced pace. For the year as a whole, the average level of export unit values averaged about 2 percent less than in 1964, though still almost one tenth more than in 1962, when they reached their postwar low point. Average export unit values of fishery products increased, however, so that the combined average export unit value of agricultural, fishery and forest products fell by only about 1 percent.

The lower average export unit value of agricultural products was to a considerable extent influenced by exceptionally low prices for a limited number of tropical products (sugar, cocoa and sisal), as well as of wool and wheat. All the same the disappointing export results of 1965 were widespread.

TABLE II-7. – INDICES OF THE VALUE OF WORLD[1] EXPORTS OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY MAIN COMMODITY GROUPS

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	Change 1964 to 1965
	Indices 1957-59 = 100											*Percent*
Agricultural, fishery and forest products	94	99	104	96	100	107	110	111	123	134	133	— 1
AGRICULTURAL PRODUCTS	94	100	105	96	99	106	108	109	122	132	129	— 2
Food and feedstuffs	86	96	101	98	101	107	115	119	140	154	155	—
Cereals	88	106	101	98	101	110	127	134	155	182	179	— 2
Sugar	86	88	118	97	85	98	107	97	147	148	120	—19
Oilseeds and vegetable oils	82	97	99	96	105	111	108	117	126	134	149	+11
Fruit	85	88	104	100	96	103	107	114	116	121	129	+ 6
Meat	82	83	92	100	108	112	113	121	147	164	167	+ 2
Dairy products	96	103	99	91	110	106	104	102	115	126	133	+ 5
Beverages and tobacco	101	103	103	102	95	96	95	96	100	108	107	— 1
Coffee	108	119	110	97	92	91	88	88	90	104	106	+ 2
Cocoa	112	85	86	106	108	104	93	91	98	101	92	— 9
Agricultural raw materials	103	105	113	88	99	111	106	100	107	106	97	— 9
Wool	99	104	122	83	95	98	104	104	118	120	106	—12
Cotton	100	110	119	94	87	115	111	96	108	107	99	— 7
Rubber (natural)	115	100	96	83	122	121	98	97	85	85	82	— 4
FISHERY PRODUCTS[2]	76	88	92	101	107	109	115	135	138	156	164	+ 5
FOREST PRODUCTS[2]	98	97	101	96	103	115	118	119	129	146	149	+ 2
Roundwood (excluding fuel)	98	97	99	96	106	132	155	161	179	197	203	+ 3
Processed wood	110	98	103	96	101	116	115	116	124	138	137	—
Panels	86	79	89	91	120	125	127	146	170	200	215	+ 7
Pulp and paper	92	100	102	96	102	110	111	109	117	133	137	+ 3

[1] Excluding U.S.S.R., eastern Europe and China (Mainland). – [2] Excluding China (Mainland) only.

Among the major regions of the world only western Europe saw any sizable increase in its agricultural export earnings. Smaller increases took place also in the value of exports from Latin America and the Near East, but in all other regions the value of exports fell or remained stationary. Among the major commodity groups there was a substantial increase in the value of trade in fishery products and a smaller increase for forest products. The value of trade in food and feedstuffs remained stable, however, and that in beverages and tobacco and agricultural raw materials fell (Table II-7).

Volume of imports

There were widespread increases in the volume of agricultural imports (see Table II-8). In particular, the imports into all of the developed regions expanded. Japan's already large agricultural imports, which now exceed those of all the rest of the Far East combined, increased by a further 9 percent. The imports of western Europe, which is the main importing region and takes more than half of the total, continued to rise at about the same average rate as in recent years, some 2.5 percent a year, and those of North America recovered part of the preceding year's fall.

Among the developing regions the picture was more varied. In some contrast with past trends, the imports into Latin America and the Far East other than Japan remained unchanged in 1965. Those of the Near East and Africa, however, rose by 5 and 7 percent respectively.

FOOD AND FEEDSTUFFS

Globally, all of the increase in the volume of agricultural imports was due to larger trade in food and feedstuffs (Table II-9). The increases were

TABLE II-8. – INDICES OF THE VOLUME OF AGRICULTURAL IMPORTS BY REGION

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	Change 1964 to 1965
	Indices, 1957-59 = 100											*Percent*
Western Europe	89	97	101	97	102	106	108	113	114	115	118	+ 3
North America	93	96	95	97	108	101	106	115	113	104	107	+ 2
Japan	90	100	98	95	108	121	139	131	154	166	180	+ 9
Oceania	98	94	99	104	97	98	96	93	102	104	109	+ 5
Total of above	90	97	99	97	104	106	110	115	117	116	120	+ 3
Latin America	90	85	99	103	99	102	106	112	122	129	129	—
Far East [1]	68	89	105	98	97	120	119	115	132	137	137	—
Near East	70	85	94	95	111	124	136	141	144	143	150	+ 5
Africa	86	95	99	94	107	118	128	126	117	124	132	+ 7
Total of above	77	88	100	98	102	116	120	121	129	134	136	+ 2
All above regions	88	95	100	97	103	108	112	116	119	119	123	+ 3
Eastern Europe and U.S.S.R.	79	81	96	96	109	116	127	124	133	167	...	...
WORLD [2]	87	94	99	97	104	109	113	116	120	123	...	...

[1] Excluding China (Mainland) and Japan. – [2] Excluding China (Mainland).

TABLE II-9. – INDICES OF THE VOLUME OF WORLD [1] IMPORTS OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY MAIN COMMODITY GROUPS

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	Change 1964 to 1965
	Indices, 1957-59 = 100											*Percent*
Agricultural, fishery and forest products [2]	92	98	102	101	97	103	106	110	114	117	120	+ 2
AGRICULTURAL PRODUCTS	88	95	100	97	103	108	112	115	119	119	122	+ 3
Food and feedstuffs	83	93	97	99	104	109	112	118	123	124	131	+ 5
Cereals	79	97	97	98	104	110	118	123	128	131	144	+10
Sugar	91	93	99	102	99	100	100	102	106	101	102	+ 1
Oilseeds and vegetable oils	86	95	99	98	103	114	109	120	121	122	124	+ 1
Fruit	89	85	96	97	107	112	114	119	114	126	133	+ 5
Livestock products and cattle	81	88	97	100	103	107	110	116	128	128	129	+ 1
Beverages and tobacco	92	97	99	99	102	107	114	119	118	118	117	— 1
Coffee	88	97	96	96	107	109	114	121	124	122	117	— 4
Cocoa	97	100	107	92	101	113	137	132	130	129	149	+16
Agricultural raw materials	95	100	105	92	103	107	109	107	108	107	106	— 1
Wool	97	105	106	94	100	94	103	103	105	94	97	+ 4
Cotton	88	99	110	92	98	119	119	106	110	114	107	— 6
Rubber (natural)	111	99	104	93	102	93	93	96	96	105	104	—
FISHERY PRODUCTS [2]	83	92	92	100	108	111	118	130	132	146	142	— 3
FOREST PRODUCTS	96	95	97	96	106	118	123	127	137	149	151	+ 1
Roundwood (excl. fuel)	91	94	95	96	109	129	145	153	166	179	182	+ 1
Processed wood	102	93	98	98	105	117	118	122	130	140	137	— 2
Panels	80	77	86	91	123	123	127	146	161	192	206	+ 7
Pulp and paper	95	100	100	96	104	115	120	122	131	143	146	+ 2

[1] Excluding U.S.S.R., eastern Europe and China (Mainland). – [2] Fishery products refer to exports and exclude China (Mainland) only.

geographically widely spread. The food imports of each of the developed regions increased substantially, especially in the case of Japan, where larger imports of all major food categories except meat and dairy products brought the total up by 14 percent. In western Europe, the 6 percent increase was, as often in the past, due principally to larger imports of various animal feedstuffs (coarse grains, oilseed cake and meal, soybeans), but imports of cattle and some fruits also increased. In North America, sizable increases in imports of sugar and cattle offset reductions in meat and, to a smaller extent, vegetable oils and oilseeds.

Among the developing regions the imports of the Near East and Africa rose by 4 and 8 percent, respectively. Larger imports of grains were a major reason in each case, though in both regions grain imports remained below the level of some years ago, when a series of drought years had reduced harvests. Greater imports of sugar also contributed to the increase in these two regions. The food imports of Latin America remained stable, however, and those of the Far East other than Japan fell slightly. Less wheat was imported by the grain deficit countries of Latin America, as domestic harvests were better in 1964/65. In the Far East, other than Japan, cereal imports increased. Less rice was imported but this was more than offset by a substantial increase in imports of wheat, especially to India, where steps were taken to counteract rising prices and to ensure supplies in deficit areas after the poor summer crops. The imports of soybeans and soybean oil were also greater, but those of a number of other foods fell in volume, including (apart from rice) sugar, copra and some vegetable oils, and condensed milk.

Beverages and tobacco

The overall stability in imports of this group reflects the absence of much change in western Europe and North America, which take nearly 90 percent of the total exports. There were, however, significant differences between the individual products. In the case of western Europe, the 1 percent fall in the total was mainly a result of sharply reduced imports of wine and also smaller purchases of tobacco. Coffee imports also fell slightly, in line with the smaller export quotas under the International Coffee Agreement, but those of tea and particularly cocoa increased. In North America, too, less coffee was imported but the effect of this on the group total was virtually offset by the one-third increase in cocoa imports, as consumption and stocks rose in response to the steep fall in prices. Japan's small imports of each product in this group, except tea, were down in 1965, though the long-term trend is rising.

The imports of this group of products into the developing regions increased steeply. Though the 1965 increase was somewhat in the nature of a recovery, following reductions from earlier peaks in 1961-63, the longer term increase in these imports has on the whole been steeper than in the developed regions.

Agricultural raw materials

Developed countries are also the major markets for this group of products, with western Europe alone taking over half the total. The longer term trend of imports has, however, been downward in North America through most of the postwar period, though fluctuating, as was shown earlier, in response to changes in the tempo of economic activity in the United States. In western Europe, too, the earlier slowly rising trend has since about 1960 come to a halt. In Japan, however, the trend has been consistently rising.

The developments in 1965 were only partly in line with these trends. Imports into western Europe fell by 5 percent, with virtually stable purchases of wool and jute and smaller imports of rubber and particularly cotton. Increasing competition by synthetics, combined with reduced levels of economic activity in some countries, affected the mill consumption of natural fibers in the region as a whole. Imports into the United States, on the other hand, rose again after falling in 1964. The continued economic expansion in that region is stimulating the growth of consumption, and wool imports in particular have risen. In Japan, imports of most major raw materials, except rubber, recovered somewhat after the cutbacks made in 1964 when the country's economic activity slowed down, and further increases were expected in 1966.

In most of the developing regions the longer term trend of raw material imports has been steeply upward, particularly in the Near East, where imports rose in 1965 by over 10 percent in volume, to more than double the level of only seven years before. There was a substantial recovery in imports of jute, and those of natural rubber continued to rise.

Fishery products

For fishery products, import indices are not yet available for 1965. Judging from the indices for

exports, the total volume of trade appears to have fallen back moderately in 1965, for the first time for a decade, with reduced sales from each of the developing regions. The reduction was greatest in Latin America, where the temporary disappearance of the anchoveta and the consequently reduced production of fish meal brought the total down by some 20 percent. The exports from each of the developed regions were greater, with western Europe showing a particularly large increase of more than 10 percent. The exports of eastern Europe and the U.S.S.R. (principally from the latter country and Poland) also grew further, though at less than the average rate over the past decade, during which the volume has more than trebled.

Forest products

For forest products, also, developed countries are the main importers, taking between them some 85 percent of the total volume. European countries in particular are important, not only as importers but also as exporters.

In sharp contrast to raw materials of agricultural origin, imports of forest products in both raw and processed form have expanded steeply over the past decade. Trade in roundwood is today double the volume of less than 10 years ago, and the overall index for all forest products stood in 1965 just over 50 percent above the 1957-59 average.

In 1965, however, the total volume increased by little more than 1 percent. The imports of North American countries expanded by 5 percent, with large increases in imports of both panel products and pulp and paper. Japan's imports also increased, though less than in most recent years. Imports into European countries, however, failed to increase. Consumption of many major products, such as sawn softwood, chemical pulp, tropical hardwood logs and fibreboard, fell off in some major importing countries, including France, the Netherlands and the United Kingdom. In the case of the first three products, moreover, importers' opening stocks had been very large. The only category of forest products of which more was imported in European countries in 1965 was panel products, with larger imports of veneer sheets, plywood and especially particle board. The Federal Republic of Germany, which is already the largest importer of particle board, doubled its imports in 1965, chiefly from other EEC countries, especially Belgium-Luxembourg and Italy.

Prices in international markets

The renewed fall in the average price level of agricultural products that started in early 1964 continued (though much more slowly) until toward the end of 1965. For the year as a whole the export unit value index for this group of products was some 2 percent lower than in 1964. Much of this decrease was, however, offset by a small increase in the average export unit value of forest products and a substantial one in that of fishery products, so that the overall level of average export unit values of agricultural, fishery and forest products fell by only about 1 percent (see Table II-10).

The combined unit value index for agricultural, fishery and forest products thus stood in 1965 considerably above its level in 1962, when the prices of agricultural products reached their postwar low point. The index for the latter group was in 1965 about the same as it was just before the Korean war boom, and again in 1957-58. In terms of their purchasing power for manufactured goods, however, the prices of these products were less satisfactory. The unit value index for manufactured goods has in the past two years risen by about 4 percent. The "terms of trade" of exports of agricultural, fishery and forest products in relation to manufactured goods were therefore 5 percent less in 1965 than the average for 1957-59.

Agricultural products

Among the main commodity groups the average price level for food and feedstuffs and for beverages and tobacco fell only slightly. Taken as groups, these products thus approximately maintained the price gains of the preceding two years. The prices of agricultural raw materials, however, fell by 6 percent.

In the food and feedstuffs group the average export unit value of the majority of commodities rose in 1965, and if the average for the group as a whole did not rise it was because of the lower prices of a fairly limited but important group of products, including such major commodities as sugar, which fell by one fourth, and wheat, down by 7 percent (Figure II-7).

Products whose prices rose included most coarse grains (except sorghum), the demand for which continued to rise, especially in western Europe, and most major fruits (except bananas), whose prices benefited from the cold spells that affected the output

TABLE II-10. – INDICES OF WORLD AVERAGE EXPORT UNIT VALUES OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY MAIN COMMODITY GROUPS [1]

	Average 1953-1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	Change 1964 to 1965
	Indices, 1957-59 = 100									*Percent*
Agricultural, fishery and forest products	106	99	96	97	94	93	99	102	101	— 1
AGRICULTURAL PRODUCTS	107	99	96	97	93	92	99	102	100	— 2
Food and feedstuffs	104	99	98	97	96	97	108	110	109	— 1
Cereals	112	100	98	98	97	103	103	106	104	— 1
Sugar	97	96	91	87	89	89	139	137	104	—24
Oilseeds and vegetable oils	103	98	101	97	95	91	98	99	110	+11
Fruit	95	105	89	90	93	93	100	94	97	+ 4
Meat	96	101	105	108	106	102	107	121	127	+ 5
Dairy products	109	92	104	103	96	96	102	106	115	+ 9
Beverages and tobacco	111	105	92	89	83	81	84	92	91	— 1
Coffee	127	102	83	80	76	73	69	88	89	+ 1
Cocoa	103	118	103	83	66	63	68	71	56	—21
Agricultural raw materials	111	94	94	103	97	92	96	96	90	— 6
Wool	118	89	85	92	90	89	103	113	96	—15
Cotton	116	101	88	94	96	92	91	88	89	+ 2
Rubber (natural)	97	87	111	125	92	87	83	79	76	— 4
FISHERY PRODUCTS	94	100	100	101	102	108	109	113	123	+ 9
FOREST PRODUCTS	101	99	97	98	97	95	94	97	98	+ 2
Roundwood (excluding fuel)	106	100	97	104	107	110	107	114	115	+ 1
Processed wood	103	99	96	99	99	96	95	99	101	+ 3
Panels	106	97	97	105	102	104	103	103	103	+ 1
Pulp and paper	84	99	97	95	93	90	89	92	93	+ 1

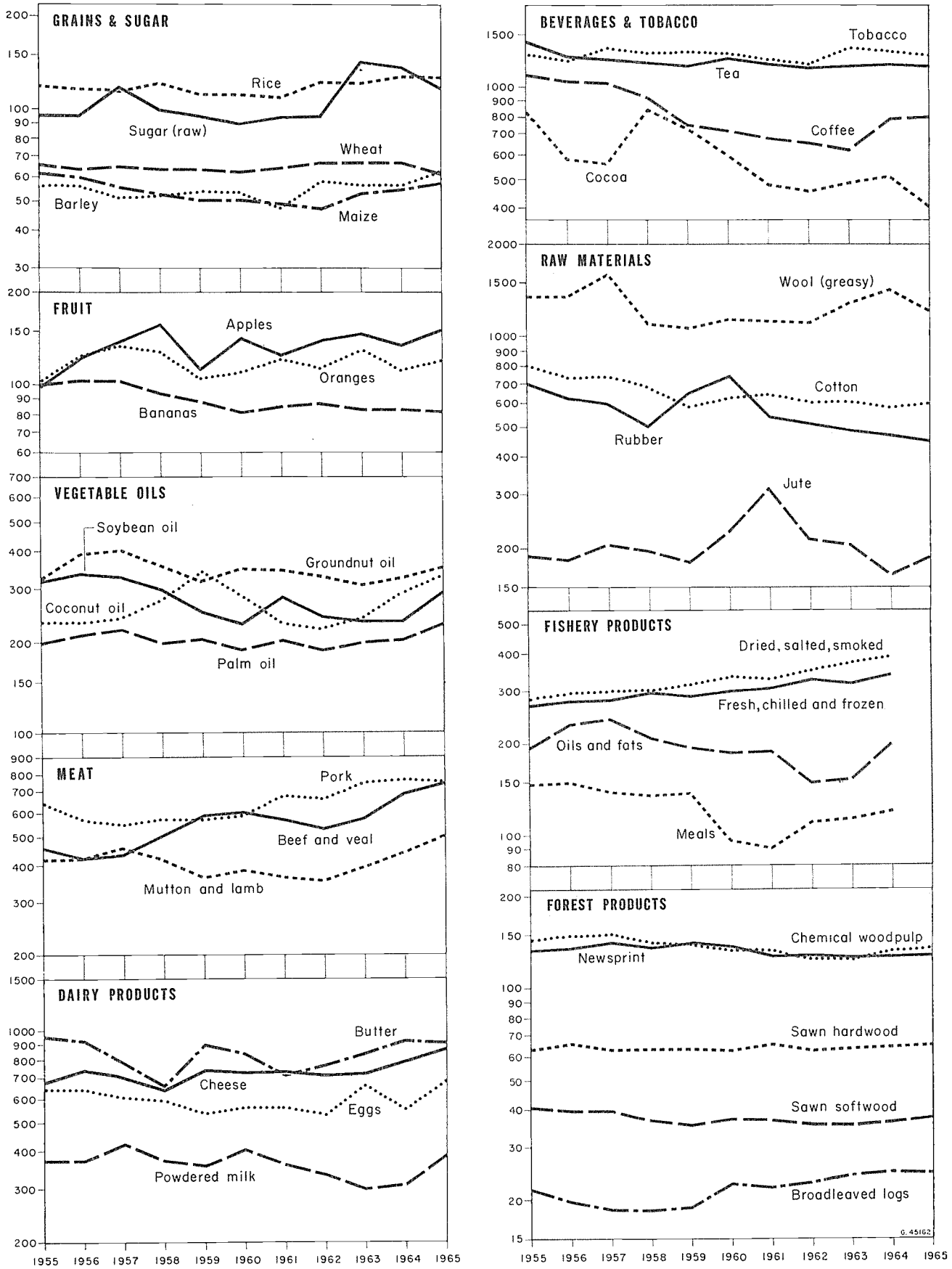
[1] Excluding eastern Europe, U.S.S.R. and China (Mainland).

of oranges in Spain and from the heavy demand for apples in European importing countries. Most vegetable oils, moreover, were unusually expensive, as exportable supplies were down. Meat supplies for export were also scarce, and most meat prices rose. Butter prices were somewhat lower than in 1964 as milk output rose, but most other dairy product prices were substantially higher, especially those of powdered milk. Eggs, too, were quoted higher as production was down in some major exporting countries.

The steep fall in the price of sugar was a reflection of the very large increase (almost 20 percent) in production in 1964/65, much of which went to increase the carry-over stocks. Free market quotations fell in 1965 to their lowest level for a quarter of a century and averaged only 2 U.S. cents a pound, compared with over 8 cents in 1963 and nearly 6 cents in 1964. Even the average export unit value, which (because of the large portion of trade that flows under various government-to-government and preferential arrangements) is both higher and more stable than the free market quotations, fell by almost a quarter. Most wheat prices, too, were lower and the average export unit value fell by 7 percent. The 1964/65 harvest was a record, 15 percent higher than in the preceding year, and commercial import demand was reduced. The prices of many types of wheat fell near their minimum levels under the International Wheat Agreement, until prices started rising again in late 1965 in response to expanding demand and the prospect of smaller total supplies. Other foods and feedstuffs whose prices were lower in 1965 include sorghum, bananas, bacon and butter.

In the beverages and tobacco group, price movements were divergent. The average export unit value for coffee was slightly higher, in response to the restriction of export supplies under the International Coffee Agreement. Wine, too, was more expensive. The effect of these increases on the group index was, however, offset by a one-fifth fall in the unit value of cocoa exports and lower tobacco prices. The production of cocoa had reached a record level in 1964/65, fully one quarter more than the previous record

FIGURE II-7. – AVERAGE EXPORT UNIT VALUES OF AGRICULTURAL PRODUCTS, BY MAIN COMMODITY GROUPS
(U.S.$ per metric ton,[1] semilogarithmic scale)



[1] U.S.$ per cubic meter for sawn softwood, sawn hardwood and broadleaved logs.

the year before. Following the failure of the initial efforts of the Cocoa Producers' Alliance to maintain prices in the face of the prospects for a record crop, quotations fell steeply in the first half of 1965 to reach their lowest postwar level in the middle of the year. Although there was a substantial recovery later, the average for the year remained very low.

Among agricultural raw materials, the prices of cotton, silk and jute averaged higher than in 1964, but this was offset by lower average export unit values for wool, sisal and rubber, as well as linseed oil. For reasons already explained, mill consumption of wool had fallen in a number of countries and although prices started rising again after the first quarter of the year, the average export unit value remained some 15 percent less than in 1964. Sisal stocks were ample and the competition from synthetics intensified further during the year. Natural rubber maintained its position in total rubber consumption but prices weakened in the course of the year, partly under the influence of disposals from the United States strategic stockpiles.

Fishery products

With rapidly growing demand for a wide range of fishery products in both domestic and export markets and with some supply shortages, notably in the South American fish reduction industry, prices of fishery products generally rose in the course of 1965. For the year as a whole the average export unit value for all fishery products was some 9 percent higher than in 1964.

World fish meal prices, which in 1964 had gradually risen from U.S.$130 to $140 a ton, subsequently shot up steeply to reach the record level of $237 a ton in August 1965, when the entire fishing fleet in Peru and Chile was laid up. Subsequently the price stabilized around $180 a ton and it was expected to remain firm in 1966. Norwegian herring meal was sold on the average 25 percent higher than in 1964. Whale oil prices, too, were considerably above the average of recent years.

Among edible fish varieties there was a particularly steep increase in prices of certain varieties of frozen tuna, and the prices of fresh and frozen fish were generally firm or rising. In the United States the wholesale index of edible fish and shellfish was 11 percent higher in January 1966 than a year earlier, with most products except shrimps participating in the increase.

Forest products

The upward movement in prices of many forest products, which started in 1963 and continued through 1964, was halted in 1965. In contrast to agricultural products proper, however, the index of average export unit values averaged higher in 1965 than in 1964.

Prices for pulp and paper, the largest product group, averaged slightly higher than in 1964. European pulp prices fell back in the second half of the year, as demand slackened, but paper prices generally remained stable. Softwood prices in Europe also weakened in the second half of the year. The prices of tropical hardwood logs from Africa were reduced in the early part of 1965, but rose again later as stocks were reduced in Europe and the supply was limited by the onset of the rainy season in Africa. Plywood and fibreboard prices tended to rise in both Europe and Japan in the course of 1965 after some early weakening in Japan, but those of particle board fell in response both to overcapacity and to technical innovations which reduced production costs.

Export earnings

There was a reduction of about 1 percent in the total value of world exports of agricultural, fishery and forest products in 1965.[12] There were, however, substantial differences between the various geographical regions (and presumably even more between countries), reflecting mainly differences in the commodity composition of their exports, in particular the share in their trade of the limited number of commodities whose prices had fallen steeply (Table II-11).

The growth of exports was greatest in the case of western Europe. Exports of agricultural products proper rose by 6 percent, with increases both in the volume of exports (especially of grains, meat and dairy products, shipments of which rose by 10 to 20 percent) and in average export unit values. Fishery products exports also rose substantially in both volume and value. The total increase in the value of exports was, however, reduced to 4 percent by a decline in exports of forest products, owing to a steep fall in the quantity of sawnwood shipments. The only other region that showed any significant increase in the value of exports was Latin America. Here the increase was almost entirely due to a larger volume

[12] Excluding exports of the centrally planned countries.

TABLE II-11. – INDICES OF VALUE OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS EXPORTS, BY REGION

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	Change 1964 to 1965
	Indices, 1957-59 = 100											*Percent*
Western Europe	93	95	104	98	99	110	115	117	131	144	150	+ 4
North America	84	101	106	96	99	112	118	115	129	150	147	— 2
Commercial	86	95	102	98	100	112	118	116	131	155	157	+ 1
Oceania	95	98	110	85	105	102	112	113	134	147	135	— 8
Total of above	89	98	105	95	100	110	116	116	131	147	147	—
Commercial	91	96	104	96	100	109	115	116	132	149	150	+ 1
Latin America	102	105	105	99	96	100	102	106	116	122	124	+ 1
Far East [1]	103	99	99	94	107	110	103	106	114	115	109	— 5
Near East	93	98	110	92	98	104	98	101	113	115	116	+ 1
Africa	93	95	98	102	100	101	104	107	115	120	115	— 4
Total of above	99	100	102	98	100	103	102	106	115	119	117	— 2
All above regions	94	99	104	96	100	107	110	111	123	134	133	— 1
Commercial	95	98	103	97	100	107	109	111	124	134	134	—
Eastern Europe and U.S.S.R.	77	70	96	91	113	117	137	144	149	146	...	...
WORLD [1]	93	98	103	96	101	108	111	113	125	135	...	...

[1] Excluding China (Mainland).

of trade in agricultural products which made up for severe price losses for some products, especially sugar and cocoa and to a lesser extent also grains and wool, and for a steep fall in fisheries exports. There was a small increase also in the value of exports from the Near East, where the reduced volume of exports of certain products, in particular rice and cotton, was offset by somewhat higher average unit values.

The exports from all other regions were smaller in value than in 1964. The drop was sharpest in Oceania, at 8 percent, reflecting mainly the lower average prices realized for wool (the volume of shipments actually rose) and to a lesser extent the low sugar prices. The total value of exports from North America was down by 2 percent, with a 5-percent fall in the exports of agricultural products only partly compensated by substantially larger exports of fishery and forest products. The fall in agricultural exports was caused by the reduction in United States government-financed shipments, which fell by 18 percent (Annex table 15). The commercial exports from the United States were greater than the year before, and although the agricultural exports of Canada were somewhat smaller than in 1964 (mainly because of smaller wheat exports to the U.S.S.R.), the region's commercial exports nevertheless rose slightly. Among individual products, wheat and cotton were particularly affected. Aside from reduced concessional shipments from the United States and smaller purchases by the U.S.S.R., demand for wheat in some European countries was smaller. Moreover, as already noted, the average prices were lower. The region's cotton exports fell by almost 30 percent, with the United States acting as a residual supplier in a shrinking market. Smaller declines were registered for barley, animal fats and powdered milk. The export value of fishery products and of all major forest products was up, with increases both in the volume and, to a lesser extent, in the average export unit value.

In the Far East and Africa, the value of exports fell by 5 and 4 percent respectively. In the Far East, the drop was mainly a reflection of a smaller volume of exports, particularly of rice and tea and to a lesser extent of sugar. Lower average export unit values for sugar and rubber also contributed. The reduction in the regional total would have been even greater had there not been a substantial increase in the value of exports of oilseeds and vege-

table oils, whose prices were, as already noted, substantially higher, and of a number of forest products, including logs, sawnwood and plywood, of which larger quantities were exported at generally stable prices. In Africa, the smaller value of exports was almost entirely due to lower prices of cocoa, sisal and to a smaller extent coffee. The volume of exports of most of these products was greater, but not sufficiently to offset the price fall. Exporters of oilseeds and vegetable oils in this region also gained from the higher prices, despite a reduction in the volume of exports of these products, but the value of forest products exports was smaller, as the volume of shipments of hardwood logs to Europe fell.

Trade of eastern Europe and the U.S.S.R.

For the eastern European countries and the U.S.S.R. only fragmentary data are available on agricultural trade in 1965. Indices have therefore been calculated only up to 1964. Moreover, because of difficulties in assigning values to barter transactions, as well as with foreign exchange rates, the trade of this region has, in computing value indices, been priced at the world average export unit values.

The trade of the region in 1964 was strongly influenced by the poor harvests of many crops, particularly cereals, in the 1963/64 crop year. As a result the U.S.S.R., which in the past had been a major supplier of cereals to its neighboring countries in the region, became in 1964 a large-scale net importer from the rest of the world. Its cereal exports to the rest of the region simultaneously fell by half, to 1.3 million tons. With substantial increases also in the imports of a number of other foodstuffs, including sugar, fruits, oilseeds and vegetable oils and dairy products, the total volume of the region's food imports rose by almost 12 percent.

Compared with the imports of foodstuffs, the growth of other agricultural imports has been relatively slow. In particular, the imports of raw materials have virtually stagnated over the past five years or so. U.S.S.R. imports of rubber have fallen as the country's synthetic industry has been built up, and this has been only partially offset by the region's slowly rising imports of cotton (much of it from the U.S.S.R.) and some other agricultural raw materials. Imports of beverages and tobacco, however, rose substantially in both 1963 and 1964 (by over 60 percent over the two years). The developing countries have benefited from this expansion as far as coffee, cocoa and tea are concerned, though the imports of these three products have, with the exception of tea, risen substantially slower than those of tobacco and wine.

The region's agricultural exports, too, have reflected harvest fluctuations. The exports of food and feedstuffs in 1964 were some 20 percent less in volume than in 1963 with a one-third fall in exports of cereals and smaller but still substantial reductions in shipments of sugar, beef and dairy products. This decrease was to some extent offset by the increased exports of cotton from the U.S.S.R., but the total volume of agricultural exports, which until 1962 had shown a steeply rising trend, nevertheless fell by 11 percent.

The limited data available for 1965 suggest that the total volume of imports fell back again as the good 1964/65 grain crop in the U.S.S.R. made it possible to curtail grain imports, though this was to some extent offset by larger imports of cocoa (up by over a quarter), sugar, coffee (into eastern Europe), tea and, for the first time in several years, rubber into the U.S.S.R. Toward the end of the year, moreover, the U.S.S.R. grain imports began to rise again as the 1965/66 harvest also was very poor, and for that crop year they are expected to be nearly as high as the 1963/64 record figure of over 15 million tons. On the export side there were increases in sugar exports from both the U.S.S.R. and Czechoslovakia, but the poor grain crops of the U.S.S.R., coinciding with good harvests in some eastern European countries, are likely to result once more in small exports from the U.S.S.R. to the other countries of the region.

Two rapidly rising branches of exports from the region have been those of fishery and forest products. Consisting principally of roundwood and sawnwood, the value of forest products exports has risen consistently throughout the past decade. In 1964 the growth was no less than 19 percent, with large increases in both the main categories, and a further increase of 4 percent was recorded in 1965. By that time the total volume and value of forest products exports were twice that of some six years ago. The U.S.S.R. is now the leading supplier of roundwood to Europe, and is also an important source of roundwood in Japan and of sawnwood in Europe. The region's exports of panel products (mainly plywood) have also risen rapidly, but they still account for only a relatively small share of the total. A feature of the region's fishery exports is the far-flung operation of the U.S.S.R. and Polish factory fleets, selling directly in various export markets, including many

African countries. Over the past decade the total value of this trade has grown more than threefold, and the increases in 1964 and 1965 were in keeping with this trend.

Trade on special terms

As already noted briefly, the United States government-financed exports, mainly under the various titles of P.L. 480, fell steeply in 1965. Their total value (at export market prices) declined from U.S.$1,770 million to $1,452 million, or by 18 percent (Annex table 15). The figure was the lowest since 1959 and the share of shipments on concessional terms in the country's total agricultural exports was, at 23 percent, the smallest since the current programs were started in 1954/55.

Most of the reduction took place in shipments under Title I of P.L. 480 (sales for foreign currencies). These fell by almost 30 percent to $867 million. There were smaller reductions also in exports under Titles II (disaster relief) and III (donations), but barter transactions under Title III and exports under Title IV (long-term supply and dollar credit sales) rose.

Most of the reduction was accounted for by wheat, with smaller reductions (in absolute terms) also in the shipments of cotton and dairy products. Wheat shipments to Brazil were sharply reduced — to only 15 percent of their 1964 level — and those to Pakistan, the United Arab Republic and the Republic of Korea were also lower. However, the commercial exports of wheat also fell steeply, so that the share of government-financed exports in total wheat exports remained unchanged at the 1964 level of 70 percent.

International policies of trade and aid

The disappointing results obtained by agricultural exporting countries in 1965, and the vicissitudes in certain commodity markets such as cocoa and sugar, served as a reminder that agricultural commodity problems, and particularly those of the developing countries, remain as serious and as difficult to solve as ever. The year therefore witnessed considerable activity in the field of international trade policies.

A number of other factors have also tended to stimulate action. The establishment of permanent United Nations machinery for trade and development following the first United Nations Conference on Trade and Development (UNCTAD) in 1964 and the consequent adaptation of the structure of certain other agencies has provided new channels for attempts at solutions. The importance of alleviating the problems of the developing countries' trade and of accelerating their development has also been brought home by the accumulating evidence that the economic growth of these countries has in the first half of the Development Decade tended to slow down rather than to gain momentum. Related to this is the increasingly evident fact that food production in a great many developing countries is rising insufficiently in relation to the growth of their populations and per caput incomes.

Most of the newly established UNCTAD machinery started to function in the course of the year under review. Both the Trade and Development Board, the principal UNCTAD body acting between Conference sessions, and various of the subsidiary bodies, including the Committee on Commodities and the Committee on Financing and Invisibles, held meetings from the spring of 1965 onward. Although much of the first year's discussions was taken up by procedural questions, some progress was made also in drawing up programs of work and on some substantive questions. These include the initiation of the examination, based on a program of studies in which FAO has an important part, of the problems involved in "international organization of commodity trade," as proposed in one of the 1964 UNCTAD recommendations; and the consideration of the World Bank (IBRD) proposals for a system of supplementary financing, also prepared in response to an UNCTAD recommendation. The latter proposals aim at preventing the disruption of development programs in developing countries by shortfalls in export earnings relative to "reasonable expectations" as determined by projections of export earnings. The financing under the proposal would be of "residual" character, available only after recourse had been made by the country to other short-term finance available to it, including its own reserves and its International Monetary Fund (IMF) drawing rights.

In the General Agreement on Tariffs and Trade (GATT), the Committee on Trade and Development, which was established in February 1965 to keep under review the application of the new chapters (on trade and development) of the Agreement, has started to function. Most of its subcommittees, including the Working Group on International Commodity Problems, held meetings during the period. The new Part IV of the Agreement was not, however, ratified by a sufficient number of

member countries by the end of 1965. The closing date for acceptance has therefore been postponed until early 1967 but *de facto* implementation continues.

Efforts were continued to conclude commodity agreements for products in particular difficulties and the consultative machinery for others was expanded. The two major attempts, to revive the International Sugar Agreement and to negotiate an International Cocoa Agreement, have so far not led to concrete results. The new shape of the International Wheat Agreement, extended by a protocol until July 1967, also remains uncertain pending the outcome of negotiations under the GATT Kennedy Round between the major interested countries. Some useful additions have, however, been made to the international consultative machinery functioning under the auspices of FAO, through the establishment of new study groups on bananas (in June 1965) and on hard fibers (June 1966), and the expansion of the earlier study group on coconut products in June 1965 to cover all oilseeds, oils and fats. In addition, the study group on jute, kenaf and allied fibers has established a consultative committee, the purpose of which is to mitigate short-term instability in jute markets, mainly by matching the timing of purchases with the flow of supplies within the season.

The GATT Kennedy Round of trade negotiations has continued to progress slowly. Following a series of exploratory discussions in the summer of 1965 to determine the content of the negotiations on agricultural products, concrete offers were tabled by mid-September. Their scope was, however, to some extent limited by the inability of the European Economic Community (EEC) to table its offers by this date. For tropical products, it has been decided to use the GATT Special Group on Tropical Products as the negotiating body. Greater hopes for progress in the negotiations resulted from the "package deal" agreed by the EEC foreign ministers in May 1966, and the subsequent agreement of the EEC Council on various aspects of the Community's negotiating position, including the form of its proposal for a world cereal agreement.

There has recently been renewed interest in financial solutions to commodity problems. A new IMF facility, for countries experiencing shortfalls in their export earnings to make drawings in excess of their normal quota limits, had been initiated in 1963, but owing mainly to the improvement in commodity prices in 1964 little use has been made of this facility so far. Nevertheless, renewed requests for compensatory financing schemes were made at the first UNCTAD meetings in 1964, and interest in financial solutions has since revived, probably also because of the difficulty experienced in reaching solutions based on trade intervention. Proposed financial solutions include the new IBRD proposals for compensatory financing already mentioned. In the meantime, the IMF is considering suggestions that have been made to modify the 1963 facility in various ways.

Some important developments have also taken place in the field of international economic assistance, the long-term significance of which it is as yet impossible to assess. In the first place, there has been evident in the past few years a stagnation in the total aid flow, as measured by the Organization for Economic Co-operation and Development (OECD), at the 1961 level of some $6,100 million (equal to two thirds of one percent of the OECD countries' GNP), though the aid has been extended on increasingly soft terms.[13] This has come at a time when the World Bank has estimated that the developing countries could use effectively some $3,000 to $4,000 million more aid than they are currently receiving. It contrasts strongly with the annual rate of growth of the aid flow of some 15 percent in the preceding five years and with the proportion of the United States GNP represented by the Marshall Plan aid in 1949 (about 2 percent).

Increasing emphasis is being put by the donor countries on efficiency in the use of economic aid funds. In the case of the United States this has taken the form of insistence, as a condition of assistance, on "self help" measures in the recipient countries, particularly in raising their farm output where food shortages are a bottleneck. Internationally, increasing use is being made of aid consortia and other forms of consultation among donor countries giving economic assistance to specific developing countries, to ensure maximum efficiency in the use of aid funds.

Important changes are also taking place in the sphere of food aid. Following the gradual disappearance of much of the surplus element in the United States agricultural stocks, discussed earlier in this chapter, the proposed new legislation on food aid (the Food for Freedom Act, now before Congress) would move away from the use for food aid of products incidentally in surplus and would instead make available substantially all types of farm product required, acquired if necessary in the open market.

[13] OECD. *Development assistance efforts and policies of the members of the Development Assistance Committee - 1965 Review*, Paris, 1965, Table II, p. 42.

Agricultural development would be recognized as a major objective of food aid, and self help in this field would, as in general economic assistance, be a condition for receiving food aid. The implications of the changing surplus situation, and the urgent problems of food aid in general, were scheduled for discussion at the meeting of the OECD Development Assistance Committee at Washington, D.C., in late July.

At the same time, proposals have been advanced in the United Nations and FAO for the expansion of the current multilateral food aid efforts "to combat hunger effectively," in particular through the constitution of an expanded cash fund for purchasing foodstuffs for food aid both from developed countries and from developing food-exporting countries. This and other possible approaches to an expanded multilateral food aid program are to be studied jointly by the United Nations and FAO, with the co-operation of other interested organizations and agencies. In the meantime, both the United Nations General Assembly and the FAO Conference have endorsed the recommendation of the Intergovernmental Committee that the United Nations/FAO World Food Program should be continued for as long as multilateral food aid is considered feasible and desirable.

Finally, discussions were continued during the period under review about the needs and possibilities for reform in the international monetary system as it has been functioning since the war, in particular with regard to the methods of creating and controlling the assets available for national monetary reserves. That sufficient "liquidity" should be available is important both for the growth of world trade, which otherwise might be restricted because of difficulties of countries in financing their short-term balance of payments deficits, and for the continued international flow of capital, including aid to the developing countries. Some progress toward a solution seemed to have been made in the course of 1965 in discussions among the Group of Ten countries, while pressure toward a solution which would also take account of the interests of the developing countries (including the possible use of some of the new liquidity as aid to them) was exerted in both the World Bank annual meeting in late 1965 and by the UNCTAD expert group on international monetary issues, reporting in November 1965. More recently, however, the diminished chances of an early equilibrium in the United States balance of payments, which over the last decade has been the main source of reserve assets for other countries, and the continued disagreement among some of the major trading nations about both the urgency of the problem and the means of solving it, seem to have again postponed action.

FARM PRICES AND INCOMES

Indices of prices received by farmers in the last five years are available for 23 countries and are set out in Table II-12 in relation to the average level in 1953-55. In most of these countries the indices have increased steadily throughout the last five years. Exceptions are several agricultural exporting countries (Australia, Netherlands, New Zealand, United States) where the indices dropped below the 1953-55 average during part of the period, but subsequently more than recovered.

In only 9 of the 23 countries, however, have farm prices kept pace with or exceeded the general rise in prices as indicated by the cost-of-living index. These 9 countries include those where price levels were initially very low and inflationary trends strongest — China (Taiwan), India, Republic of Korea, Spain and Yugoslavia. In 6 countries which are all agricultural exporters (Australia, Denmark, Ireland, Netherlands, New Zealand, United States) the indices of prices received by farmers have fallen by more than 10 percent in relation to the rise in the cost of living since 1953-55.

Considering the changes in 1965 as compared with 1964, the indices of prices received (at current prices) rose in all but two countries: Denmark, where the index declined slightly, and New Zealand, where it did not change. The increases were as large as 5 percent in Australia, Austria, Finland, Ireland, Italy and the United States, 7 to 8 percent in the Federal Republic of Germany, India (Assam) and Japan, 9 to 10 percent in Norway and Portugal, 11 percent in the Republic of Korea, and 16 percent in Spain. In general, the greatest increases were in prices of livestock and horticultural products, and there were only moderate increases in grain prices.

Smaller harvests and the pressure of demand on available supplies account in large part for the rise in agricultural prices, although price indices were also significantly affected by the upward adjustment of officially supported or stabilized prices in many countries. Guaranteed prices of milk and dairy products in many European countries and of cereals in Japan have been raised in order to maintain or increase farm incomes in relation to those in other sectors. Officially guaranteed prices have been raised as an incentive to increase production in Greece, Portugal, Spain and Yugoslavia, for example, and in a number of developing countries not shown in the table. In Yugoslavia, for which the 1965 index is not yet available, producer guarantees were raised by up to three quarters for a number of products following the devaluation of the currency in August 1965.

Producer prices in the European Economic Community (EEC) were raised as part of the gradual harmonization of agricultural prices. In France, where the level of grain prices was lower than in the other EEC countries, the upward adjustments were greatest, while in the Federal Republic of Germany the level of grain prices remained the same as in the previous year. Orientation prices for cattle were set at a higher level than in the previous season in all EEC countries, and target prices for milk in almost all of them.

Producer prices for domestic market sales were raised in Denmark in 1965, but this did not offset the fall in prices of some important exports (such as dairy products and bacon), and the aggregate index of prices received in 1965 fell back slightly; new price increases for domestic market sales were authorized in the spring of 1966. In Switzerland, producer guarantees on most products were raised — twice for milk and cattle — in order to sustain farm incomes. Adjustments in guarantees to farmers in the United Kingdom were made in line with the policy to discourage surplus output and keep price guarantees in line with market prices; this meant a slight reduction in price guarantees for wheat, barley and eggs, but increases for potatoes, sugar beet, milk, and fat cattle.

Official guarantees in Canada, generally kept at a low minimum level, had been slightly raised for a number of products, and prices actually realized for market sales in 1965 were significantly higher for some products. In the case of grains in western Canada, this means a supplementary payment to farmers by the Wheat Board. In the United States, prices received were generally lower than in the previous year for crops, but for livestock and milk were significantly higher, which accounts for the small increase in the aggregate index.

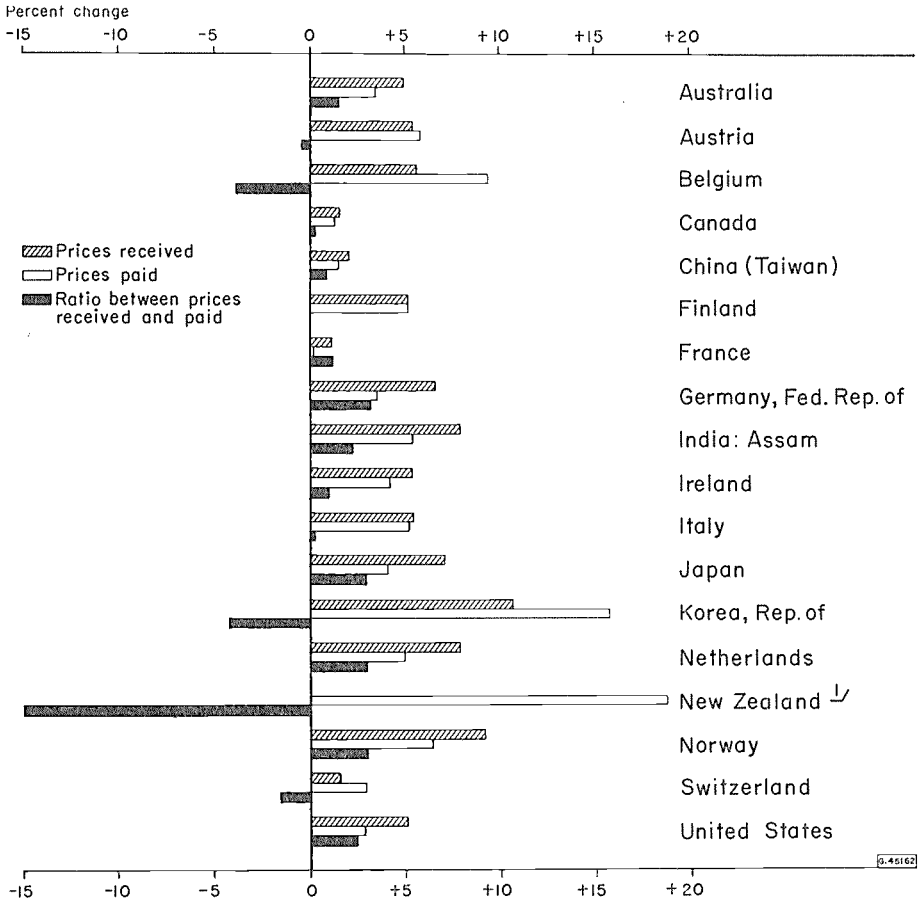
Prices paid by farmers for production requisites, wages, and various items have also gone up steadily. Indices of prices paid are available for 18 countries. The components of these indices may vary between countries, in some cases including and in others excluding farm household expenses. But although

TABLE II-12. – INDICES OF PRICES RECEIVED BY FARMERS

	At current prices					Deflated by cost-of-living index				
	1961	1962	1963	1964	1965 [1]	1961	1962	1963	1964	1965 [1]
	1953-55 average = 100									
Australia [2]	96	97	101	104	109	79	80	83	83	85
Austria	115	118	120	128	135	97	96	94	97	97
Belgium	100	102	112	113	119	91	91	98	95	96
Canada	109	113	108	111	113	99	101	95	96	95
China (Taiwan)	200	189	206	214	219	110	102	108	114	117
Denmark [3]	93	103	112	113	112	73	75	77	75	70
Finland	143	145	154	176	185	103	100	101	105	106
France	141	151	164	163	165	101	104	108	104	102
Germany, Fed. Rep. of [2]	113	115	118	123	131	100	99	99	96	102
India: Assam [4]	140	131	134	152	164	113	102	102	101	100
Ireland	99	101	101	112	118	84	81	80	84	84
Italy	106	116	115	123	130	93	97	90	90	92
Japan [5]	114	126	134	140	150	98	102	101	101	101
Korea, Rep. of [6]	137	156	221	274	304	116	124	145	138	135
Netherlands	97	96	110	113	122	82	78	86	84	85
New Zealand [7]	100	96	102	111	111	85	81	85	88	85
Norway	118	124	125	128	140	99	98	96	94	99
Portugal	105	114	105	98	108	93	98	89	80	86
Spain	161	175	182	194	226	106	108	104	103	107
Sweden [8]	113	124	129	133	135	90	94	96	95	92
Switzerland	107	113	115	120	122	97	99	97	99	98
United States	98	100	99	97	102	88	88	87	84	87
Yugoslavia	147	173	190	236	...	101	107	111	124	...

[1] Provisional estimate: in some countries only partial returns. – [2] Crop year July-June. – [3] 1950-55 average = 100. – [4] Crop year September-August. – [5] 1951-55 average = 100: April-March crop year. – [6] 1959 = 100. – [7] 1958 = 100. – [8] Middle price level.

FIGURE II-8. – CHANGES IN INDICES OF PRICES RECEIVED AND PAID BY FARMERS BETWEEN 1964 AND 1965 AND IN THE RELATIONSHIP BETWEEN THE TWO INDICES



[1] No change in the index of prices received.

they are not wholly comparable between countries, they are useful in providing (through their relationship with prices received) an indication of the "real" prices received by farmers for their products.

In 1965 the ratio of prices received to prices paid by farmers either improved slightly, as compared with 1964, or showed hardly any change in most of the countries for which data are available (Figure II-8). However, as a result of a very sharp rise in prices paid by farmers in New Zealand, there was a substantial deterioration in the ratio between the two indices. In Austria, the Republic of Korea and Switzerland, the ratio worsened slightly in 1965.

Farm incomes

In 1965, as already indicated, unfavorable weather resulted in lower harvests in many countries. Despite the higher prices and more favorable price relationships in a number of countries, the increase in gross returns was often insufficient to offset the increase in farm expenses, so that net income declined. The net "cash balance" from farming in the Federal Republic of Germany, for example, declined in 1965 by 14 percent, following a fall of 10 percent in 1964. In both years farm expenses increased faster than gross returns. In the United Kingdom, the expectations of an increase in farm income in 1965/66 have had to be modified because of bad weather, and net income is expected to have fallen again because of a faster increase in farm expenses than in gross returns. Net returns are also estimated to have declined in 1965 in Denmark and Sweden for the same reason. In Australia, the drought brought a fall of 28 percent in the gross domestic product (GDP) in agriculture in 1965/66, and this also declined by 4 percent in Austria in 1965.

In both Canada and the United States, on the other hand, there was a substantial increase in production in 1965, and net incomes in agriculture rose as a result of the greater increase in returns from

farm marketings than in farm expenses. Gross returns rose more than expenses in Finland, France, Italy and Norway in 1965, so that net returns increased too. Gross returns were also higher than the previous year in Greece, Portugal and Spain, but data on net returns are not yet available.

Net returns are likely to have fallen sharply in the many developing countries, especially in parts of Africa and the Far East, where harvests were lower in 1965/66. Up-to-date information is still not available for these countries, although in Kenya the decline in gross earnings is estimated to be about 11 percent for crops and 20 percent for livestock products, resulting in an overall decline of 13 percent in gross farm revenue in 1965.

In the developed countries, the number of farms and farmers is likely to have continued to fall during the year, so that changes in income per farm unit and per farmer were probably more favorable than the overall figures suggest. Thus, in the United States, gross income per farm went up by 8 percent in 1965, compared with a rise of 4 percent in total gross farm income; expenses increased by 7 percent and net returns per farm by 12 percent. (If the change in farm inventories is considered, the gain in net returns per farm is 23 percent.) The income position of the United States farm population also improved substantially in relation to other sectors. The estimated disposable per caput personal income of the farm population from all sources rose from $1,270 in 1964 to $1,510 in 1965. In 1964, the per caput income of the farm population was 55 percent of that of the nonfarm population, and in 1965 it rose to 63 percent. This was due not only to the general rise in farm income but also to increased opportunities for off-farm earnings and to the decline in farm population.

CONSUMER PRICES

Retail food prices have continued to rise in almost all countries. Of the 102 countries for which 1965 data are available, food prices remained stable or declined slightly in relation to 1964 in only 18 countries. In no less than 39 countries the increase in 1965 was 5 percent or more (Table II-13).

In a good many European countries and in Australia, partly as a result of the poor harvests, the increase in retail food prices appears to have accelerated in 1965. In Japan, the increase of 10 percent in 1965 was the biggest since the Korean war. Another tendency in 1965 was for prices to rise in a number of countries such as the United States where they had hitherto been fairly stable for some years.

Prices rose particularly rapidly for livestock products and horticultural products in many countries. For example, meat prices increased in Europe and in Latin America because of the shortage of supplies, and milk prices were also higher in 1965 in most parts of Europe.

Increases in the overall cost of living were equally widespread, and in many cases the rise in food prices appears to have led the way, for in almost half of the countries for which there are data, food prices rose faster in 1965 than the overall cost-of-living index (Table II-14). In Ghana, Uganda, the United Arab Republic, the Republic of Viet-Nam and Yugoslavia, food prices outspripped general prices by a particularly wide margin.

Special measures were taken in many countries in an effort to stem the rise in prices. In Yugoslavia, where farm prices had been raised sharply in mid-1965, retail food prices rose by 39 percent, and it was necessary to introduce a temporary price freeze in the spring of 1966.

In India, grain prices had already begun to rise following the record crop of 1964/65 as a result of hoarding, and retail food prices in 1964 were 19 percent higher than the year before. In 1965, in

TABLE II-13. – RELATION BETWEEN CHANGES IN INDICES OF COST OF LIVING AND RETAIL FOOD PRICES IN 102 COUNTRIES. 1965 IN RELATION TO 1964

Cost-of-living index 1965 (1964 = 100)	Total	Food prices rose faster than cost of living	Food prices and cost of living rose at about the same rate	Food prices rose more slowly than overall cost of living	Food prices remained stable or declined
	Number of countries				
100 and under	15	3	—	—	12
101-104	52	24	15	8	5
105-110	21	14	3	3	1
111-120	8	6	—	2	—
121-150	4	2	2	—	—
151-200	2	1	—	1	—
TOTAL	102	50	20	14	18

TABLE II-14. – CHANGES IN INDICES OF RETAIL FOOD PRICES AND OF THE COST OF LIVING, 1965 IN RELATION TO 1964, BY REGION

Change from 1964 to 1965	Europe	North America	Oceania	Latin America	Africa	Near East	Far East	World
	Number of countries							
RETAIL FOOD PRICES								
Decline	—	—	—	5	1	—	2	8
No change	—	—	—	4	1	1	4	10
+ 1-4 percent	12	2	2	14	11	3	1	45
+ 5-10 percent	9	—	1	—	9	2	5	26
+ 11-20 percent	1	—	1	1	1	—	—	4
+ 21-50 percent	1	—	—	3	3	—	1	8
Over 50 percent	—	—	—	1	—	—	—	1
COST OF LIVING								
Decline	—	—	—	2	2	—	—	4
No change	—	—	—	4	—	2	5	11
+ 1-4 percent	13	2	3	16	14	3	1	52
+ 5-10 percent	8	—	1	—	7	1	4	21
+ 11-20 percent	1	—	—	1	3	—	3	8
+ 21-50 percent	1	—	—	2	1	—	—	4
Over 50 percent	—	—	—	2	—	—	—	2

spite of the poor harvest, the rise in retail food prices was limited to 10 percent. When the poor prospects for the 1965/66 harvest became apparent, compulsory government purchase of rice and wheat was begun in surplus areas and free trade in foodgrains between the states was prohibited. Rationing was introduced in all industrial areas and cities of over 100,000 population, and the number of fair-price shops, selling foodgrains at fixed prices, was increased.

In Brazil, where the rise in food prices was limited to 50 percent in 1965, in contrast to a 62 percent increase in overall prices, increased purchases were made by a government agency in order to counteract local food shortages. Special measures also played a part in some of the countries where food prices were stable or declined in 1965. In Thailand, for example, a lower ceiling was placed on rice exports, in order to prevent the depletion of stocks and a rise in prices. In the Philippines, consumer subsidies were introduced in order to cut by 30 percent the prices of commodities distributed by the National Marketing Corporation.

AGRICULTURAL POLICIES AND DEVELOPMENT PLANS

The broad lines of national agricultural policies in the developing, developed and centrally planned countries were discussed in some detail in a ten-year perspective in last year's issue of this report. During the period now under review there have been few changes in these policies.

As has become usual in recent years, a principal aspect has been the large number of new development plans embarked on in the developing countries. These plans embody their objectives for accelerated agricultural growth and, increasingly, specify the means and measures by which it is hoped to achieve them. Table II-15 summarizes the main features relating to agriculture of the current plans of developing countries. From this it is clear that many African countries in particular have begun new plans during 1965/66, often the second plan since independence. New plans have also begun in a number of countries, such as China (Taiwan), India and Pakistan, which have already completed a series of several plans.

In fact, an encouraging development is the increasing amount of information that is now becoming available on the implementation of past and current plans. Although this all too often reveals shortfalls in the performance of the agricultural sector, it should contribute greatly to making future planning more effective.

TABLE II-15. – MAIN FEATURES OF CURRENT DEVELOPMENT PLANS IN DEVELOPING COUNTRIES

	Duration	Scope	Currency	Total investment	Public investment	Share of agriculture in		Planned annual increase	
						Total investment	Public investment	GNP	Agricultural production
				..... *Million*		..... *Percent*			
LATIN AMERICA									
Argentina	1965–69	Comprehensive	Pesos [1]	[2]1 339 200	427 000	17	2	5.9	4.2
Bolivia	1962–71	"	Bolivianos [3]	12 289 324	...	...	11	7.0	6.3
Brazil	1966/67	Public sector	Cruzeiros [3]	...	...	...	7	6.0	...
Chile	1961–70	Comprehensive	Escudo [1]	10 149	5 074	9	6	5.5	5.0
Colombia	1961–70	"	Pesos [3]	70 000	...	12	12	5.6	4.0
Costa Rica	1965–68	"	Colones	...	1 297	...	...	6.6	7.1
Ecuador	1964–73	"	Sucres	41 007	17 713	16	7	6.2	6.6
El Salvador	1965–69	"	Colones	...	...	...	...	6.5	...
Guatemala	1965–69	Public sector	Quetzales	...	...	...	20	5.6	...
Guyana	1966/67	"	$	...	295	...	...	...	...
Honduras	1965–69	Comprehensive	Lempiras	...	...	...	13	6.6	4.6
Nicaragua	1965–69	"	Córdobas	...	...	...	...	7.0	6.4
Panama	1963–70	"	Balboas	...	310	...	...	...	...
Paraguay	1965/66	Public sector	Guaranies	19 746	5 620	...	...	5.0	4.9
Peru	1966	"	Soles [4]	21 942	5 424	...	26	5.5	...
Surinam	1965–74	Comprehensive	S. guilders	...	...	...	...	...	7.7
Trinidad and Tobago	1964–68	Public sector	£	...	63	...	13	...	...
Venezuela	1963–66	Comprehensive	Bolivars	28 191	9 433	10	17	7.9	8.0
Uruguay	1965–74	"	Pesos [5]	56 144	18 057	14	...	4.7	4.2
FAR EAST									
China (Taiwan)	1965–68		N.T.$	88 944	35 472	14	...	7.0	4.1
India	1966/67	Annual [6]	I Rs	...	[7]20 810	...	[7]22	...	...
Indonesia	1961–68	Public sector	Rupiahs	...	240 000	...	11	[8]1.4	...
Korea, North	1961–67	Centrally planned economy	Won [1]	...	7 000	...	...	15.2	13.2
Korea, Rep. of	1962–66	Comprehensive	Hwan [1]	3 214 500	1 118 646	17	...	7.1	5.2
Malaysia	1966–70	"	Mal $	10 500	4 550	...	24	[9]5.0	5.5
Nepal	1965/66–1969/70	Public sector	N Rs	2 500	1 740	...	25.9	3.6	2.9
Pakistan	1965/66–1969/70	Comprehensive	P Rs	52 000	30 000	...	28.2	[9]6.5	5.0
Philippines	1962/63–1966/67	"	Pesos [1]	12 053	2 809	...	24.0	[6]6.0	3.0
Thailand	1961/62–1966/67	Public sector	Bahts	...	31 977	...	14.0	[9]6.0	3.0
Viet-Nam, Rep. of	1962–66	Comprehensive	V. Piastres	...	42 000	...	17.0	5.0	3.7
NEAR EAST									
Afghanistan	1962/63–1966/67	Public sector	Afghanis	...	[10]31 350	...	24	7	...
Iran	[11]1962/63–1967/68	Comprehensive	Rials	...	200 000	...	23	6.2	4.1
Iraq	1965/66–1970/71	"	I Dinars	821	668	23	26	8	7.5
Jordan	1965–75	"	J Dinars	231	104	26	41	6.7	4.7
Lebanon	1965–69	Public sector	£ Leb.	1 080	1 080	16	16	...	...

In the field, so crucial for the effective implementation of plans, of the institutional and related changes needed to remove disincentives and provide incentives for farmers to increase their production and sales, there is particularly little to report on this occasion. Concerning land reform, for example, most developing countries have already passed legislation in earlier years. During the period under review, there have been some minor modifications in this legislation, but except for a few countries there is very little information on the progress of measures taken under such legislation. Marketing and the provision of credit have been increasingly active fields in a number of countries.

Fertilizers and other physical requisites for expanding agricultural production and productivity have also received increasing attention in some developing countries. In India, fresh concessions have been given to foreign private capital in order to step up domestic fertilizer production. In Latin America,

TABLE II-15. – MAIN FEATURES OF CURRENT DEVELOPMENT PLANS IN DEVELOPING COUNTRIES (*concluded*)

	Duration	Scope	Currency	Total investment	Public investment	Share of agriculture in		Planned annual increase	
						Total investment	Public investment	GNP	Agricultural production
				..... *Million*		..... *Percent*			
NEAR EAST (*concluded*)									
Libya	1963/64–1967/68	Public sector	£ L	...	169	...	20	...	...
Somalia	1963–67	"	Som. Sh.	...	1 400	...	24	...	...
Sudan	1961/62–1970/71	Comprehensive	£ Sd.	565	337	21	27	4.3	4
Turkey	1963–67	"	T. Liras	59 647	35 700	18	...	7	4.1
AFRICA									
Basutoland	1963–66	Public sector	£	...	5.76	...	...	...	...
Central African Republic	[12]1965/66	Comprehensive	CFA Fr	30 000	27 800	...	...	...	...
Congo (Brazzaville)	[12]1964–68	"	"	50 347	30 347	6	...	[13]7.3	[14]4.3
Dahomey	1966–70	"	"	35 400	...	34	...	4	...
Ethiopia	1962/63–1966/67	"	Eth. $	[15]535	...	21	...	3.8	...
Gambia	1964–70	Public sector	£	...	4.4	...	21	...	...
Kenya	1964–70	Comprehensive	£	317	102	4	14	5.4	6.8
Madagascar	1964–68	"	MG Fr	[16]165 000	69 000	12	31	5.5	5.9
Malawi	1965–69	Public sector	£	...	44.6	...	11	...	...
Mauritania	1963–66	Comprehensive	CFA Fr	27 761	13 573	8	17	9.2	2
Morocco	1965–67	"	Dirhams	[17]3 483	2 933	...	29	3.5	...
Niger	1965–68	"	CFA Fr	43 242	33 442	31	...	4.7	3.3
Nigeria	1962–68	"	£	1 066	677	...	14	[13]4	...
Portuguese Overseas Provinces	[14]1965–67	Public sector	Escudos	...	14 400	...	...	...	...
Angola	"	"	"	...	7 210	...	14	...	...
Mozambique	"	"	"	...	5 400	...	20	...	...
Guinea	"	"	"	...	180	...	...	...	...
São Tomé and Principe	"	"	"	...	180	...	...	...	...
Senegal	1965/66–1968/69	Comprehensive	CFA Fr	119 000	84 000	20	42	6.1	5.4
Tanzania: Tanganyika	1964/65–1968/69	"	£	246	130	15	28	6.7	[19]7.5
Zanzibar	1964–67	Public sector	£	...	23	...	8	...	...
Togo	1966–70	Comprehensive	CFA Fr	28 592	20 052	23	26	5.6	3.6
Tunisia	1965–68	"	Dinar [1]	[20]380	149	31	45	[13]6.5	2.8
Uganda	1966–71	"	£	...	106	...	23	7.2	5.1
OCEANIA									
Fiji	1964–68	Public sector	£	...	15.1	...	...	...	...

NOTE. Where possible, data refer to net investment. In many cases, however, no distinction is made in the plan, and data may refer to gross investment or may include some elements of recurrent expenditure. The agricultural sector includes animal production, fisheries, forestry, irrigation, land reclamation, community development and agricultural extension, etc.

[1] Of 1960. – [2] Gross fixed investment. – [3] Of 1958. – [4] Of 1966. – [5] Of 1963. – [6] Within the framework of the fourth five-year plan which is now being revised. – [7] Total public outlay. – [8] Per caput. – [9] At constant prices. – [10] Includes some minor private investment. – [11] 5½ years, Sept. 1962 - March 1968. – [12] Interim plan. – [13] Gross domestic product. – [14] Food production only. – [15] Excluding Eth. $139 million investment in kind. – [16] Including MG. Fr 14,000 million investment in kind. – [17] Excluding 1,726 million Dirhams of public expenditure on a program of special projects. – [18] Transitional development plan. – [19] Marketed production only. – [20] Gross investment.

the Inter-American Committee of the Alliance for Progress has begun a program to promote the production and consumption of fertilizers. The possibility is being investigated by FAO of establishing a Food Production Resources Program to make available supplies of fertilizers and other needed inputs, which at present constitute a severe drain on the foreign exchange resources of many developing countries.

The same problem of lagging agricultural production that plagues so many developing countries is still faced by the U.S.S.R. This is made clearly apparent by the extent to which agricultural production fell behind planned targets in the seven-year plan just completed. The new five-year plan, which appears a good deal more realistic than its predecessors, sets targets for agricultural production that are actually below those in the previous plan. Both in the U.S.S.R. and in the eastern European countries, the emphasis on incentives to expand

production continues to be increased, and a number of price increases and related measures have been announced.

In western Europe, on the other hand, the trend away from price measures has continued. As for some years past, more and more attention is being paid to measures to increase efficiency, in particular through improvements in the farm structure. Agricultural policies in this region also increasingly embody social as well as economic objectives, but there is a tendency to try to separate them more clearly.

Following a period of stalemate, progress has been resumed in the elaboration and implementation of the common agricultural policy of EEC. Free trade arrangements between Ireland and the United Kingdom and between Australia and New Zealand have gone into operation. In the developing regions, further progress has been made with most of the proposed and existing schemes for regional economic co-ordination and co-operation.

In the United States, the Food and Agricultural Act of 1965 extends further the more flexible approach to farm support begun earlier with the feed-grain program. In addition, there have been two major developments concerning the role of the United States in helping to meet the food deficits of the developing countries. Public Law 480, which since its passage in 1954 has been the major instrument of food aid to the developing countries, is due to expire at the end of 1966. The Food for Freedom Act, which has been proposed to replace it, introduces a radically new approach to food aid, under which such aid would no longer be dependent on existing surpluses and would also be conditional on efforts by the recipient countries to improve their own agriculture. Related to this proposed program are measures to increase the United States grain acreage in 1966/67 and 1967/68 for the first time in many years.

These developments are discussed in more detail below, region by region. Brief accounts are also given of recent changes in fishery and forest policies.

North America

UNITED STATES

There have been three major agricultural policy developments in the United States in the year under review: the enactment of new basic legislation in the Food and Agricultural Act of 1965, the decision to bring back into production some of the acreage that has been out of production for some years, and the proposed Food for Freedom Act.

These measures are closely related. The increased authority given (in the Food and Agricultural Act of 1965 and in earlier legislation) to the Secretary of Agriculture in determining levels of support and acreage limitations has provided greater flexibility in adapting programs to current needs. Thus it was possible to take steps to encourage an increase in the 1966/67 wheat, rice and soybean production specifically to meet food aid commitments. For wheat the diversion payments for reducing acreages below allotments were withdrawn for the 1966 spring crop, for rice the acreage allotment was raised by 10 percent for 1966, and producers have been encouraged to shift part of their feed-grain acreage to soybeans. For the 1967/68 wheat crop an increase of 15 percent has been authorized in the acreage allotment, bringing it to the average level of 1955-61.

Concerning the mechanism of food aid, the proposed Food for Freedom Act, which is under consideration by the United States Congress at the time of writing, would replace the Food for Peace Program (Public Law 480), which is due to expire at the end of 1966. If adopted it would continue the main principles of P.L. 480, but would eliminate the requirement for a commodity to be in " surplus " before it can be supplied as food aid. Such aid would henceforth be tied to self-help measures in the recipient countries designed to provide a long-term solution to their chronic food shortages. A gradual shift is also proposed from sales in foreign currencies to dollar sales on liberal payment terms.

The Food and Agricultural Act of 1965 amends and extends until the 1969/70 crops the feed-grain and wheat programs and provides a similar program for cotton. It continues the trend to bring price support loan levels into better alignment with world market prices and extends the use of direct payments to producers to maintain farm income. Program benefits are dependent on participation in the program to adjust production to available outlets.

The cotton program, which is for the period 1966-69, aims at keeping cotton and cotton products competitive with man-made fibers and foreign production. The price support loan level is to be not more than 90 percent of the estimated average world market price. To maintain incomes, price support payments at not less than 9 cents per pound ($0.198 per kilogram) are provided for producers who plant within their domestic acreage allotments, which will be not

less than 65 percent of the farm allotments. The combined loan and price support payment must be within the range of 65 to 90 percent of parity. Except for small farms, producers must divert at least 12.5 percent of the farm allotment to be eligible for price support and loan payments, which are set by law at 21 cents and 9.42 cents per pound ($0.463 and $0.208 per kilogram) for 1966.

The 1966 voluntary wheat program is similar to that of 1965 and the loan rate unchanged at $1.25 per bushel ($4.59 per 100 kilograms) but it differs in that wheat for domestic food use is supported at 100 percent of parity, and domestic marketing certificates issued to producers are valued at the difference between the national average loan rate and the parity price of $2.57 per bushel ($9.44 per 100 kilograms) as of the beginning of the marketing year. The cost of domestic certificates to processors remains unchanged at 75 cents per bushel ($2.75 per 100 kilograms). Export certificates will not be issued to farmers for the 1966 crop, but exporters are required to purchase export certificates whenever world prices are above the United States market price, and a subsidy is paid whenever world prices are below it.

The voluntary feed-grain program was amended to provide added flexibility and extended through the 1969 crop. Price support payments can be varied and made on only part of the acreage planted for harvest, thereby ensuring that producers benefit from the program according to their degree of participation. Farmers can be allowed, as in 1966, to grow soybeans on permitted feed-grain acreage and still earn feed-grain price support payments.

A long-term cropland adjustment program is established which supplements the annual commodity programs. It provides for the diversion of land from surplus crops to protective conservation uses, and offers farmers contracts for 5 to 10 years with lower rates of payment than those in the annual commodity programs. Up to 40 million acres (16.2 million hectares) are allowed under such contracts by 1970.

Other provisions of the 1965 act include the continuation of the rice program and the extension of the National Wool Act with a new formula for determining the support price. It also authorizes a fluid milk base plan which, if approved by producers of a Federal milk marketing order area, would enable dairymen in that area to reduce or eliminate that part of their production moving into lower priced uses while keeping their share of the market for the higher priced milk for fluid use.

Canada

Recent agricultural policy in Canada has as its objectives increased income for farmers, removal of major fluctuations in income, and agricultural adjustment in low income areas. Measures include the provision of improved credit facilities, expansion of a crop insurance program, and attention to problems of obtaining farm labor. Appropriate adjustments are being fostered to obtain better land use and to provide increased employment opportunities for people in low income rural areas.

Under the commodity stabilization program some adjustments were made in 1965 in guaranteed prices. An interim dairy program was introduced which slightly raised the level of support. During the period May 1965-March 1966, fixed payments on milk for cheese and casein were discontinued and a system of deficiency payments introduced for manufacturing milk used domestically; any expenses incurred by the Government on exporting dairy products would be deducted from the deficiency payment. To support incomes of dairymen, the Government authorized supplementary payments for manufacturing milk and for farm-separated cream on the volume marketed by individual producers in 1964/65. In May 1966, the level of dairy support was again raised, to be implemented by direct monthly or quarterly payments to producers by the Federal Government. In addition to the program for dairy products, the level of support for certain other commodities was reduced slightly or remained unchanged, and support for certain nonstatutory commodities was eliminated.

Western Europe

All western European countries continue to combine long-term development measures with short-term assistance, their policies covering a wide range of economic and social measures, with the general aim of ensuring for the agricultural population a level of living comparable with that of other population groups. While no radical policy changes were introduced during the period under review, there was a noticeable trend toward increased emphasis on measures for improving economic efficiency.

Price and marketing policies

There were, therefore, few basic changes in price policies. In Greece and Yugoslavia, the number of products with protected prices was gradually widened.

Denmark changed the support system for milk and for bread grains; from 1966/67 bread grains will no longer be protected by guaranteed prices, but by minimum import prices (as is already the case for feed grains). The United Kingdom adjusted some details of its price policy in line with the general objective of a selective increase in production; for wheat, barley and pigs the last two price reviews have put greater emphasis on increasing the standard quantity or adjusting the flexible guarantee scale than on raising the guaranteed price. Finland has continued price reviews and policy measures along the established lines, although the Agricultural Price Law expired in autumn 1965 and no agreement has yet been reached on a new law.

In Sweden, the existing system of price support came under discussion in March 1966, when the first and still limited information on the report of the Royal Agricultural Committee (set up in 1960) became available. The report includes proposals that for three years agricultural prices should not be allowed to rise as fast as other prices, that the basis for price decisions should not include income comparisons, and that the present system of supporting milk prices should be abolished gradually.

Increasing emphasis is being placed in all countries on the quality of production and on the marketing and processing of agricultural products. Quality improvement is specifically stressed in many plans for developing agriculture. In some countries the legislative basis for such measures is still missing, and its introduction is under consideration in Austria.

The growing emphasis on marketing is apparent from a new French law to organize and rationalize the meat markets and abattoirs. In the United Kingdom, a Home-Grown Cereals Authority was set up in 1965 to encourage efficient marketing; a new contract scheme for egg marketing was introduced in 1966; and the establishment of a Meat and Livestock Commission has been proposed Other countries have also taken measures in this field, and in many countries producer co-operation is being promoted not only for production, but also for storage, processing and marketing.

Structural policies

To promote greater efficiency in agriculture and to reach the desired levels of income for the agricultural population, most countries consider a far-reaching and long-term process of adjustment and reorganization to be necessary, in particular in respect of the improvement of farm structures, farm organization and farm management.

The increasing emphasis on structural policies is evidenced by a number of specific steps taken during 1965. Norway, in introducing guidelines for future agricultural policies, has put greater stress on the enlargement of holdings and on structural rationalization. In Sweden, the proposals of the Royal Agricultural Committee, referred to above, advocate a relaxation of price supports and a further shift to structural improvements and measures of rationalization. In the Netherlands, the initial experimental period of measures to improve the structure of agriculture (through the Fund for Agricultural Development and Improvement) has been concluded, and in the light of the experience gained the scope of these arrangements has been extended. Legislation was passed in the Federal Republic of Germany in 1965 to provide funds for promoting the structural changes needed in agriculture to adjust to the conditions of an integrated common market.

In France, the Fifth Economic and Social Plan continues the main agricultural goals of its predecessors, namely the modernization of agricultural structures and the improvement of agricultural incomes per holding. The new Italian Green Plan puts special emphasis on the improvement of farm structures, the development of co-operatives, the organization of markets, the improvement of marketing and processing, mechanization and irrigation, and the development of livestock production.

Problems of land tenure and farm size have continued to receive attention. In Denmark, a change in legislation is envisaged to lessen the restrictions on amalgamation. In Finland, a new tenancy bill has been put forward. In Italy, a law of May 1965 promotes land consolidation and direct peasant ownership of farms of a sufficient size.

In the United Kingdom, where small farmer schemes are already in operation, efforts to improve the size structure of holdings were intensified in 1965. The emphasis is on those small farms which are capable of being improved to the extent that the farmer could earn a satisfactory living. The Government has proposed that grants be provided for amalgamation and the state given the opportunity to purchase land directly until such time as it can be resold for amalgamation. Where enlargement is not possible and co-operation would not be helpful, small farmers are encouraged to retire or resettle in nonagricultural employment.

The new Swedish proposals published in 1966 also

suggest that the present support for smallholders should be abandoned and replaced by support for professional retraining.

Another problem connected with the size of operation, namely that of industrialized or factory-type large-scale production of pigs, broilers and eggs, has been under discussion for some time. In some countries, proposals have been made by farmers' organizations to limit this kind of production by making it subject to licensing or by fixing a size limit (for example, in Norway, where a draft proposal was handed to the Ministry at the end of 1965). In the Federal Republic of Germany, this question has gone beyond the informal discussion stage and a draft bill is under consideration. It has also been proposed to regulate this problem uniformly for the whole European Economic Community. The proposed size limits (2,000 laying hens in Norway and 10,000 in the Federal Republic of Germany) still leave considerable leeway in comparison with the actual average size in the countries concerned, but would nevertheless affect some establishments immediately and limit the expansion plans of others.

In their efforts to improve the basic conditions and the structure of their agricultural holdings, most countries have found it useful to establish integrated schemes of rural and regional development. Thus, in the Netherlands, land reallocation schemes pay more attention to the modernization of the whole rural community and take account of the national and regional planning objectives and of possible future developments in the region. In Ireland, the establishment of pilot development areas in the western part of the country is one of the measures to help small farmers; the aim is to demonstrate to units of 200 to 400 farmers what could be achieved in such areas with existing aids and incentives, and with the special guidance and assistance of the advisory service. In Italy, a law of July 1965 provides for the organization of special development bodies (*enti di sviluppo*) for certain regions with rather wide tasks. In the United Kingdom, special measures for hill and upland areas have been in existence for some time. In 1965 it was proposed to put the hill cow and hill sheep subsidies on a permanent basis, to continue the winter keep arrangements, to draw up a land improvement scheme which would provide 50 percent of the cost of land improvements such as fencing and field drainage, and to set up rural development boards for different areas to co-ordinate development plans for all the activities (including farming, forestry and tourism) in their respective areas. In Belgium, a bill for the establishment of rural councils is under consideration, and in Finland three bills concerning rural area development were presented to parliament in November 1965.

A further aspect of the attempt to compensate for the small size of farms and to improve the economic efficiency of farming is the promotion of co-operation between farmers. In recent years this policy has been modified so as to go beyond co-operatives in the narrow legal sense and also to go beyond the production stage. Both these modifications are exemplified by the French producer groupings, the promotion of which has continued. Uniform regulations for such groupings in all member countries of EEC have been under discussion for some time. In Italy, proposals have recently been made to further promote the development of co-operation in production, storage, processing and marketing. In the United Kingdom, the new proposals of 1965 also include grants to co-operative organizations for the production and marketing of agricultural products; co-operative purchasing organizations will not be assisted as they are considered to be adequately developed already.

Structural improvements require not only considerable public funds, but also large investments by the farmers themselves. The provision of agricultural credit is therefore emphasized in all countries. France improved the existing credit schemes in 1965. In Switzerland, the funds available for investment credits (under the law of 1962) were doubled in 1966. In the United Kingdom, the farm improvement scheme, which has made an important contribution to raising productivity, is to be extended with some modifications; tax concessions for investments are to be replaced by outright grants; and in October 1965 the Agricultural Credit Corporation announced that it would guarantee loans by commercial banks to farmers and co-operative organizations for buildings, machinery and livestock purchases and for the provision of working capital, subject to the drawing up of an approved development program by the farmer or the co-operative organization. In Denmark it has been proposed to give financial assistance to new farms by introducing advantageous loans.

Attempts to relieve the financial problems of farmers in case of natural catastrophes are also being widened. In addition to the measures taken earlier by France, Italy took steps to help farmers in 1965, Greece has improved the insurance against frost and hail damage (for which farmers no longer have

to pay contributions), in Belgium, a bill to create a permanent national fund for agricultural disasters is under discussion, and in Norway the farmers have demanded a permanent system to provide indemnity payments in case of crop failure.

Agricultural policies in western Europe continue to be a blend of economic and social measures, though in recent years greater efforts have been made to keep these two aspects separate, supplementing economic policies by separate measures of a specifically social character. The trend has continued to offer farmers as independent entrepreneurs a similar degree of social protection as is offered to employees. Greece lists pension funds and health insurance among the social measures for agriculture, Austria introduced obligatory health insurance for farmers in 1965, Switzerland improved the children's allowances for hired labor and small farmers at the end of 1965, in Norway a general pension scheme will be introduced as from January 1967 (the financing of which is still under discussion), and in Finland (where farmers and other entrepreneurs are so far excluded from the pension acts) the subject is now being studied.

Regional economic co-operation

For much of the period under review, developments in the European Economic Community hung fire, following the breaking off on 1 July 1965 of the discussions in the Council on agricultural financing. Discussions were not resumed until the end of January 1966, and it was not until the beginning of May that the timetable for completing the common market in agricultural and industrial goods was agreed.

It was decided that the single market for agricultural and industrial products would come into effect on 1 July 1968. This means that on that date the free circulation of these products within the community will begin, and the common external tariff will come into effect on trade with third countries. In the meantime, therefore, the remaining items of the common agricultural policy must be completed: common price levels have to be set for milk, meat, fats and oils, and sugar; market regulations have to be adopted for sugar, vegetable fats and oils, fruit and vegetables, tobacco, horticultural products, hops, and fish; and these regulations and single Community-wide prices have to be brought into effect.[14]

As regards financing the agricultural policy, it was decided that from July 1967 its full cost would be borne by the Community instead of, as at present, part by the Community and part directly by the member states. At the same time, the member states would be called upon to contribute 90 percent of the receipts from levies on agricultural products, which are expected to cover 45 percent of the estimated requirements of the European Agricultural Guidance and Guarantee Fund. The remainder would be obtained through direct budgetary contributions (Belgium 8.1 percent, France 32 percent, Federal Republic of Germany 31.2 percent, Italy 20.3 percent, Luxembourg 0.2 percent, Netherlands 8.2 percent.) In addition, a ceiling of U.S.$285 million was set on Community contributions to structural improvements (hitherto one third of the fund's resources were to have been made available for such purposes).

In mid-June, the EEC Council reached agreement on a series of points relating to the Kennedy Round of tariff negotiations. These include the offers which they are prepared to make on access for imports of pulp and paper, and an outline of a plan for trade in cereals. The Council also hopes to complete its pricing policies, and hence its negotiating position, on other agricultural items such as meat and dairy products by the end of July.

A treaty of association between EEC and Nigeria has been signed, and discussions have continued concerning the possible association of Austria.

In the European Free Trade Area (EFTA) industrial tariffs between the member countries were reduced by a further 10 percent on 31 December 1965, bringing them to 20 percent of their 1960 level. Exploratory talks on improving trade relations between Yugoslavia and EFTA have begun, and increasing emphasis has been given to the aim of "bridge-building" between EFTA and EEC.

The Anglo-Irish Free Trade Agreement came into force on 1 July 1966. On that date the United Kingdom removed import duties and quantitative restrictions on virtually all Irish products, and Ireland began a series of 10 percent yearly cuts to be completed in 1975. Basically, the agreement is an exchange of agricultural for industrial advantages.

[14] The agreed timetable is as follows:
(*a*) decision on common prices for milk, meat, fats and oils and sugar, end July 1966;
(*b*) implementation of the common market and single price level for olive oil, 1 November 1966;
(*c*) implementation of supplementary provisions for fruit and vegetables and adoption of quality standards for trade in these products within the Community, 1 January 1967;
(*d*) implementation of single prices for grains and oilseeds and of the common market for sugar and fats and oils, 1 July 1967;
(*e*) implementation of the single price for rice 1 September 1967;
(*f*) implementation of single prices for milk and dairy products, and beef and veal, 1 April 1968;
(*g*) implementation of the single price for sugar and of the common market for tobacco, 1 July 1968 at the latest.

For the first time there will be freedom of access for live cattle, already a quarter of Irish exports to the United Kingdom, and the waiting period for their eligibility for guarantee payments will be reduced. Imports of butter and bacon from Ireland will still be restricted, although the butter quota is being increased by almost 20 percent. Sugar and main crop potatoes are excluded from the agreement.

Eastern Europe and the U.S.S.R.

Following the seven-year plan for 1959-65, a new five-year plan for 1966-70 has been begun in the U.S.S.R. At the same time, a ten-year program of land development has been announced for the period 1966-75. In both the U.S.S.R. and the eastern European countries there have been further changes in the organization of agriculture, and additional measures have been taken to increase price and other incentives.

Development plans

Although the targets of the seven-year plan which ended in 1965 were realized for industry, the agricultural targets were not met. In comparison with the planned increase of 70 percent, agricultural production in 1965 was only 14 percent greater than in 1958. Not only do the targets appear to have been too ambitious, but there has been a tendency for the growth of production to slow down.

The targets of the new five-year plan, especially those for livestock products, are considerably lower not only than those formerly envisaged for 1970 in the twenty-year plan, but also than the targets for 1965 in the seven-year plan just ended (Table II-16). The target for grain production suggests that the U.S.S.R. will continued to require grain imports during the plan period.

Further indications of a more prudent approach to planning are that far fewer targets are specified than in earlier plans (they are limited to total agricultural production and seven major products), and that the targets no longer refer to single years but to the increase to be obtained between two averages (1961-65 and 1966-70). In contrast to the production targets, those for the means of production are stepped up sharply. Between 1966 and 1970, agriculture is to receive 1.8 million tractors, 1.1 million trucks and 555,000 combine harvesters, and the mechanical power per agricultural worker is to be

Table II-16. – Agricultural production and targets in the U.S.S.R.

	Average production, 1961-65	Maximum production, 1961-65	Target of 7-year plan for 1965	Targets of 20-year plan for		Targets of new 5-year plan, (average 1966-70)
				1970	1980	
	Thousand million rubles					
Agricultural production ...	52.3	55.3	82.4	124.5	174.3	65.4
	Million tons					
Grains	130.2	152.1	164–180	230	295–300	167
Potatoes	81.0	93.6	147	140	156	100
Vegetables	16.8	19.5	...	47	55	...
Sugar beet	59.0	81.2	76–84	86	98–108	80
Cotton	5.0	5.7	5.7–6.1	8	10–11	5.6–6.0
Fruit	[1]6.1	[1]6.9	13.2	28	51	...
Meat	9.3	10.2	16	25	30–32	11
Milk	64.7	72.4	100–105	135	170–180	78
Eggs [2]	28.7	30.1	37	68	110–116	34
Wool	0.4	0.4	0.5	0.8	1.0–1.1	...

[1] 1961-64. [2] Thousand million units.

doubled. Deliveries of fertilizers to agriculture are to be doubled, and electricity consumption in the rural areas is to be trebled. The state is to invest 41,000 million rubles in agriculture and the kolkhozes a further 30,000 million.

In addition, a ten-year program of land development was announced for the U.S.S.R. in May 1966. By 1975 it is planned to increase the irrigated area from the present level of 10 million hectares to between 17 and 18 million hectares, and to drain an additional 15 to 16 million hectares.

In most of the eastern European countries also, new five-year plans beginning in 1966 have been announced. Here too, planning systems have generally been overhauled and plan targets are more realistic than in the past. In Czechoslovakia total agricultural production is expected to rise by 15 percent from 1965 to 1970, and marketable production by 19 percent. Agricultural production in 1966-70 is planned to be 13 to 15 percent higher than that of the previous five years in Hungary, 14 to 15 percent in Poland, and 20 percent in Romania.

Other policy measures

The reorganization of the agricultural sector has continued in the U.S.S.R. The hasty amalgamation of kolkhozes with sovkhozes and the development of gigantic, unmanageable enterprises has been condemned. A commission has been established to draw up a new model statute for the kolkhozes, in place

of the present one dating from 1935. The reconstitution has been proposed of the regional and central kolkhoz councils that existed before the war.

In the U.S.S.R. much attention has been paid to the stimulation of higher levels of productivity, by price incentives and other means. There have been further increases in prices, especially for livestock products and sugar beet which, together with the price increases in the spring of 1965, enabled the kolkhozes to increase payments to members by 11 percent in 1965. Various measures have been taken to reduce the prices of equipment and requisites for agriculture. A large part of the debt of the kolkhozes has been annulled, including their debts for the purchase of machinery after the abolition of the machinery and tractor stations in 1958. Credit facilities are to be improved, including credit to finance the payment of monthly wages, which are now to be introduced in all kolkhozes; these are to be based on a guaranteed tariff for different types of work (supplemented at the end of the year by a share of receipts.) A more liberal attitude has been adopted toward the private plots of the kolkhoz members and workers. Sales of fodder for private livestock have been organized in certain areas, credit has been given for the purchase of cows, and the tax on livestock owned by the urban population has been abandoned.

Prices were also increased in many cases in eastern Europe. In Eastern Germany, the system of premiums for the fulfillment of production plans was extended to additional products. Attempts have been made in the eastern European countries to achieve more economic management of farms. In Hungary, for example, it is planned to make the management of co-operatives more independent. Material incentives would be based more consistently than before on the principle of independent economic accounting. The more efficient enterprises would be enabled to confer greater benefits on their workers. In general it is aimed to increase the incentives and responsibilities of the farm managers and specialists. A partial reorganization of the agricultural administration was undertaken in some countries in order to simplify the state management of agriculture and to adjust it to the new planning practice.

Australia and New Zealand

After two years of negotiation Australia and New Zealand signed a free trade agreement covering 60 percent of the trade between the two countries, which came into effect on 1 January 1966, for an initial period of ten years. Most of the items included are those already traded on a duty-free basis; in a number of cases where duties were very low they were removed immediately upon signing the treaty; if duties were more than 10 percent they are generally to be removed over a period of eight years. While the benefits to Australia are mainly in relation to minerals, chemicals and manufactured goods, New Zealand's gains are chiefly in primary products, especially forest products. Each year talks are to be held with a view to adding more items to the free trade list.

The Australian Committee of Economic Enquiry set up at the beginning of 1963 tabled its report in parliament in September 1965. Its proposals include the establishment of a permanent council to advise the government on economic growth.

Australian wool growers have rejected a proposal for the introduction of a reserve price plan for the wool industry. A stabilization plan for the Australian tobacco industry, which had been in operation for some time on an interim basis, was made law. The plan provides for a minimum average price and puts a ceiling on tobacco production for a period of at least four years. An Australian Tobacco Board is being formed to administer the scheme.

The New Zealand Government is to establish a Wheat Authority in order to stimulate wheat production. The organization will in practice be the sole buyer and supplier of both locally produced and imported wheat.

The Australian Government has decided to set up a development bank with an initial capital of $A2 million in Papua-New Guinea to help stimulate development in the private sector and to promote the more rapid growth of indigenous business enterprises.

Latin America

Development plans

Almost all Latin American countries are now implementing development plans. Argentina, Costa Rica, Ecuador, Honduras, Nicaragua, and Uruguay began new plans during the period under review. Chile and Colombia have completed the first part of their ten-year development plans, which have now been evaluated and revised. New plans are in preparation in Barbados and Venezuela. In July 1965, Paraguay approved a short-term plan for

1965-66, with projections to 1970. Bolivia's ten-year plan for 1962-71 has been replaced by a series of short-term plans.

Argentina's plan for 1965-69 allocates approximately 17 percent of total investment for agriculture, livestock and fisheries. The principal agricultural targets are to double the area under artificial pasture and to raise yields per hectare. Herds are to be built up and the use of fertilizers increased.

Costa Rica's four-year plan for 1965-68 calls for an annual increase of 7.1 percent in the agricultural sector. This would be based on programs of land distribution and the raising of productivity per hectare through the development of education and extension, and the distribution of agricultural machinery and improved seeds.

In Ecuador, the development plan for 1964-73 aims at an average annual increase of 5.8 percent in the agricultural product. This assumes a growth of 50 percent in yields as a result of more intensive cultivation through irrigation, improved practices and the use of better seeds and fertilizers. The agricultural sector will receive 17 percent of total investment, if the cost of settlement is included.

The Honduras five-year plan for 1965-69 includes a rural development program which aims both to expand the area under cultivation and to increase yields. The annual rate of agricultural growth expected is 4.6 percent, and total sectoral expenditure is 64.6 million lempiras, of which about 25 percent is for irrigation and the balance for agricultural credit, grain storage facilities, livestock improvement, the introduction of improved seeds and establishment of experimental farms.

During Nicaragua's development plan for 1965-69, crop production is expected to increase at an average annual rate of 5.5 percent, livestock by 10.1 percent, forestry 2.9 percent and fisheries 10.5 percent.

Uruguay's ten-year plan aims at an annual rate of growth of 4.1 percent in agriculture during the period 1965-74.

Land tenure

In Argentina, activities in connection with agrarian reform have centered on land settlement. In 1965, some land was distributed in the Province of Corrientes and settlements were being considered in other provinces. The Brazilian Agrarian Reform Institute (IBRA) and the National Institute of Agricultural Development (INDA) began operations in 1965. The Chilean Government has sent a new Agrarian Reform Bill to Congress. While this law is being approved, the Government has taken several measures toward its immediate implementation.

In 1965, the Government of Uruguay prepared several bills with the aim of reforming the present agrarian structure. The proposed legislation envisages direct measures such as the expropriation and redistribution of land, and indirect measures of a fiscal nature. The National Agrarian Reform Institute of Venezuela (IAN) paid out 100.4 million bolivars in 1965 for land destined for the agrarian reform program.

Other domestic policies

In Argentina, the need to step up beef exports has led to tighter rationing of internal consumption and the granting of tax concessions to beef exporters. At the same time, only steers weighing 410 to 480 kilograms may be sold and slaughtered for export, and breeding cows and young steers are to be retained. In the face of the continuing crisis in the sugar industry, the Government is planning a reduction of about 30 percent in the cane area, which will be devoted to citrus fruit.

At the beginning of 1966 Brazil's National Monetary Board approved a reduction in rates of interest for loans for agriculture. In major coffee areas the eradication plan has been revised and strengthened. This diversification program aims at replacing coffee by other crops, especially maize, rice, cotton and beans, or by pastures.

In order to facilitate the achievement of the production targets of the agricultural development plan, Chile has introduced measures to provide price incentives to farmers, improve marketing facilities, reduce costs of agricultural inputs, and increase agricultural wages. In view of the meat shortage, a regulation was introduced, under which meat can be sold to the public only from Tuesday to Friday of each week, and slaughtering is prohibited of animals weighing less than 250 kilograms on the hoof.

Export regulations have been simplified in Colombia, in order to stimulate the diversification of exports. This has been supplemented by financial measures such as the authorization of additional credit, and by tax incentives, such as a 40 percent rebate on agricultural export duties. Bananas, cotton, livestock and meat are among the export products benefiting from these measures.

The Government of the Dominican Republic has established the Dominican Sugar Institute to control

national sugar policy. The institute will have authority to fix prices and determine internal sales quotas.

In Ecuador, the Ministry of Agriculture has allocated 21 million sucres for the development of crops including fruit, wheat, cocoa, tobacco, coconut palm and other oilseeds, for the improvement of coffee plantations and the development of artificial pastures and forage crops. In December 1965, an agricultural development law was put into effect under which farmers will enjoy tax rebates and will be able to import livestock, tools, machinery and other requisites free of duty.

To ensure adequate supplies of wheat and maize for domestic consumption, the Mexican Government has introduced support prices. With the same objective of ensuring domestic food supplies, exports of livestock and milk have been restricted.

In Uruguay minimum prices have been established for exports of meat.

Regional economic co-operation

The fourth annual meeting of the Inter-American Economic and Social Council (IA-ECOSOC), held in Buenos Aires in March 1966, recommended a number of agricultural measures, including the acceleration of agrarian reform, the establishment of a regional system of agricultural insurance, and the formulation, by the Inter-American Committee of the Alliance for Progress (ICAP) in co-operation with FAO and in consultation with the international financing agencies and private industry of a general program and specific projects for promoting the use of fertilizers on a regional basis.

During 1965 the Inter-American Development Bank (IDB) approved operations totaling U.S.$373.5 million, which represents an increase of 30 percent over the average of $300 million in the previous four years. Of the total funds allocated by the end of 1965, about 40 percent have either directly or indirectly been for the benefit of agriculture.

In August 1965 IDB inaugurated the Institute for Latin American Integration in Buenos Aires to study the process of regional integration in its institutional, economic, legal and technical aspects. Its specific activities include research, provision of advisory services, training of officials, and dissemination of studies and research results.

The Central American Integration Scheme has made further rapid progress. Within the framework of the Central American Common Market, there has been an increase in intra-area trade and signs of diversification of exports and import substitution. The GDP of the five member countries has increased by an average of 6 percent annually.

A protocol concerning marketing conditions for maize and beans has been approved. Negotiations have continued concerning guaranteed prices for staple products such as maize, sorghum and beans. It has been recommended that member countries follow a common external commercial policy in order to keep up the present volume of traditional exports (mostly agricultural products) and develop new export products.

In the Latin American Free Trade Association (LAFTA), the first Common List of products which will be duty-free in intra-LAFTA trade after 1973 includes four basic agricultural products: coffee, cotton, cocoa and bananas.

Far East

Development plans

New development plans have been launched in China (Taiwan), India, Malaysia, Nepal and Pakistan, while Ceylon and the Republic of Korea have begun special programs for agricultural development. Development plans are also being prepared in Ceylon, Indonesia, and Japan, where previous plans were discontinued, and in the Republic of Korea, the Philippines and Thailand, where current plans will be completed in 1966/67.

China (Taiwan) finalized its fourth four-year plan for economic development (1965-68), under which an annual total growth rate of 7 percent is envisaged. Crop production is expected to grow at an annual rate of 4.1 percent, forestry at 2.6, livestock production at 6.4 and fisheries at 3.3 percent. Of the fixed capital investment required by agriculture for the plan period, 43 percent will be allotted to the development of land and water resources, 27 percent to farm crops, 12 to forestry, 12 to fisheries and 6 percent to livestock.

In India's third planning period which ended in early 1966, production of most agricultural commodities remained below target except for sugar. Supply of inputs such as fertilizers, improved seeds and irrigation facilities also failed to reach the goals set. The growth of national income did not exceed 20 percent, as against the target of 34 percent. One reason for this failure was bad weather which adversely affected agriculture; another, hostilities which

necessitated the reallocation of some development funds for defense and also hampered foreign trade. In the framework of the fourth five-year plan, which is still in preparation, an annual plan for 1966/67 has been adopted. Although it apparently allocates a higher share of public expenditure to industry and mining (25 percent) than to agriculture, including community development and irrigation (22 percent), this plan gives highest priority to agriculture, because a large part of industrial production, such as the supply of fertilizers, pesticides and machinery, is geared to agriculture. The production target for foodgrains is 97 million tons (compared with the previous maximum of 88 million tons achieved in 1964/65), and the availability of fertilizers will be double that of the previous year, both from imports and domestic production.

After the second Malayan five-year plan had easily exceeded its targets, the first plan of Malaysia was launched for 1966-70. It gives major emphasis to agriculture, rural and industrial development, health and education. In view of the high rate of population increase (3 percent), it is planned that GNP should grow at an annual average rate of 4.8 percent, agriculture by 4 percent, employment by 2.8 percent and exports by 2.4 percent. High production targets have been set for major crops, such as rice, rubber and oil palm.

Nepal's third plan has the long-term objective of doubling national income in 15 years through an annual increase of 4.7 percent. During the present plan period (1965-70), top priority is given to agriculture, with special emphasis on institutional reforms and the raising of food-grain production by 15 percent.

Pakistan's second plan successfully achieved a rise of 28 percent in GNP as against a planned 24 percent, and of food-grain output by 29 as against a planned 21 percent. The approved version of the third plan calls for an expansion of 37 percent in national income, 61 percent in industry, and 27 percent in agriculture, with a 28 percent increase in food-grain production. High priority is to be given to heavy industry.

The primary objective of the proposals for agricultural development (1966-70) adopted in Ceylon is food import substitution through a large paddy program and the encouragement of subsidiary food crop, livestock, fruit and vegetable production. Paddy output is to rise by 40 percent both through increased inputs and the expansion of cultivated and irrigated area. Output of export crops (tea, rubber, coconuts) is to improve through fertilizer and replanting subsidy schemes. Institutional factors such as credit, marketing and tenancy reforms receive special attention.

The Republic of Korea published a seven-year plan for increased food production, aiming at self-sufficiency in food by 1971, mainly through an annual 6.7 percent increase in the output of grains. It is reported that the plan is now being revised, but the emphasis on food-grain production seems to have been retained.

Japan abolished its medium-range economic program (1964/65-1968/69) because in 1965 the unexpectedly sharp rise in consumer prices proved the basic assumptions of the plan to be outdated. Basic economic policies for the next three years have been established, while a new long-range plan is being formulated.

The return of China (Mainland) to five-year planning with the launching of a third plan in January 1966 seems to indicate that the present level of agricultural production is considered sufficient to support further industrial growth. The second plan was abandoned in 1960, and the commencement of the third plan, due in early 1963, was postponed until recovery from the economic setback in 1959 and the following years of poor crops was deemed completed. Official sources are silent on the size of the plan, the ways of financing it, the quantitative targets to be fulfilled, or the expected economic growth rate over the plan period. The New Year editorial of the *People's Daily* announcing the plan instructs party committees on all levels to place agriculture first, with specific attention to grains and cotton. Industry is to "turn out more and more products suited to the needs of the countryside," that is, mainly fertilizers and agricultural equipment.

Price and marketing policies

In order to facilitate procurement and distribution, especially of food grains, the People's Stores Corporation in Burma was replaced in late 1965 by a Trade Council, empowered to handle all internal trade and supervise all foreign trade.

Ceylon's agricultural development proposals for 1966-70 include special recommendations for the improvement (mainly through the encouragement of co-operatives) of the marketing of products which hitherto had not been covered by marketing reforms, namely coconuts, fruit and vegetables, subsidiary food crops and livestock products.

Apart from the stepping up of foodgrain imports, stringent control measures were undertaken in India to cope with the price rise and food shortages. These measures included statutory rationing in all urban areas, maximized procurement of food grains and stricter licensing of food-grain dealers. Upon the recommendation of the Agricultural Prices Commission, established in early 1965, the minimum (support) price policy for food grains, adopted in 1962, was continued in 1965/66 with slight increases in the price for paddy and larger increases for wheat. State governments have been requested to set up purchasing centers at important assembly points and the Food Corporation, established in early 1965 as a link between the central and state government machinery for trading in foodstuffs, has undertaken the purchase, storage and distribution of food grains. Apart from purchases under the price support program, procurement was also made, either through levy or voluntary offers, at the maximum control price (that is, the price specially notified for such purchases). These control prices have been considerably higher than the support prices.

In Japan the government-fixed producer price for rice was raised by nearly 11 percent for 1965, and the consumer price for rationed rice by nearly 9 percent for 1966. Under a new law concerning sugar price stabilization, fluctuations in sugar prices are to be prevented by regulating the price of imported sugar and supporting the prices of home produced sugar and glucose.

In an effort to achieve a compromise between the interests of agricultural producers and middlemen, a Federal Agricultural Marketing Authority has been set up in Malaysia. It will co-ordinate the activities of all individuals and organizations concerned with marketing, supervise and improve the marketing of agricultural produce, and conduct the necessary research for such improvements.

Compulsory procurement of rice and paddy (after deduction of family requirements) was introduced in East Pakistan for cultivators of over 5 acres in non-border areas, and for all producers in the five-mile wide border belt, where smuggling presents a special problem. Procurement prices for the border area were fixed at a slightly higher level than in the hinterland.

The Rice and Corn Law enacted in early 1966 in the Philippines raises the floor and ceiling prices at which these staple food products have for some years been bought from producers and resold to consumers by the Rice and Corn Administration (RCA). The support price for rice, however, is to be reduced by 1 peso each year, until in 1973 it levels off at 12.50 pesos, in order to discourage farmers from depending too much on subsidies. A system is also instituted under which farmers may deposit paddy or corn (maize) in bonded warehouses against receipts which may be cashed at designated banks. Finally, the new law clarifies emergency conditions under which private imports of rice and corn may be permitted.

In Thailand, the Government decided to undertake rice purchases for buffer stock purposes, in order to control domestic price fluctuations.

Other domestic policies

In Ceylon, crown land has been made available under suitable lease conditions to the private (non-peasant) sector for the cultivation of selected crops, with a view to increasing local supplies and replacing imports.

Special emphasis is now being placed on the stepping up of domestic fertilizer production in India, and fresh concessions have been given to foreign private capital in the fertilizer industry. The system of advancing credit to farmers on the security of their crops instead of their land, which is already functioning successfully in three states, is now to be introduced all over India.

Regional economic co-operation

The Asian Development Bank was formally established in December 1965 with headquarters at Manila, Philippines. Nineteen countries from within the region[15] and twelve[16] from outside have ratified the charter and pledged U.S.$642 million and $341 million respectively, toward the bank's authorized capital of $1,000. The purpose of the bank is to supplement private banks and the various national governments in providing funds for economic development projects in the region, especially small and medium size projects. As the bank will concentrate on providing "hard loans" at least in the first few years, a proposal has been made to establish additional trust funds, to be administered by the bank, for agricultural development projects.

[15] Afghanistan, Australia, Cambodia, Ceylon, China (Taiwan), India, Iran, Japan, Republic of Korea, Laos, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Singapore, Thailand, Republic of Viet-Nam, Western Samoa (Afghanistan, Australia, Iran and New Zealand are included in the region covered by the United Nations Economic Commission for Asia and the Far East).

[16] Austria, Belgium, Canada, Denmark, Finland, Federal Republic of Germany, Italy, Netherlands, Norway, Sweden, United Kingdom, United States.

A ministerial conference held in Tokyo in April 1966 examined the possibility of establishing an Economic Promotion and Development Center to study concrete economic co-operation projects in southeast Asia. It was proposed to hold a similar conference on southeast Asia's agricultural development problems at some future date.

Near East

Development plans

Iraq completed its five-year plan and launched a new plan for the period 1965/66-1969/70, aiming at an annual increase of 8 percent in national income and of 7 percent in the agricultural sector. Total planned investment amounts to ID 821 million, of which ID 643 million is to be invested in the public sector. Among the main objectives are the diversification of production and the lessening of the country's dependence on oil revenue as a source of foreign exchange. The plan aims also at greater economic integration between Iraq and the Arab countries in general and with the United Arab Republic in particular, while it also takes into account the opportunities for trade provided under the Arab Common Market. Priority is given to agriculture, which will receive 23 percent of total investment and 26 percent of public investment.

A new seven-year plan (1965-71) was adopted in Jordan. The plan's main aims are the reduction of the trade deficit and of the dependence upon budget support. Total gross investment under the plan is set at JD 231 million, of which the private sector is expected to contribute more than half (JD 128 million). As it is expected that agricultural development can do much to improve the country's balance of trade by increasing exports and replacing imports, this sector will receive 25 percent of total investment.

A five-year plan for public expenditure was adopted in Lebanon for the period 1965-69. Total expenditure under the development budget was initially set at £Leb 1,080 million, of which £Leb 205 million was to be devoted to agriculture and irrigation. At the beginning of the current year, however, the program had to be scaled down because of lack of funds. Approval has now been given for a number of projects at a total cost of £Leb 272 million to be carried out during the plan period.

A new five-year plan for 1966-70 has been started in Syria, but few particulars are available. In the agricultural sector the main scheme is the Euphrates dam which is to be built with U.S.S.R. aid. Other important works are the Khabour, Ghab and Acharne projects, while much attention will be given to the construction of grain storage facilities. Total investment in agriculture would amount to £S 507 million, of which the private sector is expected to provide £S 300 million. An annual increase of 6 percent is envisaged in agricultural production. As a result of improved yields, cotton production is expected to increase by a third and wheat production by half.

After having completed its first five-year plan, the United Arab Republic started on 1 July 1965 its second five-year plan, which places emphasis on industrial development. While the magnitude of the overall planned outlay is not yet finalized, recent information indicates that £E 641 million is to be devoted to agriculture, including irrigation, drainage and fisheries. This amount is 70 percent higher than under the previous plan, reflecting the inclusion in the plan of a number of major projects of land reclamation, irrigation and drainage. It is expected that agricultural production will grow at an annual rate of 3.5 percent. Much of this growth will result from horizontal expansion, for which £E 300 million has been earmarked, while £E 57 million will be allocated for vertical expansion. It is hoped that by 1970 an additional 400,000 permanent new jobs will have been provided for agricultural workers, which is about a quarter of all new employment opportunities aimed at under the plan.

A midterm revision is being undertaken of the Sudan ten-year development plan. The general conclusion seems to be that agricultural development is progressing satisfactorily, while industrial development is lagging somewhat.

New development plans are in preparation in a number of other countries. A five-year plan for Kuwait (1966-71) is in an advanced stage of preparation and is expected to go into operation by the middle of the current year. The plan is reported to aim at an 8 percent annual growth in the GDP and to envisage total investment of KD 700 million (KD 320 million by the private sector). While the scope for agricultural development is very limited in Kuwait, immediate possibilities appear to exist for expanding fisheries and poultry production. Total capital investment in the agricultural sector is tentatively set at KD 11 million.

In Afghanistan, the third five-year plan is in preparation. As it is probable that only part of the targets of the second five-year plan can be achieved, some of the projects of this plan are to be incorpo-

rated in the third plan. Special efforts are to be made to increase production of wheat in order to replace recently rising imports.

In Somalia, it has been decided to replace the current five-year plan (1963-67). It is intended to formulate an emergency plan with the main objectives of self-sufficiency in basic foods, the improvement of livestock production with a view to expanding exports, and reducing the cost of banana production so that the country can compete in international markets.

Changes in planning organization have been reported from Sudan and Saudi Arabia. In Sudan, an independent Central Planning Board will be established. In Saudi Arabia, the Supreme Planning Board has been replaced by a Central Planning Organization whose president holds ministerial rank.

Land tenure

Land reform measures continue to receive attention. In Syria, the Ministry of Agrarian Reform has been combined with the Ministry of Agriculture, as there will be no need for these two separate ministries when the land distribution program is completed in the near future.

The Government of Iran has embarked on a scheme to encourage former land owners to invest in industry. It hopes to achieve this by offering to exchange shares in state factories for land reform bonds received in payment for land taken over by the state after land reform.

Iraq's Agricultural Reform Law of 1958 has recently been amended to improve compensation payment to landlords affected by the law. The maximum compensation in cash for expropriated land has been raised from ID 1,000 to ID 3,000. The balance of the compensation to landlords is paid in government bonds, which will now mature in 20 years instead of 40 years, while the interest rate has been raised from 1 to 3 percent. It has also been decided to change the function of government-owned farms, which henceforth will concentrate on the production of improved seeds.

The Sudanese Government has decided to increase the tenant's share in the Gezira scheme from 44 to 50 percent.

Price and marketing policies

Agreement has been reached between Sudan and the United Arab Republic on the co-ordination of their cotton policies. It is expected that this will have a considerable effect on the marketing of long-staple cotton, and will contribute to the stability of prices.

It has been decided to set up a Cotton Marketing Board in Sudan. The board will not have a monopoly of exports but will direct marketing operations. It will also check on the financial and technical capacity of cotton exporters.

In Lebanon, following last year's crisis in the apple industry, the Government has reorganized the Fruit Office and has given it wider powers to buy apples and to make arrangements for their export.

Africa

Development plans

During 1965/66, many new economic development plans were put into operation in Africa. For several countries the new plans were the second postindependence plans and were generally much less ambitious, with more modest targets, than the previous ones. In the more recent plans there is generally also an increased realization of the importance of the agricultural sector. In a few countries evaluation reports have been issued on the implementation of earlier plans and on the progress of current development plans.

Dahomey's new five-year plan for 1966-70 is based principally on agricultural development, and 34 percent of the total investment is allocated to this sector. It calls for administrative reforms to facilitate regional development in the agricultural sector. During the plan period the aim is to increase the production of palm oil by more than 30,000 tons, and livestock production by 25 percent. Increased production targets have also been set for cocoa, cotton, groundnuts, tobacco and coffee. By 1970, rice production is expected to supply more than half of the country's requirements, and other food production is envisaged to keep up with population growth mainly by more intensive rather than extensive agricultural practices.

In Malawi, a five-year plan for 1965-69 has been announced. The expansion of agricultural production to provide for the growing population and for increased exports, and the improvement of communications to reduce transport costs and increase the competitiveness of agricultural exports are among the four main aims of the plan.

In Morocco, a new comprehensive three-year development plan was launched early in 1965. In

comparison with the earlier unsuccessful plan (1960-64), the current one is much less ambitious, with the target for the annual growth of GNP at 3.5 percent as compared with over 6 percent in the previous plan. The plan lays special emphasis on agriculture, tourism and technical training. The agricultural program involves extensive land reclamation, soil conservation, reafforestation and irrigation schemes as well as a pest control campaign.

In Niger, a new comprehensive four-year development plan for 1965-68 within a ten-year (1965-74) perspective plan has been adopted. The new plan follows the interim one for 1961-64, during which agricultural production increased by 33 percent and GNP by 14 percent. Some 31 percent of the total investment is allocated to agricultural development, and agricultural production is expected to increase by 3.3 percent yearly during the plan period. The development of water resources is allocated some 40 percent of total investment in the agricultural sector, and it is planned to establish about 700 water holes for human as well as animal use. Other aims include diversification through the production of sugar cane, tobacco, and cotton, and the improvement of livestock production.

Following the completion of Senegal's first four-year plan, the second four-year development plan (1965/66-1968/69) has been put into operation. The target for the average annual growth of GNP is set at 6.1 percent, compared to 8 percent in the previous plan. The plan gives the highest priority to agricultural production, which it is planned to increase by 5.4 percent annually during the plan period. Investment in the agricultural sector is estimated at some 20 percent of the total. By the end of the plan period it is aimed to increase the production of groundnuts by 43 percent and of rice by 25 percent. The production of sugar cane and cotton is to be encouraged in order to diversify the agricultural economy.

In Togo, the first five-year development plan (1966-70) has been launched, with the objective of achieving equilibrium in the budget and the balance of payments. It aims at increasing GNP by 5.6 percent annually and in the sectoral targets the highest priority is given to infrastructure and agricultural development. The growth rate for the agricultural sector is set at 3.6 percent annually. Special attention is to be paid to research on improved and modern production techniques for food crops, sugar cane, tobacco, oil palm, coffee and cocoa, and extensive research is to be undertaken on the natural resources of the country, including soil, hydrology, agronomy and socio-economy.

In Tunisia, a comprehensive four-year development plan (1965-68) has been started following the completion of the three-year plan for 1962-64. The current plan lays greater emphasis on the development of industry, and aims to increase the GNP by 6.5 percent annually. Investment in the agricultural sector is set at 31 percent of the total, and it is envisaged to raise agricultural production by 2.8 percent annually during the plan period.

A two-year interim plan for 1965-66 has been adopted in the Central African Republic to provide time for the preparation of a four-year development plan.

A three-year transitional plan (1965-67) has been launched in the Overseas Provinces of Portugal.

In South Africa, the Government has published a revised economic development program for 1965-70.

According to recent reports, Sierra Leone's development plan is being recast on the basis of the available investment resources, and a new five-year plan for 1965/66-1969/70 is in preparation. It was also reported that Ghana's seven-year development plan has been abandoned following the change of government.

A number of reports are now available on the progress of implementation of current plans. During the first year of Kenya's six-year development plan (1964-70) there was an increase of 7.4 percent in GDP compared with the target of 5.4 percent. According to earlier reports, the economic growth achieved in the first year had encouraged the Government to revise upward the targets for future years from 5.4 to 6.2 percent. But in the second year, because of the drought combined with lower world prices for Kenya's principal crops, the economic growth rate is expected to have fallen considerably short of the planned target.

According to the second progress report on Nigeria's six-year development plan (1962-68), the plan has fared relatively well in spite of many problems. The growth of the GDP has been maintained at just over the planned 4 percent and many projects are well under way. The second progress report, like the first, envisages an upward revision in the planned total public capital expenditure. Among the main reasons for the increases are more accurate assessment of the cost of projets, incorporation of new projects into the plan, the carry-over of projects from the previous development program (1955-62) which proved to be larger than anticipated, and increased expen-

diture in the nonproductive sector of the economy. Apart from the substantially increased cost of the plan, other factors which may hamper its full implementation include increasingly strained financial resources, particularly foreign aid, and a more rapid growth of population than assumed in the plan. In the agricultural sector, Eastern Nigeria made considerable progress, including the plantation of 14,000 hectares of tree crops. In Western Nigeria, only just over 2,800 hectares of cocoa were established during the first two years, in comparison with the target of 49,000 hectares over the six-year period, but half of the planned new area of oil palm was established. In Northern Nigeria, some 1,000 hectares of wheat out of a planned total of 20,000 were established.

In Uganda, the results over the first four years indicated that the objectives of the five-year development plan (1961/62-1965/66) would be surpassed. The GDP is estimated to have increased in the first four years by 22.5 percent, while the objective for the whole plan period was 25 percent.

Land tenure

In Tunisia, the Government is to distribute 21,000 hectares out of the recently nationalized colons' land among 900 families. The remainder is to be farmed under state supervision and to employ 160 families who will own it after a period. In Zanzibar, the Government has continued to expropriate plantations belonging to private owners.

Kenya has obtained a loan of £18 million from the United Kingdom to finance a four-year settlement scheme directed toward the systematic purchase, development and settlement of former European-owned land by African farmers, beginning in April 1966. The scheme is expected to transfer annually about 40,000 hectares of European-owned mixed farming land to African ownership.

In Ethiopia, a new Ministry of Land Reform has been established to study and recommend measures to improve the land tenure system in the country.

Marketing and price policies

A state-owned marketing and export office (Office chérifien de commercialisation et d'exportation) has been established with a monopoly control over the export of Morocco's main products, including citrus fruit, vegetables, fish products and handicrafts.

In Kenya, a new state-owned company, the Kenya National Trading Corporation, has been formed to deal with export and import trade in international markets.

The Government of Chad has established a national marketing agency to stimulate agricultural production by assessing fair and remunerative prices to growers and to stabilize internal market conditions including consumer prices. The newly formed agency has been given a monopoly over the marketing of groundnuts and gum arabic. In Gabon, two government marketing agencies have been established: the Fonds de régularisation des prix d'achat des produits agricoles is to support and stabilize producer prices for coffee, rice, groundnuts and palm oil, while the Caisse de stabilisation des prix du cacao has been established exclusively for cocoa. The Farmers' Marketing Board, the semigovernment agency in Malawi, has decided to buy all produce directly from African farmers and villages throughout the country, instead of through co-operative societies as hitherto. In Zambia, the Government has appointed a price controller and has formalized price control over certain basic essentials such as flour and maize meal, while in Tanzania the Government has brought the price of rice under statutory control.

Other domestic policies

The Government of Ivory Coast has prohibited the establishment of new coffee plantations and the extension of the old ones.

In Algeria, a new Banque agricole nationale is to be established to facilitate increased agricultural production. In Morocco, the Caisse nationale de crédit, with the assistance of the International Bank for Reconstruction and Development (IBRD) is to provide credit to farmers and co-operatives to make use of up-to-date agricultural machinery to increase their production. The National Development Agency of Tanzania, with the assistance of the International Development Association (IDA), has embarked on a four-year lending program for the development of small-scale agriculture through the medium of co-operatives.

In Chad an Office national du développement rural has been established to co-ordinate and expedite all activities in the agricultural development of the country. In order to diversify the agricultural economy of Ivory Coast, an eight-year oil palm plantation project involving the plantation of 32,000

hectares of high-yielding oil palm has been started with the aid of the European Development Fund.

Regional economic co-operation

The Organisation commune africaine et malgache (OCAM) has taken steps for greater economic co-operation in the marketing of agricultural produce. A scheme has been reportedly worked out for a common market in sugar among the OCAM countries. Proposals have also been made for the combined marketing of groundnuts, cotton, and other raw materials.

The Union douanière et économique d'Afrique centrale (UDEAC) was officially established on 1 January 1966, following the decision of the Heads of State meeting of the former Equatorial African countries and Cameroon in December 1964. With its headquarters at Bangui, Central African Republic, UDEAC replaces the Union douanière équatoriale (UDE). It retains the basic features of its predecessor but in addition provides for the free movement of labor, unification of all import taxation, of customs nomenclature and of exemption from customs duties.

It has been agreed to establish an East and Central African Economic Community. The proposals include co-operation in the economic development of individual member countries as well as the establishment of a common market with customs and tariff concession.

A project for a free trade area between Liberia, Ivory Coast, Guinea and Sierra Leone is under study. According to reports, the Organization for West African Economic Co-operation established by the four countries in Freetown, Liberia, is currently studying the various problems and possibilities for closer co-operation.

The recently established interstate organizations for the development of the Chad basin and the Senegal and Meno rivers are making good progress. The newly created Council of Ministers of Economic Affairs and the Permanent Consultative Committee are continuing their work for increased economic and trade co-operation among the Maghreb countries.

On the other hand, difficulties have arisen in the functioning of the East African Common Market and Common Service arrangements. In June 1965, Kenya, Tanzania, and Uganda decided to dissolve the East African Currency Board and each of the three member countries are to establish in 1966 separate currencies and central banks.

Fishery policies

International measures

The Convention on Fishing and on the Conservation of the Living Resources of the High Seas, the last of the four conventions adopted by the First Conference on the Law of the Sea at Geneva in 1958, entered into force in March 1966 upon ratification by the required number of countries. The convention seeks to promote the conservation of the living resources of the high seas, the objective of conservation being defined in terms of the achievement of "optimum sustainable yield . . . so as to secure a maximum supply of food." A stock exploited by a single country must be so protected. Where high seas fishery resources are exploited by more than one country, the countries must enter into conservation agreements if one of them so suggests.

The Convention recognizes the special interest of coastal states in conservation agreements and gives them the right to participate on an equal footing in research and regulatory activities even if they do not themselves exploit the fishery. It also includes procedures for the settlement of disputes in connection with the implementation of agreed conservation measures.

The rational management of high seas fishery resources has for many years been the concern of a number of commissions dealing with certain species or regions. One of the major difficulties encountered in the attainment of management objectives has been the failure, in some instances, to obtain the observance of recommended regulations by all countries exploiting the fishery. Thus in 1965 the International Whaling Commission (IWC) agreed on appealing to certain countries to adhere to the Convention for the Regulation of Whaling. In the same year, an intergovernmental meeting on yellowfin tuna regulation adopted a resolution requesting the assistance of FAO in efforts to obtain the adherence of countries fishing in the Eastern Pacific Ocean to the Inter-American Tropical Tuna Convention. This step was taken after the Inter-American Tropical Tuna Commission had failed to obtain the desired results from a request to member countries to help in persuading nonmember countries participating in the fishery to co-operate in the implementation of conservation measures. Since some of the countries participating in the whaling and yellowfin tuna fisheries in the areas where conservation measures appear necessary are not to date among the signatories of the Convention on Fishing and on the Con-

servation of the Living Resources of the High Seas, the recent ratification of this convention is not likely to have an immediate effect on the management of these resources.

As a result of a recommendation of the 1964 European Conference on Fisheries, efforts have been made to draw up a convention for the North Atlantic on matters related to the policing of protected fishing waters, regulating the conduct of vessels on fishing grounds, the marketing of fishing gear, and the settlement of disputes arising through damage to a vessel's gear by a vessel of another country.

A Convention for the Conservation of Atlantic Tunas was adopted at Rio de Janeiro, Brazil, in May 1966 by a Conference of Plenipotentiaries convened by FAO. The Convention, which will come into force upon ratification or approval by seven countries, provides for the establishment of a new body to be known as the International Commission for the Conservation of Atlantic Tunas. Membership in the commission will be open to any government which is a member of the United Nations or of any specialized agency of the United Nations. The commission will be responsible for the co-ordination of research and for the development of recommendations to its member countries for appropiate measures to conserve the tuna stocks.

Early in 1966, the U.S.S.R. and Japan renewed the Northwest Pacific Fisheries Convention which they had signed in 1956. The agreement covers regulations on seasons, gear, and catch quotas for the fisheries exploited by the two countries in these waters: the salmon, herring and crab fisheries. Under the new agreement, the high seas catch quota in the salmon fishery, economically the most important, has been considerably reduced.

A Baltic Sea Salmon Conservation Agreement between Denmark, Sweden and the Federal Republic of Germany came into effect on 1 March 1966. The agreement provides for minimum mesh sizes in the gill net fishery and minimum width between the point and shaft of hooks in the long line fishery as well as for a minimum size of specimen to be taken.

Recent action taken by the Joint Commission for Black Sea Fisheries includes prohibition of the catching of one species of sturgeon, provisions that other sturgeons are not to be taken with unbaited hooks, and annual overall as well as national quotas for turbot.

Intergovernmental negotiations on whaling under the aegis of IWC came up with only partial solutions to the critical resource problems faced by the Antarctic and North Pacific industries. A five-nation conference held in September 1965 in Tokyo (not called under IWC auspices) failed to produce agreement on renewal beyond 1966 or modification of the national allocations of the international Antarctic pelagic whale catch quota set by IWC. An agreement, which it had unsuccessfully tried to obtain in 1964, was reached by IWC itself not only on the overall quota for the forthcoming season, but also on the future reduction of this quota aiming at the eventual recovery of the excessively depleted stock and of larger sustained yields. For the first time the agreement prohibited the capture of blue whales. An important element in the effective international control of whaling is the implementation of an international observer scheme, agreed some years ago by IWC. Arrangements along these lines were scheduled to expire in 1966, and the five-nation conference in Tokyo failed to obtain agreement on their renewal.

The experience of the various commissions reveals some common problems: concern with the evaluation of the economic effects of proposed and existing regulations (and perhaps, eventually, the elaboration of economic criteria for the management of internationally exploited resources); the examination of principles and procedures for the international observation and enforcement of regulations on the high seas; and the growing need to devise appropriate measures for the limitation of fishing power and effort (as well as measures relating to mesh regulation, size limits, and closed areas) in order to ensure high sustained yields.

The trend toward the extension of national fishery limits, and of zones in which coastal states claim the right to enforce conservation measures, continued during 1965. Fishing rights were claimed, in most instances, for a 12-mile distance. Pakistan declared its intention to enforce a 100-mile wide zone for conservation purposes without reserving, however, exclusive fishing rights for its nationals in this zone. In some instances, proposed legislative changes in regard to fishing limits were concerned with the establishment of base lines for the measurement of fishing zones rather than the width of these zones as such.

National measures

Many of the new development plans that went into operation during the period under review call for a rapid expansion of fisheries. The U.S.S.R.'s new five-year plan set a fishery production target

of 8.5 million tons for 1970, an increase of over 50 percent above 1965 catches. Poland wants to double production by 1970, and by 1980 expects a production of 900,000 tons. Yugoslavia has drawn up a fishery development plan envisaging expenditures of U.S.$38.5 million in the next decade; in order to increase productivity and concentrate investment funds, the merger is planned of a number of smaller enterprises into large state-owned fishing corporations.

India plans to increase its production by 1971, the end of the fourth plan, by 500,000 tons (in 1964, its catches exceeded 1.3 million tons). Countries with a comparatively modest fisheries output have also made ambitious plans for development. Kenya, for instance, whose fish production in 1964 was only slightly more than 20,000 tons, hopes to triple production under a five-year plan which terminates in 1970.

Some plans, such as those of Pakistan and the Republic of Korea, have set high export targets. Pakistan wants to more than double its exports by the end of its third five-year plan (in 1964, it exported nearly U.S.$21 million worth of fishery products). Korean fishery development is expected to receive a considerable stimulus as the result of an agreement concluded with Japan in 1965 under which as much as $190 million may be made available to the country in the form of reparations payments and credits. A substantial share of the Korean production increase is to be exported to Japan.

Japanese private fishery industries and China (Mainland) agreed in December 1965 to extend for two years their Private Fishery Agreement covering fishery operations in the East China Sea and the Yellow Sea.

Government aid was made available to fisheries not only for development purposes, but also to rationalize operations and to solve difficulties which had arisen in established industries. In Peru and Chile, raw material supply difficulties exacerbated or created cost and financial problems for many enterprises of the fish reduction industry. The governments of the two countries tried to provide relief through fiscal measures and, at the same time, promote the orderly transfer of excess capacity to other employment.

Forest policies

Recent developments in the laws, administrative machinery and incentive systems that control forest land use have continued to reflect the expansion and growing diversification of the goods and services derived from the forests, as well as the increasing complexity of the relations between forestry, agriculture and industry. In the developed countries, there is an increasing need to expand the manifold protective and social benefits provided by the forest in connection with urbanization, communications and leisure space, while maintaining the role of the forest in yielding a timber crop. In the developing countries, the critical question today is the adjustment of the forest land sector to economic development needs, notably through the reservation and management of productive forests and the establishment of industrial forest plantations, while promoting the closer integration of the forest with land reform and settlement programs, not just as a reserve of arable land and a generator of favorable climatic and soil conditions for efficient agriculture, but as a dynamic factor that can help to raise rural incomes, offer more diversified employment and contribute to industrialization. An outstanding feature of the present situation is the growing influence on national forest policies of the increased knowledge of the nature and location of the world's forest resources and of where, when and in what amounts timber and wood products are or will be required.

In Europe (excluding the U.S.S.R.) the latest statistics show that wood consumption is growing faster than output, thus confirming the continued need for timber imports, which rose from 21 million cubic meters in 1960 to 36 million cubic meters in 1964. Another continuing trend reported from numerous countries, including the Federal Republic of Germany, Greece, Norway, Spain, Sweden and Yugoslavia, is the abandonment of marginal agricultural lands, many of which could be restored to productive use by forestry. At the same time, the many-faceted protective, recreational and touristic roles of the forest are coming increasingly to the fore. In the U.S.S.R., for example, the possible felling of forests around Lake Baikal has aroused concern regarding the undesirable effects that this might have on the protective role of these forests in the central Siberian region. The general trend toward urbanization is reflected in the shortage and high cost of labor for forest operations. The expanding wood requirements are leading to the shortening of rotations, the conversion of coppice to high forest, the restoration of unproductive forests and the establishment of forest plantations. All these factors, plus the growing emphasis on economic planning, have led to

the reconsideration of forest policies and management practices in most European countries. The solutions, still under discussion, are likely to require the co-ordination of national policies, as for example in the co-ordinated forest policy being studied in EEC.

Efforts have continued in many European countries to overcome the restraints imposed by structural obstacles to the development of the private forest sector and to maximize forestry's contribution to the economy of small farms. Recent forest laws in Norway, Portugal and Switzerland are examples of this trend; the new Italian Green Plan places considerable emphasis on promoting private forestry through loans, tax exemptions and the encouragement of multipurpose co-operatives. The new problems and policy issues created by economic development and urbanization have also affected the structure of the forest administration in some countries. France for example, has established the Office national des forêts, which places particular emphasis on the development and utilization for production of forests in the public domain. In Yugoslavia, the Basic Forest Law of 1965 provides for the establishment of forest zones to make possible the implementation of a dynamic forestry development policy based on large economic units, either in single or multiple ownership.

A series of intergovernmental forestry meetings, culminating in 1965 in the Conference on Pulp and Paper Development in Africa and the Near East and the Intergovernmental Conference on Timber Trends and Prospects in Africa, have made possible a major reappraisal of the importance and role of the forestry and forest industries sector in the African region. The primary purpose of the latter conference was to review the FAO/ECA study, *Timber trends and prospects in Africa,* which brings together for the first time a wealth of quantitative information for the formulation or advancement of national forestry development plans. In fact, several countries in the African region have already been able to draw up such plans, but shortage of staff and funds has often hampered implementation.

Some major guidelines for the development of the great potentialities of forestry in Africa have emerged: the importance of forestry for industrial development and exports; the considerable possibilities offered by man-made forests; the need to know more about Africa's forests and forest industries; the need for qualified personnel at all levels; and the need to secure an adequate forest domain, especially in relation to population growth. Several countries have enacted new forest laws intended to foster forestry development under the new circumstances created by national independence. In Congo (Brazzaville) and Ivory Coast, long-term contracts for large forest areas are envisaged, in order to facilitate private investment in the forestry and forest industries sectors. Other new forest laws, for example in the Central African Republic and Madagascar, contain provisions for the creation or extension of communal forest plantations or, as in the case of the forest code of Senegal, for financial compensation to the communities deprived of damaging forest usage rights. There has been widespread acceptance of the concept of wildlife management as a source of both tourist revenue and protein food. Exports of selected logs have continued to increase faster than those of sawn or board products, but plans to increase the production of plywood and board products are well advanced in several west African countries, and various projects for pulp and paper plants are under study in Ethiopia, Kenya, Malawi and Tanzania.

With a few exceptions, the Near East countries do not possess a sizable growing forest stock and the task of the forest services is mainly related to the conservation of soil and water resources, particularly in connection with irrigation and land settlement projects. There is a good case for developing production forestry in various countries of the region; in Iran, for example, a project is under study for the development of the Caspian forests. However, the bulk of present forestry activities lie in conservation work within the catchment areas on which land reclamation and irrigation projects depend, in the establishment of protective plantations such as windbreaks and shelterbelts, in the creation of communal plantations and green belts near population centers and in the implementation of improved methods of range management. Several forestry administrations, for example those of Iraq and Sudan, have adapted themselves, on the one hand to playing a supporting role in large-scale government projects for land development, and on the other hand to promoting the contribution of forestry to economic development. Thus the integration of forestry with other land uses in the framework of general land-use planning is acquiring increasing importance in the Near East, and is affecting not only administrative methods and structures but also forestry research and education programs.

In some Latin American countries such as Ecuador, forestry development plans have already resulted in

spectacular increases in public expenditure on forestry. Another recent development is the establishment of consultative bodies such as the Timber Marketing Committee in Honduras, the National Poplar Commission in Chile and the Commission for the Protection of Natural Resources in the Dominican Republic. Several countries, including Bolivia, Brazil, Chile, Costa Rica, El Salvador, Mexico, Paraguay, Uruguay and Venezuela, have improved, or are in the process of improving, their forest legislation. Most of the new laws involve increased responsibilities for the national forest administrations, with greater control over private forestry, and in many cases they reflect the need for closer integration between forestry and forest industries. The fact that a structural reform which embraces also the forest resources could make a greater contribution to overall economic development than one which affects exclusively the agricultural sector, is becoming recognized, and this is reflected in closer co-operation between forest administrations and land reform agencies, as well as in an improved co-ordination between forest laws and agrarian reform laws. The Venezuelan Forest Law of 1965, for example, devotes a special section to forestry questions in land reform areas. In Ecuador and Uruguay, the administrative status of the forest services has been raised and in certain countries, such as Chile, there is a tendency toward giving the forest service a high degree of administrative autonomy and financial self-sufficiency. In Brazil, the first graduation of forest engineers from the national forestry school took place in 1965; this is only one example of the sustained efforts made in Latin America in forestry research and training, matched by a considerable development of the administrative machinery that will absorb the trained manpower and help in applying technological advances. Most of Latin America's imports of forest products still consist of pulp and its products, and the need to replace such imports is the major consideration in national forest policies.

There has been considerable progress in forestry and forest industries development in the Far East. Overall, the region is still a wood-deficit area, and the large-scale establishment of forest plantations to remedy this situation has continued in many of the countries with few natural forests and is being considered with increasing interest by those with extensive but slow-growing and complex natural forests. The afforestation programs in Cambodia, India, Indonesia and the Philippines are particularly noteworthy. The strengthening of institutions for forestry education has continued, but more efforts will have to be made in the field of subprofessional and vocational training. The Papua and New Guinea forestry school for subprofessional training was inaugurated in 1965 and a large logging training project has been initiated in India. The need for intensive rather than extensive management, for genetic and tree-breeding studies and for economic studies on logging and industries is leading to a revision of research priorities and a strengthening of research centers. An outstanding feature has been the rapid development of plywood, veneer, pulp and paper industries, especially in India, Indonesia, Japan, the Republic of Korea, and the Philippines. Exports of forest products have been facilitated in many countries, such as Burma and Thailand, by improved grading and standardization methods, and better market organization.

Chapter III. Agriculture and industrialization

Industrialization is one of the chief objectives of every developing country. Indeed, a characteristic difference between developed and developing countries is in the relative position of agriculture and industry in their economies. In developing countries agriculture generally accounts for the major proportion of national income, employment and exports, and manufacturing and other industries as yet play only a small part in the economy. In developed countries the position is reversed, and the nonagricultural sectors predominate.

Because of the diminishing relative importance of agriculture as development goes forward, there has sometimes been a tendency to identify economic development with industrialization and to devote insufficient resources to the agricultural sector. However, it has increasingly been realized that agriculture and industry are mutually dependent. Recent experience in a number of countries has demonstrated that a lagging agriculture may jeopardize industrialization and the growth of the economy as a whole.

This study begins by setting out the main aspects of the interrelationship between agriculture and industry. The subject is dealt with fairly briefly, however, since it has already been covered in some detail in other recent publications of FAO.[1] The main emphasis of the present study is on the two branches of industry most closely related to agriculture: the industries using agricultural, fishery and forest products as raw materials, and the industries serving agriculture by the provision of equipment and other requisites for production.

Industries based on agricultural raw materials played a major part in the early stages of the industrialization of the developed countries, and they are no less important in the industrialization now under way in the developing countries. Such industries are estimated to account for about half of of the total value added and almost two thirds of the employment in manufacturing industry in the developing countries at the present time, and their share in the developed countries, although smaller, is still substantial. The development of these industries also has many beneficial feedback effects on agricultural production itself.

The industries serving agriculture may also make a notable contribution to a country's industrial development, and their role in raising the low levels of agricultural production and productivity in developing countries is even more crucial.

INTERDEPENDENCE OF AGRICULTURE AND INDUSTRY

The interrelationships between agriculture and industry are complex. Agriculture's basic role as supplier of food for the industrial labor force and of many of the raw materials for industry is only one element, although perhaps the most essential. In most of the developing countries, agricultural exports must provide the bulk of the foreign exchange earnings for the import of the capital goods required for industrialization. Agriculture releases labor and often finance to industry. The agricultural population provides a market for industrial products, not only for consumer goods but also for a wide range of equipment and materials used in agricultural production.

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[1] FAO. Agriculture in economic development, *Monthly Bulletin of Agricultural Economics and Statistics*, 13(2). February 1964, p. 1-14; FAO. The role of agriculture in economic development, by P.G.H. Barter. In *Agricultural planning course 1963*, Agricultural Planning Studies No. 4. Rome, 1964, p. 45-54.

Agriculture as supplier of food and raw materials

The expansion of industrial and other nonagricultural employment increases the size of the population dependent on purchased food. It is therefore necessary that, parallel with the development of industry, there should be a sufficiently rapid increase in marketed supplies of food. This implies a substantial transformation of the primarily subsistence-oriented agricultures of the developing countries. In particular, incentives must be provided, institutional and social barriers removed, and an adequate marketing system developed, so as to ensure that agricultural producers feel the full force of the growing demand of the population employed in industry.

If agriculture fails in this basic task of increasing marketed supplies of food in line with the demand of the industrial population, food prices will rise, with consequent pressure on industrial wages. Alternatively, food imports must be increased, at the expense of diverting scarce foreign exchange resources from the import of the capital goods needed for industrialization. Although a large part of these imports can at present be obtained on concessional terms, even imports paid for in local currency under United States Public Law 480 entail some expenditure of foreign exchange for freight and other services. Furthermore, if (as would probably have been necessary in the absence of concessional supplies) at least some of the imported food had instead been produced by domestic farmers, their incomes would have been higher and their purchasing power for industrial goods correspondingly larger.

There are several striking examples of the effects of insufficient attention to agriculture. The classic case is that of the U.S.S.R., where from the early 1920s industry, and especially heavy industry, was developed at the expense of agriculture. Agricultural production consistently fell far short of planned targets, and there were severe shortages of agricultural products. From about 1953 the emphasis on agriculture has therefore been greatly increased, but basic food production has still failed to rise fast enough, and industrial production has been held back by insufficient supplies of raw materials from agriculture.

More recently, China (Mainland) attempted to follow a similar policy of rapid industrialization. Here the effects of the neglect of agriculture coincided not only with attempts to reorganize the agrarian structure at an unprecedented pace, but also with a run of very bad seasons, and even with vastly increased food imports it was impossible to avoid serious food shortages. Moreover, as in the U.S.S.R., agriculture failed to provide industry with the expected quantities of cotton and other raw materials. Since the series of crop failures there has been a gradual shift in emphasis toward agriculture.

In Argentina, farm prices were kept artificially low during the immediate postwar years in order to provide cheap food for the industrial labor force. Far from ensuring cheap food supplies, however, this policy led to food shortages, runaway inflation, and sharp reductions in agricultural exports. Here too, greater stress is now laid on agricultural development.

These are extreme cases, but the situation in many of the developing countries today does not appear to be very different. In some of them, just as occurred earlier in Argentina, farm prices have been kept too low to offer sufficient incentive for the necessary increase in production. Even where an attempt has been made to provide adequate prices, poor marketing facilities and other institutional deficiencies have often made these prices ineffective at the farm level. For this and other reasons, food production in a number of developing countries has lagged behind population growth and even more so behind demand (which reflects the increase in income as well). It has been possible to maintain per caput supplies in these countries only at the cost of increased imports or reduced exports of food. Retail food prices have risen sharply in many developing countries, often significantly faster than has the overall cost of living.

In examining how agriculture has performed its role as supplier of food for the industrial labor force of the developing countries, it must also be noted that diets are often nutritionally inadequate in these countries, in quality if not in quantity. This has some bearing on industrial development, since working efficiency is reduced by an inadequate diet. If there is a shortage of calories, it is impossible to sustain a high rate of output. Moreover, physical development is impaired by undernutrition and malnutrition during childhood, and reduced disease resistance and lethargy are caused by deficiencies of protein and other essential nutrients in the current diet.

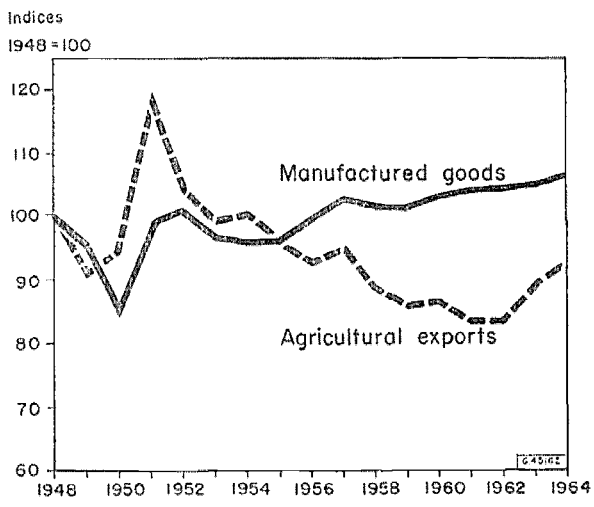
As well as providing food for the industrial labor force, agriculture supplies many of the raw materials for industry. In fact, in most developing countries, agricultural products, both food and nonfood, are the most readily available raw materials for industrialization.

Agriculture as earner of foreign exchange

The foreign exchange earned by agricultural exports (and saved by the substitution of agricultural imports by domestic production) is of particular importance in industrialization. The capital goods required for industrialization are still largely produced in the developed countries, and the developing countries must therefore spend foreign exchange in order to purchase them. The same applies to many of the intermediate goods needed in industry and also to many of the consumer goods for which the demand increases as the industrial labor force expands.

It was largely earnings from agricultural exports that made possible the necessary imports of capital goods in many of the countries that are now highly industrialized. They must play much the same role in the developing countries that are at present in the process of industrialization, where agricultural products account for about half of the total value of exports, or as much as three quarters if petroleum

FIGURE III-1. – TRENDS IN THE PRICES OF AGRICULTURAL EXPORTS AND OF MANUFACTURED GOODS IN WORLD TRADE



and other fuels (which are exported by only a small number of countries) are excluded.[2] In many individual developing countries the proportion is more than 90 percent.

It is nowadays much more difficult to obtain a sufficiently rapid increase in export earnings than, for example, when in the last three decades of the 19th century Japan was able to achieve an eightfold increase in its already substantial exports of silk and silk products. In recent years most developing countries have made considerable efforts to increase production for export. However, prices of agricultural products on world markets have for many years tended to decline (in spite of some recovery in 1962-64), in part because of the large volume of exportable supplies resulting from these efforts, as well as the slow growth of demand in developed countries. Thus, the agricultural export earnings of the developing countries have expanded much more slowly than the volume of their exports.

The difficulties of these countries in finding the foreign exchange needed for industrialization have been further increased because world prices of manufactured goods, in contrast to those of agricultural products, have been slowly rising (Figure III-1). The purchasing power of their export earnings for manufactured goods has therefore been gradually eroded.

Agriculture as supplier of finance and labor

In the early stages of development, unless there are substantial mineral resources, the economy is very largely agricultural and most of the national income is generated in agriculture. A dynamic agricultural sector can provide much of the finance required for the development of the rest of the economy, and this is in fact what occurred during the early stages of industrialization in many of the developed countries.

Funds may be transferred out of agriculture for investment in industry and other sectors in a number of different ways. Apart from transfers through the payment of artificially low prices for agricultural products in relation to those for nonagricultural products, and through land taxes, export duties and other fiscal measures, there may be a considerable outflow of funds in developing countries as a result of the high interest rates paid by farmers to moneylenders and the disproportionately large share of the retail price of agricultural products that accrues to middlemen, since the investment of these classes is often chiefly outside the agricultural sector.

Agriculture is, of course, a source of funds not only for investment in industry but also for investment in agriculture itself. New fiscal measures should therefore generally be accompanied by measures to increase the supply of agricultural credit at low interest rates and to improve marketing, if agricultural production is not to become too unprofitable for

[2] FAO. *Trade in agricultural commodities in the United Nations Development Decade. FAO Commodity Review 1964.* Special Supplement, Vol. 1, Part I, p. 3, Rome, 1964.

producers to have sufficient incentive to increase their production for the market.

There is, in fact, some evidence that in recent years the rate of increase of agricultural productivity in many developing countries has been insufficient to provide a surplus for investment in the industrial sector. For instance, a recent survey by the United Nations Economic Commission for Asia and the Far East (ECAFE) concludes that: "the current high population density in developing ECAFE countries and the high rate of population growth make it impossible for a moderate improvement in agricultural productivity to do more than meet the increase in consumption demand, leaving very little saving for re-investment in agriculture and still less for industry."[3]

Even where there is a net outflow of funds from agriculture to the rest of the economy, the government must generally furnish some of the finance needed for agricultural development, for the provision of infrastructure and other facilities and services that farmers cannot provide for themselves. In the early stages of development this is often necessary on a substantial scale if agricultural production and productivity are later to reach a level at which a sizable surplus is available for investment in the rest of the economy.

Agriculture also employs the great bulk of the labor force in the early stages of economic development. Agriculture's role as a source of manpower for industrial development, however, is rather different in the present circumstances of the developing countries from what it was when the countries that are now developed were industrializing. Population growth in the developing countries is in many cases more than twice as rapid as it was at a comparable stage of economic development in the industrialized countries. The expansion of industrial employment can therefore absorb only part of the natural growth of the agricultural population.

Agriculture as market for industrial products

If, as in many developing countries, agriculture accounts for as much as 60 to 70 percent of the total population, it must clearly also form a large part of the market for industrial products. This aspect, however, must not be exaggerated, for it appears that incomes in agriculture are usually very much lower than those in industry, in developed as well as developing countries.[4]

Even so, there is no doubt that in most developing countries the agricultural population is a large part of the total market for these products, and increased agricultural incomes will do much to raise the demand for them. This is an important consideration in determining the level of agriculture's financial contribution to industry, for if it is set too high it will obviously reduce the agricultural population's purchasing power for industrial goods.

It seems that in a good many developing countries there has been a tendency to neglect this part of the market and to concentrate industrialization unduly on the products demanded by urban consumers. For example, the import substitution industries that were developed in Latin America during and since the second world war chiefly produced the goods demanded by the small number of richer, urban consumers, and there was insufficient attention to the needs of the mass market in rural areas. The consumer goods demanded by the agricultural population are of key importance in agricultural development, for they help to provide them with the incentive to expand their production for the market. Closer study of the demand of the agricultural population for industrial consumer goods would thus help both agricultural and industrial development.

Even more important for agricultural development are the industries supplying fertilizers, implements, machinery, pesticides and other requisites for the improvement of production; boats and gear for fisheries; and various types of equipment for forestry. As agriculture is modernized, the demand for such requisites will steadily increase. In addition to these goods directly required in production, the market will also increase for industries providing equipment and other requisites for the marketing, packaging, storage and processing of agricultural products, for transport facilities, fishing harbors, etc.

Agro-oriented industrialization

Agriculture's contributions of food for the urban population, agricultural products as raw materials for industry, foreign exchange earnings, and finance for

[3] United Nations, Economic Commission for Asia and the Far East. *Economic survey of Asia and the Far East 1964*. Part 1. Economic development and the role of the agricultural sector, p. 112, Bangkok, 1965.

[4] Recent FAO estimates suggest that in most of the few developing countries for which data are available per caput incomes in agriculture are a good deal less than half of those in nonagricultural employment (see FAO. *The state of food and agriculture 1965*, Rome, 1965, p. 59). Even if per caput incomes in agriculture were as much as 50 percent of those in the rest of the economy, in a country where 60 percent of the population was in agriculture this sector would be responsible for less than 40 percent of total purchasing power. Moreover, at the lower level of incomes in agriculture as compared with the rest of the economy, a smaller share is available for expenditure on industrial products.

investment in industry are essential for industrial development. As a result, the agricultural sector is subject to considerable strain during a period of rapid industrialization, and the rate of growth of agricultural output is usually a critical determinant of the rate at which industrialization can proceed.[5] Similarly, agriculture depends on industry both for the consumer goods that give producers the incentive to raise their production for the market and for the inputs that are needed for the modernization of production. Perhaps the most essential aspect of the relationship is that each sector depends very largely on the demand of the other for its products. Thus, rather than giving priority to one of them over the other, it is necessary to determine the balance between them that, at a particular stage in a particular economy, is the most appropriate for their mutual development and for that of the economy as a whole.

In the conditions of the developing countries, which are in effect trying to achieve an agricultural revolution and an industrial revolution simultaneously, there is much to be said for greater attention to what may be termed "agro-oriented" industrialization. This would concentrate particularly on the consumer goods and inputs needed by the agricultural population, who would thus be assisted and stimulated to produce the increasing quantities of food and other agricultural products demanded by the industrial population, and would in turn, as a result of having higher incomes, become better customers for the products of industry.

CHARACTERISTICS OF INDUSTRIES USING AGRICULTURAL RAW MATERIALS AND THEIR CONTRIBUTION TO ECONOMIC DEVELOPMENT

A very large part of agricultural production undergoes some degree of transformation between harvesting and final use. National input-output tables appear to vary widely in their definition of final and intermediate demand, so that detailed international comparisons are not possible. It is significant, however, that the proportion of agricultural production that is processed is set as high in these tables as 81 percent in Japan, 77 percent in Malaysia: Malaya, 65 percent in Norway, 64 percent in the United Arab Republic, 62 percent in France, and 50 to 60 percent in a good many others.

These data refer to fishery and forest production as well as crops and livestock. For fishery production separately, FAO estimates indicate that in 1964 only 32 percent of the world catch was consumed fresh; 10 percent was frozen, 16 percent cured, 9 percent canned, 30 percent used for the production of fish meal and fish oil, and 2 percent for the production of other processed products. As regards forestry, about half of the world's wood production is used for fuel, but almost all of the remainder is processed in some way after the logging stage.

The industries based on agricultural, fishery and forest products as raw materials comprise a very varied group. They range from simple preservation (such as sun drying) and operations closely related to harvesting, on the one hand, to the production by modern, capital-intensive methods, at the other extreme, of such articles as textiles, pulp and paper.

Since their products all have the same end use, the food industries are much more homogeneous and easier to classify than the nonfood industries. Most preservation techniques, for example, are basically similar over the whole range of perishable food products, whether fruit, vegetables, milk, meat, or fish. In fact, the processing of the more perishable food products is to a very large extent for the purpose of preservation.

Table III-1 shows a rough classification of the main functions performed in food processing. It does not attempt an exhaustive listing of all the many different processes, but merely shows some of the main ones by way of illustration. Furthermore, the five categories distinguished in the table overlap to some extent. The original purpose of some of the processes included in the first three categories was actually preservation, but the preserved products (such as cheese and jam) have become established in their own right as separate foodstuffs. Similarly, some preserved products (such as canned and frozen fruit, vegetables, meat and fish) are used by consumers, mainly in developed countries, more for their

[5] For a recent attempt to derive the rates of growth of agricultural output needed to sustain different rates of growth of industry in India, see: Ashok Rudra. Relative rates of growth: agriculture and industry. *Economic Weekly*, 16(45), Nov. 1964, p. 1781-1783.

TABLE III-1. - MAIN CATEGORIES OF FOOD PROCESSING

Commodity group	Extraction of edible component	Conversion to more edible form	Conversion to new products	Preservation	Meeting consumer demand
LESS PERISHABLE CROPS	Sugar milling; oilseed crushing	Milling of grains and pulses; treatment of starchy roots; tea and coffee processing	Bakery, confectionery and pasta making; manufacture of fermented soy products; brewing, distilling		More refined milling, juice extraction, prepared foods and mixes, convenience packaging
PERISHABLE CROPS			Wine making; jam making	Drying, smoking, pickling, canning, freezing, etc. of fruit, vegetables, milk, meat, fish	
LIVESTOCK PRODUCTS	Slaughtering, flaying and cutting		Butter and cheese making		
FISH					

convenience than because they are preserved, and thus could be included in the fifth category of processing that is carried out in response to consumer demand, rather than because it is essential. There is also a further category (not included in the table) covering the by-products of food processing, but these are used mainly for animal feed, fertilizer and other nonfood uses.

For the nonfood industries, it is difficult to do more than list some of the main processes undergone by the different groups of raw materials (Table III-2). In contrast to the food industries, they have a wide variety of end uses, although the majority of them are concerned either with clothing or shelter. Almost all of the nonfood agricultural products require a high degree of processing, whereas many of the food products can be consumed with little or no processing. Much more markedly than with the food industries, there is in most cases a definite sequence of operations, leading through various intermediate products to the final product. Because of the value added at each of these successive stages of processing, the proportion of the total cost represented by the original agricultural raw material diminishes steadily.

A further feature of the nonfood industries is that many of them now increasingly use synthetics and other man-made substitutes (especially fibers) in combination with natural raw materials.

TABLE III-2. - MAIN PROCESSES UNDERGONE BY NONFOOD AGRICULTURAL PRODUCTS

Commodity group	Main processes
Apparel fibers	Cotton ginning, wool scouring, silk reeling; spinning, weaving, production of piece goods, clothing
Nonapparel fibers	Retting and decortication of jute and hard fibers; production of sacking, hessian, cordage, matting, carpets
Rubber	Coagulation, milling, smoking, vulcanization, etc.; manufacture of tires and other rubber products
Hides and skins	Curing, tanning; production of shoes and other leather goods
Technical and essential oils	Oil extraction; manufacture of soap, paint, etc.
Tobacco	Curing, fermentation; manufacture of tobacco products
Fish	Production of fishmeal, fish oil, glue, etc.
Forest products	Sawmilling; manufacture of veneer and plywood, fibreboard and particle board; production of pulp, paper and paperboard; manufacture of construction, materials, containers, furniture, etc.

Main characteristics

Because of the great variety of the industries using agricultural raw materials, it is difficult to generalize about their characteristics. It is desirable, however, to examine the main characteristics of these industries (especially in comparison with those using nonagricultural raw materials) in relation to their suitability for establishment in the conditions prevailing in the developing countries.

In most of these countries, agricultural raw materials and unskilled labor are the only production factors in abundant supply, and capital, foreign exchange, skilled labor and managerial ability are in short supply. The most suitable industries for establishment in such conditions are those that maximize total output and returns to these scarce factors in combination with as much as possible of the abundant raw materials and unskilled labor.

Few, if any, industries may be expected to fulfill these requirements completely. Indeed, a review of some of the main characteristics of different industries in relation to their suitability for establishment in developing countries indicates that most industries combine both advantages and disadvantages in this respect. Thus, in considering the suitability of an

industry, favorable and unfavorable factors must be weighed carefully against one another in the context of the conditions in a particular country or area.[6] Furthermore, the potential advantages can be realized only if the industry is efficiently operated.

Nevertheless it does appear that many of the industries using agricultural raw materials have characteristics that make them particularly suitable for the circumstances of the developing countries. Many of them have a lower capital intensity than other industries, and their requirement of skilled labor also is often lower. There is evidence that they have an especially high degree of linkage with other industries, so that their establishment has beneficial repercussions throughout the economy. For a good many agricultural industries a small plant may be economically efficient, which is another important factor in developing countries, where the domestic market is limited by low purchasing power and also sometimes by the small size of the population.

These and other characteristics are discussed further below. First, however, it is necessary to examine the fundamental difference between agricultural and nonagricultural raw materials that results from the biological nature of agricultural production.

Need for integration of agricultural production and processing

Processing is only one link in a continuous chain between raw material production and final consumption. The production of the raw material can obviously be planned realistically only in the light of the demand for the final product, while equally the processing enterprise must take account of raw material supply. In the case of crops, livestock, fish and forest products (the so-called renewable natural resources), the need for a close integration of raw material production and processing is reinforced by the biological nature of the raw material.

Because of the effects of the weather and of pests and diseases, the level of crop and livestock production cannot be controlled or even predicted with any great accuracy, and tends to vary sharply from year to year. To some extent, however, these fluctuations can be reduced by such measures as the control of pests and diseases, and it is therefore in the interest of the processing enterprise, which requires as regular a supply of raw material as possible, to ensure that these measures are taken by producers.

The production of most crops tends to be concentrated in a particular season. It is therefore advantageous for processing enterprises, particularly those engaged in canning and freezing, to arrange for the production in a particular area of a suitable range of crops and varieties maturing in different seasons, so as to ensure that the processing facilities are in operation for as long as possible. The perishable nature of many crops and livestock products also requires close contact between producer and processor and also advance planning if losses are to be kept to a minimum.

Most of all, however, the need for this close contact arises from the possibility of controlling the quality of the raw materials. Their quality can be influenced by such factors as the choice of seed, the application of fertilizers, the control of weeds, pests and diseases, sorting, and cleaning. The processor is interested not only in obtaining uniformity in the quality of his raw material supplies, but also, in some cases, his needs are quite specific. Particular varieties of some crops (for example, of tomatoes, apples and pears for canning) have long been grown for processing, but the need for such varieties is increasing as food technology develops more advanced processes. Often there are specific requirements for such factors as shape, size, texture, color, flavor, odor, acidity, viscosity, maturity, specific gravity, soluble solids, total solids, and vitamin content.

The initiative for the introduction of such varieties and practices has usually had to come from the processing industry. As a result, for some commodities, especially fruit and vegetables for canning and freezing, raw material production and processing are increasingly "vertically integrated" in the developed countries through various forms of contract farming.[7] In the developing countries, the large-scale plantation production of such crops as sugar, coffee, tea, sisal and rubber is based on the vertical integration of raw material production and processing.

Fish production is even less predictable than crop and livestock production, although some control is possible by varying the intensity of the catching operations. Because of the extreme perishability of fish, some processing (filleting and freezing) is

[6] Kenneth A. Bohr. Investment criteria for manufacturing industries in underdeveloped countries. *The Review of Economics and Statistics*, 36(2), May 1954. p. 158.

[7] For a useful study of this tendency, see International Federation of Agricultural Producers. *Integration and the farmer: a symposium on recent trends in the organization of food production, processing and distribution.* Rome, 1963.

increasingly carried out on board the fishing vessels themselves.

On the other hand, forest production from accumulated growing stock, like the output of such nonagricultural raw materials as minerals, can be varied within limits in accordance with demand. The establishment of the growing stock is, however, less flexible because of the long period that many trees take to reach maturity. In recent years considerable progress has been made in the integrated development of man-made forests (based on homogeneous, quick-growing stock) and industries using the raw materials they provide.

Raw material availability, transport costs, and the location of industry

In most developing countries agricultural products are the most readily available raw materials for industrialization. Where, as in many cases, the raw material represents a large proportion of total costs,[8] its ready availability at reasonable cost can often to a large extent offset such disadvantages as the lack of infrastructure or skilled labor in these countries.

The factors determining the most economic location for a processing industry are complex.[9] Generally, however, transport is a main factor. Most agricultural products either lose weight and bulk in processing so that they can be transported more cheaply after they have been processed,[10] or they are perishable and can more easily be transported in processed form. The situation is also affected by labor supplies and the availability of power and other infrastructure, but generally industries based on these products are "raw-material oriented" and can be most economically set up in the area where the raw material is produced. They can therefore contribute to the relief of the rural underemployment characteristic of developing countries.

For most grains, however, shipment of the raw material in bulk is frequently easier, while many bakery products are highly perishable and are therefore "market-oriented." Oilseeds (except for the more perishable ones like olives and palm fruit) are also exceptions and can be transported equally easily and cheaply in raw form or as oil and cake or meal, so that there is technical freedom of choice in the location of processing. The same is true of the later stages of processing some commodities. For example, while raw cotton loses weight in ginning which is therefore carried out in the producing area, ginned cotton, yarn and cotton textiles can all be transported equally easily and cheaply.

Where there is technical freedom of choice, industries have usually tended to be market-oriented, because of the more efficient labor supply, better infrastructure and lower distribution costs in the large market centers. With production for export, this has often tended to favor the location of processing in the importing country. This tendency has been reinforced by other factors, including the need for additional raw materials and auxiliary materials (particularly chemicals) not usually available in the producing country; the greater flexibility in deciding the type of processing according to the end use for which the product is required; and the greater regularity of supply and continuity of operation that are possible when raw materials are drawn from several different parts of the world. Thus, most of the oilseeds entering international trade have up to now been crushed in the importing countries, which are the main market for the oil and, even more, for the cake.[11] However, as the infrastructure and the efficiency of labor are improved in the developing countries, and as their domestic markets expand for such by-products as oilcake, it is likely to be increasingly profitable for such processing to be carried out in the countries where the raw materials are produced. Many developing countries are planning substantial increases in the proportion of their main export products that is processed domestically,[12] but they face the obstacle that for many commodities tariffs in developed countries are often higher for processed than for raw produce.

Economies of scale and size of market

In most industries using agricultural or nonagricultural raw materials, there are economies of scale,

[8] Cost structures vary considerably, but FAO estimates, based on data for a number of countries, indicate, for example, that the raw material is generally 75 to 85 percent of the total cost in vegetable oil extraction, 70 to 80 percent in sugar manufacture, 60 to 70 percent in leather manufacture, 50 to 70 percent in sawmilling, 50 to 60 percent in starch manufacture, 40 to 60 percent in canned fish and in fish meal, 30 to 50 percent in pulp and paper and in plywood, and 20 to 40 percent in fibreboard production.

[9] For a detailed account, see Charlotte Leubuscher. *The processing of colonial raw materials: a study in location.* H.M. Stationery Office, London, 1951.

[10] In sawmilling, for example, up to 30 to 40 percent of the volume of the log is residues.

[11] A special factor in the case of oilseeds is their interchangeability, as a result of which blends can be varied in line with changes in relative prices on world markets. Crushers in importing countries therefore have the advantage over those in producing countries of being able to vary their raw material supplies as prices and demand change.

[12] In Northern Nigeria, for example, the 1962-68 development plan envisages that the proportion of total production processed domestically will increase from 25 to 42 percent for groundnuts, from nil to 70 percent for cottonseed, from nil to 40 percent for soybeans, from nil to 34 percent for benniseed, and from 4 to 64 percent for hides and skins.

TABLE III-3. – CHARACTERISTICS OF TYPICAL FOOD CANNING PLANTS

	Plant A	Plant B	Plant C
Capacity (lb/hr)	100–200	1 000	10 000
Capital costs (U.S.$)	56 000–90 000	180 000–290 000	600 000–850 000
Labor requirements (man-years)	28–56	42–100	63–300
Capital per man employed (U.S.$)	2 000–2 600	1 800–6 900	2 000–12 900
Capital per lb/hr (U.S.$)	560–450	180–290	60–85
Labor per lb/hr (man-years)	0.280	0.100–0.042	0.030–0.007

so that minimum average costs of production can be reduced as the scale of plant is increased. This is illustrated in Table III-3, which summarizes the characteristics of three typical food canning plants.

The importance of economies of scale should not, however, be exaggerated. They have little relevance, for example, when, as in many cases in developing countries, plants are in operation for only one shift a day and thus are utilized well below their full capacity. Similarly, although there are potentially substantial economies of scale in canning, difficulties of handling and transporting large volumes of perishable produce often make their realization impossible. The lower cost per unit of production with a large-scale plant results not only from the spreading of capital and other overhead costs, but also from the frequently smaller labor requirements of the large plant, and this aspect is of less importance in developing countries where labor costs are low. Economies of scale may also be outweighed by other factors such as the poor and costly transport network in most developing countries, so that a very large part of the processing of agricultural products is still carried out by small units.

In fact, an important trend in recent years has been the increasing development of smaller scale equipment for agricultural processing, so that in many industries using agricultural raw materials economically efficient and profitable production is now possible on a much smaller scale than formerly. Examples include the development of light semiportable sawmills which can be operated in or near the forest, small oil expellers, hydraulic presses, sisal decorticators, equipment for canning factories, mills for rice, grains and sugarcane, and equipment for coir manufacture. This trend toward smaller equipment also provides much greater flexibility for in many cases (for example, in modern flour milling and oilseed crushing) the plant may be expanded mainly by the addition of further relatively small units.

Where there are considerable economies of scale (as in the production of rubber tires, and pulp and paper), large markets are of course essential. The size of market needed for economic production in such cases may be far in excess of the domestic market in individual developing countries, where it is limited not only by the low level of per caput income but also by the frequently small size of the total population. The production of the raw material in one country may also be insufficient to sustain a processing unit of economic size.

The opportunity they afford to increase the size of the market for industrial products is one of the chief reasons for the various schemes for subregional economic co-operation proposed in recent years. Most of these schemes have so far paid rather little attention to industries using agricultural raw materials, but a recent survey by the United Nations Economic Commission for Africa (ECA) of industrialization in central Africa [13] has demonstrated that there are more possibilities in this regard than are generally realized. The Central American Integration Scheme has also prepared a preliminary specialization scheme for the cotton textile industry, while other agricultural processing industries are being studied. The League of Arab States envisages the co-ordination of certain industries using agricultural raw materials, including the sugar and paper industries.

Such schemes also afford possibilities for specialization within a particular industry, as for example cotton textiles, where there is a great variety of end products.

CAPITAL AND LABOR INTENSITY

Some data assembled for a number of countries in the region covered by the United Nations Economic Commission for Asia and the Far East (ECAFE) make possible a comparison of some technological and other features of industries using agricultural or nonagricultural raw materials.[14] As might be expected, these data indicate that the situation varies considerably from country to country. It is note-

[13] United Nations. Economic Commission for Africa. *Report of the ECA Mission on Economic Co-operation in Central Africa.* Addis Ababa. 1966.

[14] United Nations. Economic Commission for Asia and the Far East. *Economic survey of Asia and the Far East 1964.* Part I. Economic development and the role of the agricultural sector. Bangkok. 1965, p. 90-91.

worthy, however, that in most of these countries industries using agricultural raw materials appear to have a lower capital intensity than other industries and a given amount of fixed capital also generates a larger flow of output and income than in other industries. The main exceptions are China (Taiwan) and New Zealand, where the industries using agricultural raw materials consist predominantly of "advanced-stage food manufacturing industries."[15] The productivity of labor (the output-employment ratio) is greater than in other industries in these two countries but lower in the other developing countries covered (India, Pakistan and the Philippines) and in Japan, mainly because of lower capital intensity.

The relative efficiency of capital and labor in industries using agricultural or nonagricultural raw materials will, of course, depend on such factors as the composition of the two groups of industries and their scale and technology. Some idea of the wide variations among the different industries using agricultural raw materials may be obtained from some data assembled in an FAO study.[16] These indicate that while many of these industries are a good deal less capital-intensive than manufacturing industry as a whole, in a number of them (most notably vegetable oils, rubber tires and tubes, and paper) the reverse is the case. They also confirm the existence of sharp differences from country to country.

It seems in fact that there is some degree of technological flexibility in many industries using agricultural raw materials. In many cases it is possible to use relatively simple production techniques, which provide a useful foundation for more complex industrial skills. Most factory techniques of food processing, for example, have evolved from simple methods, often of domestic use. It is generally possible, as labor becomes scarcer or more skilled, to introduce fairly easily a greater degree of mechanization in certain stages of manufacturing.

For example, in the food canning industry there is a good deal of flexibility in the proportions of capital and labor employed. This flexibility is mainly in the stage of food preparation, for many functions such as weighing, cleaning, trimming, grading, sorting, cutting, slicing and curing can be satisfactorily performed by hand labor in areas where labor costs are low.

[15] United Nations, ECAFE. Op. cit., p. 91.
[16] FAO. *Trade in agricultural commodities in the United Nations Development Decade. FAO Commodity Review 1964*; Special Supplement. Vol. I, Part III. Rome, 1964, p. 91-96.

Linkage effects

From the viewpoint of development strategy, one of the most important features of any industry is the degree to which it is able to generate demand for the products of other industries. This phenomenon is known as linkage. An industry may encourage investment both in subsequent stages of production by forward linkage and in earlier stages through backward linkage.

Input-output data for a number of countries are assembled in the ECAFE study already quoted to indicate the extent to which an initial increase in demand for the products of any one sector will increase the total demand for the products of all sectors.[17] From this it appears that, in almost all of the countries for which data are available, the total demand effect was greatest in the case of agricultural processing and textiles.

The establishment of certain primary processing industries can lead, through forward linkage, to a number of more advanced industries. Forest industries are particularly valuable as a base on which other industries can be established in this way. Once paper and board production has been started, a large number of conversion industries, such as the manufacture of paper bags and sacks, stationery, boxes and cartons, becomes more readily possible. Sawmilling and the production of wood-based panels give rise to joinery, wood package, furniture, and a wide range of timber products.

There are many other examples. Products such as vegetable oils and rubber are used in a wide variety of manufacturing industries. Based on the preparation of hides and skins, tanning operations can be begun, as well as the manufacture of footwear and other leather goods.

There are numerous industries using by-products or waste products that can be established (sideways linkage). These help to reduce the cost of the main product by making possible the fuller use of the raw material. For instance, the mechanical conversion of wood leaves residues that can be used in such industries as the manufacture of fibreboard, particle board, blockboard and pulp. These residues (amounting to 30 to 40 percent of the raw material entering the sawmill) were formerly wasted; the fact that they can now almost entirely be used has greatly modified the economics of sawmilling in developed countries, where it has often stimulated the integration of forest industries.

[17] United Nations, ECAFE. Op. cit., p. 30.

Animal feed industries can be based on a wide variety of by-products and waste products, including milling by-products, whey, oilseed presscakes and blood, carcass and bone meal. The less refined elements of animal residues can be used for the manufacture of glues, gelatins and fertilizers. Fish meal, for animal feed, can be produced from the residues of food fish processing.

The waste products of many industries using agricultural raw materials can be used as fuel. Thus sugar mills, sawmills and palm oil factories, for example, are generally self-sufficient in fuel. In some cases, however, this may be an extravagant use of a raw material that may be used more profitably (for example, bagasse for paper pulp, fibreboard, and particle board, and palm fruit residues for fertilizer).

The development of industries using agricultural raw materials also has many beneficial feedback effects on agriculture itself. The most direct is, of course, the stimulus it provides for increased agricultural production through the expansion of the market. Often, in fact, the establishment of processing facilities is itself an essential first step in the stimulation both of consumer demand for the processed product and of an adequate supply of the raw material. In Nigeria and Mexico, for example, one of the objectives of the establishment of additional flour mills is the stimulation of domestic wheat production, while in Sudan the country's second flour mill is to be located in the wheat-growing area for this purpose.

The provision of transport, power, and other infrastructural facilities required for the processing industries also benefits agricultural production. The development of these and other industries provides a more favorable atmosphere for technical progress and the acceptance of new ideas in farming itself.

An effect that is sometimes overlooked is the substantial increase in employment in the production of the raw material that may result from setting up an industry using it. Even if the industrial process is itself capital intensive, considerable employment may be generated in providing the raw material base. For example, the fish meal and fish oil industry of Peru provides employment for roughly 60,000 persons, of whom about half are fishermen; about a quarter are employed in the manufacturing plants, and the remainder in associated industries such as boat building and gear manufacture. In Brazil, the textile industry not only provides direct employment for more than 300,000 workers (about a quarter of the total labor force in manufacturing) but also for about another 500,000 engaged in raw material production. Similarly, while many forest industries are capital intensive, the associated logging operations are highly labor intensive.

Finally, as is discussed later, the industries using agricultural raw materials give rise to a demand for a wide variety of machinery, equipment, packaging materials and intermediate goods used in the processing itself.

Contribution to economic development

From the above account of some of their main characteristics it would appear that the industries using agricultural raw materials are in a number of respects well adapted to the conditions of the developing countries and to the early stages of industrialization. Furthermore, their products cater for the basic needs of food, clothing and shelter, and are therefore in demand at an early stage of economic development.

Even in the most advanced economies, these industries represent a large part of total industrial activity. Table III-4 shows their contribution to the total value added[18] and number of persons engaged in manufacturing industry in the world as a whole and in the main regions. The tabulation on which the table is based follows the International Standard Industrial Classification (ISIC),[19] and makes it possible to distinguish as industries using mainly agricultural raw materials the ISIC major groups 20 to 27: i.e., food manufacturing industries; beverage industries; tobacco manufactures; textiles; footwear, other wearing apparel and made-up textile goods; manufactures of wood and cork; furniture and fixtures; and paper and paper products. It is not possible to separate the major groups 29 (leather, and leather and fur products, except footwear and other wearing apparel) and 30 (rubber products) or group 312 (vegetable and animal oils and fats). Against this must be set the fact that the textile and furniture groups include products made from nonagricultural raw materials. On balance, however, it is probable that the figures may underestimate the industries using agricultural raw materials, since some of

[18] The value added by an industry is the addition it makes to the national income. The gross value added is the difference between the value of the final product and that of the raw materials, fuel and other inputs (excluding labor). To arrive at the net value added, capital depreciation also is deducted.

[19] United Nations. *Indexes to the International Standard Industrial Classification of all economic activities.* Statistical papers, Series M, No. 4, Rev. 1, Add. 1. Indexed edition, New York, 1959.

TABLE III-4. – CONTRIBUTION OF INDUSTRIES USING AGRICULTURAL RAW MATERIALS TO TOTAL VALUE ADDED AND TOTAL EMPLOYMENT IN MANUFACTURING INDUSTRY, WORLD [1] AND MAJOR REGIONS

	Year	Industries using agricultural raw materials, by ISIC group						Other manufacturing, ISIC groups
		Food, beverages and tobacco	Textiles	Clothing, footwear and made-up textiles	Wood products and furniture	Paper and paper products	Total	
		20-22	23	24	25-26	27	20-27	28-39
		Percent of total						
Value added [1]								
WORLD [2]	1938	19.2	9.3	6.6	5.0	3.1	43.2	56.8
	1948	15.6	8.9	6.7	5.4	3.4	40.0	60.0
	1953	13.7	7.0	5.4	4.6	3.3	34.0	66.0
	1958	14.3	5.7	4.9	4.3	3.5	32.7	67.3
INDUSTRIALIZED COUNTRIES	1938	18.4	8.5	6.5	4.6	3.3	41.3	58.7
	1948	14.4	8.0	6.7	5.2	3.6	37.9	62.1
	1953	12.6	6.2	5.3	4.5	3.5	32.1	67.9
	1958	13.2	5.0	4.8	4.1	3.7	30.8	69.2
North America	1938	20.3	6.9	7.0	4.9	3.9	43.0	57.0
	1948	14.0	6.6	6.9	5.4	4.0	36.9	63.1
	1953	12.0	4.3	5.3	4.4	3.9	29.9	70.1
	1958	13.3	3.4	5.1	3.9	4.3	30.0	70.0
Northwestern Europe [3]	1938	17.1	9.3	6.3	4.4	2.9	40 0	60.0
	1948	14.9	10.9	6.3	4.6	2.9	39.6	60.4
	1953	13.6	9.2	5.4	4.5	2.9	35.6	64.4
	1958	13.2	6.6	4.6	4.3	2.9	31.6	68.4
Southern Europe [4]	1938	23.6	18.4	5.2	11.4	1.8	60.4	39.6
	1948	23.1	18.6	6.2	10.2	2.4	60.5	39.5
	1953	18.6	18.9	6.5	8.8	1.8	54.6	45.4
	1958	16.6	15.2	5.7	8.5	2.1	48.1	51.9
Oceania	1938	24.3	5.3	8.1	7.6	1.7	47.0	53.0
	1948	19.4	6.3	8.8	7.8	2.1	44.4	55.6
	1953	18.3	6.1	7.2	7.9	2.6	42.1	57.9
	1958	15.7	5.1	6.1	7.4	3.4	37.7	62.3
LESS INDUSTRIALIZED COUNTRIES	1938	26.6	17.1	7.4	7.7	1.1	59.9	40.1
	1948	28.2	17.6	6.7	7.0	1.3	60.8	39.2
	1953	26.7	16.0	6.3	6.2	1.4	56.6	43.4
	1958	24.8	13.5	5.7	5.7	1.7	51.4	48.6
Africa [5]	1938	47.3	11.1	1.1	3.2	0.4	63.1	36.9
	1948	40.2	20.2	1.9	3.1	0.6	66.0	34.0
	1953	32.9	15.9	2.5	5.0	0.7	57.0	43.0
	1958	37.0	14.2	3.1	4.9	0.9	60.1	39.9
Latin America	1938	32.4	12.2	8.3	5.1	1.0	59.0	41.0
	1948	30.5	14.1	7.1	6.0	1.4	59.1	40.9
	1953	30.5	11.7	6.7	4.6	1.8	55.3	44.7
	1958	27.9	10.1	6.2	4.1	2.1	50.4	49.6
East and southeast Asia [6]	1938	20.5	22.2	10.5	6.7	0.5	60.4	39.6
	1948	26.2	22.0	7.9	7.4	0.5	64.0	36.0
	1953	27.2	21.1	7.0	7.2	0.8	63.3	36.7
	1958	25.7	17.4	5.8	5.7	1.0	55.6	44.4
Number of persons engaged								
WORLD [2]	1938	15.2	17.6	12.1	7.9	2.0	54.8	45.2
	1948	16.2	15.4	10.1	9.2	1.9	52.8	47.2
	1953	16.2	14.4	9.4	8.7	2.0	50.7	49.3
	1958	16.5	12.6	9.0	7.9	2.2	48.2	51.8
INDUSTRIALIZED COUNTRIES	1938	12.9	14.0	11.7	7.2	2.7	48.5	51.5
	1948	11.7	10.9	9.9	7.8	2.6	42.9	57.1
	1953	11.8	10.5	9.3	7.0	2.7	41.3	58.7
	1958	12.1	9.0	8.7	6.5	2.9	39.2	60.8
North America	1938	14.0	11.5	12.4	8.0	3.7	49.6	50.4
	1948	12.4	8.5	9.7	7.5	3.2	41.3	58.7
	1953	11.3	6.7	8.9	6.6	3.2	36.7	63.3
	1958	11.9	5.7	9.2	6.1	3.7	36.6	63.4
Northwestern Europe [3]	1948	11.5	11.7	10.9	7.7	2.2	44.0	56.0
	1953	11.9	11.4	10.5	6.8	2.3	42.9	57.1
	1958	12.1	9.4	9.5	6.3	2.4	39.7	60.3
Southern Europe [4]	1948	19.4	19.0	14.4	14.9	1.0	68.7	31.3
	1953	16.9	16.5	12.1	14.2	1.0	60.7	39.3
	1958	17.0	14.8	12.2	12.5	1.2	57.7	42.3
Oceania	1938	17.0	7.8	15.0	8.5	1.5	49.8	50.2
	1948	15.3	7.3	13.0	8.3	1.7	45.6	54.4
	1953	14.6	6.9	11.1	8.5	1.8	42.9	57.1
	1958	13.4	6.0	9.9	8.1	2.1	39.5	60.5

TABLE III-4. – CONTRIBUTION OF INDUSTRIES USING AGRICULTURAL RAW MATERIALS TO TOTAL VALUE ADDED AND TOTAL EMPLOYMENT IN MANUFACTURING INDUSTRY, WORLD [1] AND MAJOR REGIONS (*concluded*)

	Year	Industries using agricultural raw materials, by ISIC group						Other manufacturing, ISIC groups
		Food, beverages and tobacco	Textiles	Clothing, footwear and made-up textiles	Wood products and furniture	Paper and paper products	Total	
		20-22	23	24	25-26	27	20-27	28-39
		Percent of total						
LESS INDUSTRIALIZED COUNTRIES	1938	20.1	25.4	13.2	9.4	0.5	68.6	31.4
	1948	24.5	23.7	10.4	11.9	0.6	71.1	28.9
	1953	24.7	21.8	9.5	11.9	0.7	68.6	31.4
	1958	24.4	19.0	9.4	10.3	0.8	63.9	36.1
Africa [5]	1958	25.2	18.4	7.0	8.6	1.2	60.4	39.6
Latin America	1938	28.9	14.6	13.1	...	1.0	...	...
	1948	26.6	15.8	12.6	...	1.1	...	...
	1953	28.0	14.5	11.4	...	1.4	...	...
	1958	27.1	13.1	11.1	6.9	1.6	59.8	40.2
East and southeast Asia [6]	1948	24.7	27.0	9.2	12.7	0.3	73.9	26.1
	1953	25.5	25.7	8.6	13.2	0.4	73.4	26.6
	1958	24.9	21.7	8.4	11.2	0.5	66.7	33.3

SOURCE: United Nations. *The growth of world industry 1938-1961: international analyses and tables.* New York. 1965. p. 320-327.
[1] Current U.S. dollars. – [2] Excluding U.S.S.R. and eastern Europe. – [3] Including Italy. – [4] Excluding Italy. – [5] Excluding South Africa – [6] Excluding Japan.

them are carried out on too small a scale to be included in industrial censuses.

The data in Table III-4 indicate that industries using mainly agricultural raw materials, as defined above, accounted in 1958 for 33 percent of the value added and 48 percent of total employment in world manufacturing industry (excluding the U.S.S.R. and eastern Europe). The difference between these two figures indicates that productivity per worker is generally lower in these industries than in those using nonagricultural raw materials. This may be expected to result partly from their usually lower capital intensity.

Of the groups of manufacturing industries distinguished in the United Nations tabulations, the largest, in terms both of value added and of employment, is that of metal products, followed in second place by food, beverages and tobacco. Textiles are in fifth place in terms of value added but in terms of employment move up to third place. In fact, it is the relatively labor-intensive textile industries that are mainly responsible for the higher contribution of industries using agricultural raw materials to employment than to value added.

Similar data for individual countries are also assembled by the United Nations.[20] These data indicate that the food, beverages and tobacco industries loom particularly large in some Latin American countries. In El Salvador, for example, they account for 66 percent of the total value added in manufacturing, in Nicaragua 65 percent, in Panama 62 percent, and in Costa Rica 60 percent. Textiles are most important in the Far East, especially in Pakistan (48 percent of value added in manufacturing) and in India (39 percent).

While in almost all countries these two are the largest of the main groups of industries using agricultural raw materials, in a few countries other groups occupy a very important place as a result of the availability of particular raw materials. For instance, wood products and furniture are as much as 42 percent of value added in manufacturing in Ghana, 20 percent in Honduras, and 17 percent in Nigeria; pulp and paper products are 16 percent in Finland, 10 percent in Norway, and 9 percent in Canada and Sweden; while rubber products are 22 percent in Malaysia (Malaya) and 15 percent in Indonesia.

CHANGES WITH ECONOMIC DEVELOPMENT

The contribution to industry as a whole of the industries using mainly agricultural raw materials is proportionately much larger in developing than in developed regions. Table III-4 indicates that in 1958 they accounted for 31 percent of total value added in manufacturing industry in the industrialized countries with market economies, as against 51 percent in the less industrialized countries. In terms of employment these industries were responsible in 1958 for no less than 64 percent of total in-

[20] United Nations. *The growth of world industry 1938-1961: national tables.* New York. 1963.

TABLE III-5. – INCREASE IN VALUE ADDED AND IN NUMBER OF PERSONS ENGAGED IN INDUSTRIES USING AGRICULTURAL RAW MATERIALS, 1953-58

	Industries using agricultural raw materials, by ISIC group						Other manufacturing, ISIC groups
	Food, beverages and tobacco	Textiles	Clothing, footwear and made-up textiles	Wood products and furniture	Paper and paper products	Total	
	20-22	23	24	25-26	27	20-27	28-39
	Percentage increase						
Value added [1]							
World [2]	36	7	18	20	37	25	33
Industrialized countries	35	3	16	18	36	23	31
Less industrialized countries	41	28	36	39	79	37	70
Number of persons engaged							
World [2]	9	— 6	2	— 3	17	2	13
Industrialized countries	8	— 10	— 2	— 2	15	—	9
Less industrialized countries	10	— 3	10	— 4	31	4	28

SOURCE: United Nations. *The growth of world industry 1938-61: international analyses and tables.* New York, 1965, p. 320-321 and 324-325
[1] Current U.S. dollars. – [2] Excluding U.S.S.R. and eastern Europe.

dustrial employment in the less industrialized countries, as compared with 39 percent in industrialized countries.

For the world as a whole the share of these industries declined from 44 percent of value added in manufacturing industry in 1938 to 33 percent in 1958. At the world level all the major groups of industries using mainly agricultural raw materials shared in the proportionate decline, except for paper and paper products. In the less industrialized countries as a group there appears to have been a remarkably rapid decline in recent years in the share of the food industries in the total value added in manufacturing industry, which fell from 27 percent in 1953 to 23 percent in 1958, and in that of textiles, which dropped from 15 to 12 percent during the same period. The share of paper and paper products, however, has continued to rise in almost every region.

The fall in the share of industries using agricultural raw materials in industry as a whole does not reflect a decline in these industries in absolute terms, but a greater proportionate rise in heavy manufacturing, especially metal products. This in turn reflects the changing pattern of demand as incomes rise.[21]

In the world as a whole (excluding the U.S.S.R. and eastern Europe), the value added in the industries using agricultural raw materials rose by about a quarter in the period 1953-58 (Table III-5 and Figure III-2), in comparison with an increase of about 10 percent in the population. The rise in the numbers engaged has been very much smaller and, in fact, considerably less than the growth of population, indicating that in general the recent expansion of these industries has contributed little to total employment.

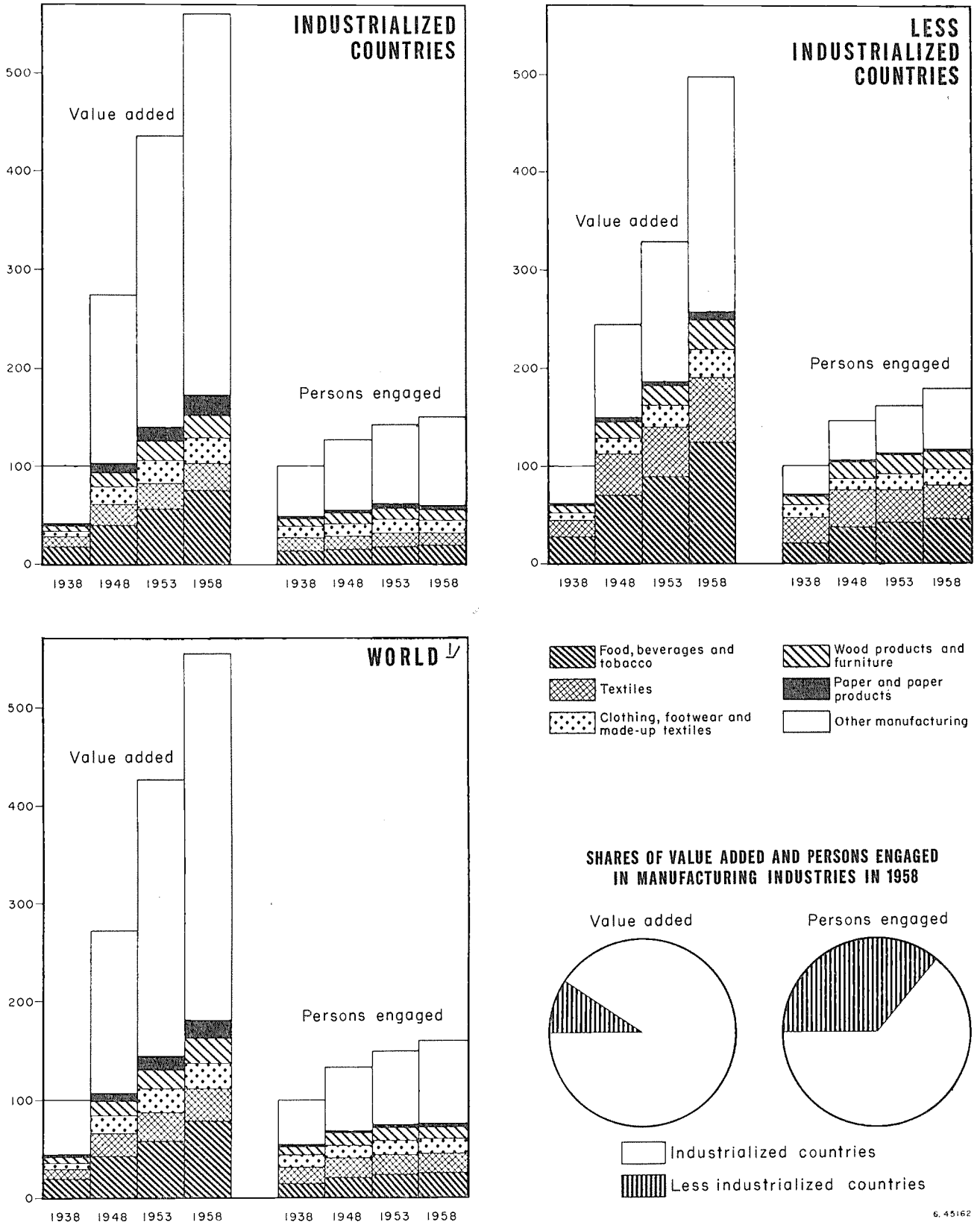
The food processing industries, which in terms of value added are the largest of those using agricultural raw materials, have continued to expand considerably faster than population growth, since consumers tend as their incomes rise to demand an increasing proportion of processed food, while the processing is also gradually shifted from the farm and the household to the factory, reflecting the increasing opportunity costs of time spent in home processing. Urbanization also tends to bring an increase in demand for processed food, since urban dwellers have to purchase most of their food and are consequently the more ready to purchase it in processed form, while it increases the need for the preservation of perishable foods that may have to be brought long distances from producing to consuming centers. Table III-5 indicates that between 1953 and 1958 the value added in the world's food, beverage and tobacco industries rose by more than a third.

In the earliest stages, the food processing industries may be expected to consist mainly of the preparation for consumption of the staple foods of which

[21] Several studies have demonstrated that the output of the main industries using agricultural raw materials (food, beverages and tobacco; textiles) has a lower income elasticity than the other main industrial groups. The elasticity for paper products, on the other hand, is estimated as one of the highest. See, for example, H.B. Chenery. Patterns of industrial growth, *The American Economic Review*, 50(4), September 1960, p. 624-654: United Nations. *A study of industrial growth.* New York, 1963.

FIGURE III-2. – CHANGE IN VALUE ADDED AND IN THE NUMBER OF PERSONS ENGAGED IN INDUSTRIES USING AGRICULTURAL AND NONAGRICULTURAL RAW MATERIALS

(Indices, all manufacturing in 1938 = 100)



SOURCE: United Nations. *The growth of world industry, 1938-61: international analyses and tables*, New York, 1965, p. 320-321 and p. 324-325.

[1] Excluding U.S.S.R. and Eastern Europe.

the diets of low-income consumers so largely consist (for example, the milling of wheat and rice). As consumer incomes rise, there is some shift in consumption toward more expensive foods such as meat, milk, eggs, fish, fruit and vegetables, and industries processing these products increase in importance. At the same time, industries develop for the more elaborate processing of the basic foods (for example, bakery and confectionery). Later, the food industries become still further diversified to meet a wide range of tastes and convenience.

Trends in the production and consumption of processed foodstuffs are particularly well documented in the United States. From 1925 to 1954 the proportion of the total food supply commercially processed (beyond the minimum needed for retail sale as fresh or raw) is estimated to have increased from 25 to 35 percent. During this period the consumption of frozen foods increased ninefold and of canned foods almost threefold. These changes were found to be only partly explained by increasing incomes and urbanization; much more important were changes in supplies and in consumer preference, including technological developments and marketing changes, such as the increased availability of frozen foods.[22]

Over the longer period 1909-58, the factory production (that is, excluding processing by wholesalers and retailers as well as in farms and households) of farm food products in the United States rose by 2.6 percent a year, of which about a quarter mainly reflects the shift to factory processing and the increased purchases of processed relative to unprocessed food (mainly fruit and vegetables).[23] The demand for factory processing services appears to have increased between two and three times as fast as for farm food products, and the income elasticity of demand during the period 1919-58 has been calculated as 0.86 for food manufacturers' services, 0.35 percent for farm food products used in manufacturing, and 0.57 for manufactured food products.[24]

Table III-5 indicates that the value added in the world's textile industries increased by only about 7 percent between 1953 and 1958. For this group of industries, however, there has been a particularly rapid growth in the developing countries (28 percent). Before the war, the Indian subcontinent was the only developing country producing cotton to have a domestic textile industry. Since the war, cotton manufacturing has been started in a large number of developing countries, and several have joined India and Pakistan as exporters of cotton textiles, including China (Mainland), China (Taiwan), Hong Kong (whose industry was established soon after the war on the basis of imported raw materials), Israel, the Republic of Korea, Mexico and the United Arab Republic. Between 1951 and 1961 the number of spindles installed in a representative group of developing countries is estimated to have increased by 70 percent and of looms by more than 50 percent.[25]

Jute manufacturing capacity has also expanded rapidly in a number of developing countries since the war. In addition to the long-established Indian mills, a jute manufacturing industry was founded in Pakistan in 1951, sack factories were established in Burma, Thailand and a number of African countries, and mill consumption has expanded in Argentina, Brazil and China (Taiwan).

Among the main forest industries, the value added in wood products and furniture increased by about a fifth between 1953 and 1958, and in paper and paper products by somewhat more than a third, which was the fastest increase for any group of industries using agricultural raw materials (Table III-5). In both cases the expansion was much more rapid in the developing than in the developed countries, especially for pulp and paper products, which increased by about 80 percent in the former group of countries. While the great bulk of the pulp and paper requirements of the developing countries are still imported from developed countries, a number of them have recently started their own production. Pulp and paper requirements are rising very rapidly in the developing countries, as a result of the increased demand for packaging materials as well as for newsprint.

Agricultural products in the industrialization of individual countries

Although industries based on agricultural raw materials now account for less than a third of the total value added in industry in the developed countries, in most cases they played a crucial role in the early stages of the industrialization and general economic development of these countries. The pro-

[22] Marguerite C. Burke. *Consumption of processed farm foods in the United States*. United States Department of Agriculture, Marketing Research Report No. 409. Washington. D.C., 1960.
[23] William H. Waldorf. *Output of factories processing farm food products in the United States 1909-1958*. United States Department of Agriculture. Technical Bulletin No. 1223. Washington. 1960.
[24] William H. Waldorf. *Demand for manufactured foods, manufacturers' services, and farm products in food manufacturing — a statistical analysis*. United States Department of Agriculture. Technical Bulletin No. 1317, Washington. D.C., 1964.
[25] FAO. *Trade in agricultural commodities in the United Nations Development Decade. FAO Commodity Review 1964*: Special Supplement. Vol. 1. Part III. Rome. 1964. p. 52.

duction and export of woollen textiles was the basis of England's industrialization in the 16th and 17th centuries. Textiles played a major part in the United States, a number of western European countries, and Japan, largely through their pioneering role in the mechanization of production and the development of factories in place of handicraft production. Food processing and a wide variety of other industries based on agricultural raw materials were also of considerable importance in the earlier stages of economic development in these and many other countries that are now highly industrialized.

In the United States, industries using agricultural raw materials accounted for as much as 57 percent of the total value of manufacturing output in 1879, but by 1919 this had already declined to 44 percent.[26] Later data are not strictly comparable, but the contribution of these industries to the value added in all manufacturing fell from about 40 percent in 1929 to less than 30 percent in the early 1960s.[27]

In Canada, flour milling and the processing of logs into lumber, both mainly for export, were the two main industries in 1851, contributing 31 percent and 13 percent respectively to the gross value of manufacturing output. By 1890 the share of flour milling had declined to 11 percent and was slightly exceeded by log products, while with urbanization and increased incomes a number of other food processing industries had moved up into the ten leading industries. By 1900 the four leading industries (log products, flour milling, slaughtering and meat packing, and butter and cheese) were all based on agricultural raw materials, and together contributed 30 percent of manufacturing output.[28] In 1927 the movement of electric power and automobile production into fourth and fifth place marked the beginning of the growth in importance of heavy industry. Even in 1961, however, industries using agricultural raw materials still accounted for 46 percent of total manufacturing output, as compared with 61 percent in 1925, and pulp and paper remained the leading industry.[29]

Industries based on agricultural raw materials accounted for more than three quarters of the total value added in manufacturing in Italy during most of the latter part of the 19th century, with food and beverage industries and textiles contributing about a third each. During this period, textiles had the largest working force of any industry and contributed substantially to export proceeds. By 1961-64 the share of the industries using agricultural raw materials had fallen to 30 percent of the value added in manufacturing.[30]

Forest industries have been of particular importance in the Scandinavian countries. In Sweden, for example, the wood and paper industries accounted for slightly more than a quarter of the total value of manufacturing production in 1896-1900, as compared with about a third for the food processing industries. In spite of the growth of the dairy and meat industries, food processing declined steadily in relative importance until it stabilized at about 15 percent of the total value of manufacturing in the 1950s. The forest industries maintained their share at almost a quarter of the total until the 1930s, but by 1959-60 this had fallen to about 15 percent.[31]

A major feature of Japan's industrialization at the end of the 19th century was the rapid growth of a modern textile industry, which partially replaced the long-standing handicraft production of textiles. The production of raw silk more than doubled between 1883 and 1889-93, and that of cotton yarn almost trebled between 1893 and 1897; after 1890 the cotton textile industry was built up almost entirely on the basis of imported cotton. As late as 1930, the textile industries still accounted for more than a third of the total value added and about half of the total employment in industry, but by 1959 these figures had fallen to 10 percent and 18 percent respectively, and in terms of value added textiles were only slightly more important than the food and drink industries.[32]

Australia and New Zealand are two of the developed countries where industries using agricultural raw materials still account for a large proportion of industrial activity. In Australia, they contributed 55 percent of the value added in manufacturing as late as 1934/35, but since the war there has been a rapid decline to 31 percent in 1961/62; the share of the food, drink and tobacco industries fell over this period from 33 percent to 14 percent.[33]

In New Zealand, food manufacturing reached a peak of 53 percent of the total value of manufactur-

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[26] W.H. Shaw. *Value of commodity output since 1869*. National Bureau of Economic Research, New York, 1947, p. 108-152.
[27] United States. *Statistical abstracts*.
[28] O.J. Firestone. Development of Canada's economy 1850-1900. In *Trends in American economy in the nineteenth century*. National Bureau of Economic Research, New York, 1960, p. 237.
[29] Canada. Official yearbooks.
[30] Italy, Istituto centrale di statistica. *Indagine statistica sullo sviluppo del reddito nazionale dell'Italia dal 1861 al 1956*. Rome, 1957, p. 212-213, 216-217; *Annuario statistico italiano*.
[31] Sweden. Statistical abstracts.
[32] G.C. Allen. *A short economic history of modern Japan*. Allen and Unwin, Revised edition London, 1962, p. 67, 72-73, 197, 204.
[33] Australia, Commonwealth Bureau of Census and Statistics, *Production. I. Secondary industries 1938-39*, p. 59; *Quarterly summary of Australian statistics*, March 1963, p. 17.

ing production in 1935/36, but has since fallen rapidly to 33 percent in 1962/63. The food manufacturing industries in New Zealand are dominated by meat freezing and preservation, and dairy production, both largely for export, which constituted respectively 15 and 11 percent of manufacturing production in 1962/63.[34] A notable feature of New Zealand's postwar industrial development has been the spectacular growth of pulp and paper production.

In most of the developing countries, as is clear from Table III-4, industries using agricultural raw materials are still responsible for a substantial portion of total industrial activity. Even though many of these countries are now embarking on heavy ndustries at a much earlier stage of their economic development than was the case in the countries now industrialized, the industries based on agricultural raw materials are likely for some time to come to account for a large share of their total industrial output and employment. Moreover, as indicated earlier, they have an important role in paving the way for the more advanced types of industry.

Long-term statistical series on manufacturing industry are available for very few of the developing countries. An exception is India, where a modern textile industry has been in existence since the middle of the 19th century. The contribution of the textile industries to total industrial employment in the Indian subcontinent reached a peak of 62 percent in 1909 and then stabilized at around 45 percent throughout the interwar period.[35] Even in the early 1950s the cotton textile industry was still by far the most important single factory industry in India and all textiles combined contributed more than 45 percent of the total capital, number of workers, gross value of output, and value added in factory industries.[36] Since the war India has become one of the world's major exporters of cotton textiles.

Two recent examples of the contribution to economic development of industries using agricultural raw materials are of particular interest. In China (Taiwan), although sugar production has not expanded for ten years or so, the sugar industry has had a steadily increasing effect on the economy through the establishment of new industries using by-products, including the manufacture of alcohol and yeast from molasses, the use of molasses in the manufacture of monosodium glutamate, and the manufacture from sugar waste of bagasse board and particle board for export. The sugar industry has also been a factor in the rapid expansion of the canning industry, which has made possible the export of large quantities of fruits and vegetables. Exports of canned foods increased more than sixfold between 1957 and 1963, and their share in the total value of exports rose from 3 percent to 9 percent. The canning industry was originally based on canned pineapple, but there are now about 200 canneries producing a wide variety of products, while canned mushrooms, the production of which was begun only in 1957, have since 1963 been a larger export earner than canned pineapple. Because the canning industry is highly labor intensive, it has also helped to alleviate the employment problem.[37]

The rise of the fish-meal industry in Peru in recent years is especially noteworthy. Production of fish meal increased from 31,000 tons in 1956 to 1.5 million tons in 1964 (equivalent to nearly 9 million tons of fish), when Peru accounted for about half of the world output. The associated increase in the fish catch took the country from 26th place among world fish producers in 1956 to first place only nine years later. Almost all of the fish meal is exported, and by 1964 fish and fishery products had become Peru's most valuable export. The number of fish-meal plants rose from only 27 in 1956, with an annual capacity of less than 1 million tons of raw material, to 168 in 1964, with a capacity of over 20 million tons, while more than 100 plants also produced fish oil as a by-product. Since then, there has been some consolidation in the industry, as a result of which the number of plants has decreased and their average capacity increased.

Foreign exchange earnings

An important potential contribution to economic development of industries using agricultural raw materials is the earning and saving of foreign exchange. When a product formerly exported in raw form is processed before export, or when a processed commodity previously imported is produced locally, a country can obtain for itself the value added that formerly accrued elsewhere. Not all of this value added, however, amounts to a net gain in foreign exchange.

Because of the need to import all except the simplest processing equipment from developed countries,

[34] New Zealand. Official yearbooks.
[35] *Statistics of British India for 1911-12 and preceding years.* Calcutta, 1913, p. 6-39; *Statistical abstract relating to British India, 1927-28 to 1936-37.* Delhi, 1939, p. 504-511.
[36] *Summary of Census of Indian Manufacturers 1948-52.* Supplement to *Indian Trade Journal,* 25 June 1955, p. 16-19, 24-27.
[37] United Nations ECAFE. Op. cit., p. 138-139.

TABLE III-6. – CHANGES IN EXPORTS OF SELECTED AGRICULTURAL PRODUCTS FROM DEVELOPING COUNTRIES IN RAW AND PROCESSED FORM, 1953-55 TO 1962-63

Processed products	Value of exports in 1962-63 (current prices)				Percentage in processed form		Raw products
	Processed	Raw	Processed	Raw	1953-55	1962-63	
	... *Million U.S.$* ...		*Index 1953-55 = 100*		..... *Percent*		
FOOD PRODUCTS							
Wheat flour	10	177	34	51	8	5	Wheat
Vegetable oils	295	739	111	149	35	29	Oilseeds
Cocoa products	38	432	157	79	4	8	Cocoa beans
Total	343	1 348	108	97	19	20	
FIBERS AND RUBBER							
Cotton manufactures	345	1 085	136	90	17	24	Raw cotton
Wool manufactures	70	245	111	82	17	22	Raw wool
Jute manufactures [1]	444	162	173	93	59	73	Raw jute [1]
Hard fiber manufactures [2]	20	106	163	148	14	16	Hard fibers [2]
Rubber manufactures [3]	16	1 060	203	99	1	2	Natural rubber [3]
Total	895	2 657	151	94	17	25	
FOREST PRODUCTS [4]							
Sawnwood	171		129				
Panels	97	399	605	333	59	44	Roundwood
Pulp and paper	48		205				
Total	316	399	183	333	59	44	
GRAND TOTAL	1 554	4 404	143	102	20	26	

NOTE: Most data refer to major exporters. Exports from China (Mainland) are excluded.
[1] 1953-55 to 1963. – [2] 1953-55 to 1959-61. – [3] 1953-56 to 1962-63. – [4] 1956 to 1962-63.

there is usually a high import content in the capital costs of industries using agricultural raw materials in developing countries (and equally those using non-agricultural raw materials).[38] Some of the current inputs for agricultural processing industries also have to be imported at present by most developing countries. Containers provide a good example. In most developing countries not only cans but even labels and sealing materials are imported. Thus the import content of meat canning costs is estimated at about 13 percent in Paraguay and 20 to 30 percent in some African countries.[39] Other inputs that have to be imported by most developing countries include the chemicals and dyes used in textile manufacture, fabric for tire manufacture, and tanning agents.

Nevertheless, the processing of agricultural products either for export or for import substitution generally brings a net gain in foreign exchange. It may be estimated for example that, for every dollar's worth of jute exported in manufactured form instead of raw, Pakistan earns an extra dollar in foreign exchange. Similarly, in the Mexican cordage industry the net gain is about 50 U.S. cents, and in cotton textiles in Pakistan 85 cents. Every dollar's worth of carpet wool manufactured before export can earn as much as $2.5 to $3 of foreign exchange.[40]

Increased exports of processed agricultural products were in fact singled out by the United Nations Conference on Trade and Development as one of the main ways of increasing the foreign exchange earnings of the developing countries. At present only a small proportion of the agricultural exports of these countries is shipped in processed form. For the products included in Table III-6 the figure is only about a quarter.[41] Much of the remainder undergoes some processing on reaching the importing country, especially the industrialized countries of western Europe and North America. In many cases agricultural products are re-exported after

[38] An exception is the fish-meal industry in Peru, for which a large part of the necessary plant and equipment is now produced locally, although imports were necessary in the early stages of the industry's development.
[39] FAO. Op. cit., p. 8.

[40] FAO. Op. cit.
[41] Fishery products, which are not included in the table, constitute an important exception. Because of their highly perishable nature, they are almost entirely exported in processed form.

processing in these countries, sometimes even to the country that originally exported the raw product.

For a group of the major processed agricultural commodities it is estimated that the value of exports from developing to developed countries in 1959-61 was U.S. $1,348 million, as compared with $1,757 million for the developing countries' imports of these commodities from developed countries.[42] The biggest deficits were for pulp and paper, cotton manufactures, and rubber manufactures.

Forest products provide a good example of the pattern whereby developing countries export products in raw form while importing some of the same products in processed form for their own domestic consumption. In 1959-61, unprocessed roundwood constituted 54 percent of these countries' total forest product exports, sawnwood and plywood 41 percent, and pulp and paper products 5 percent. For imports the position was completely reversed, with roundwood 6 percent, sawnwood and plywood 28 percent, and pulp and paper products 66 percent.[43]

In the last few years, exports of many processed agricultural products from the developing countries have increased rapidly. Over the period of roughly a decade from 1953-55 to 1962-63, the total value of their exports of the processed products shown in Table III-6 rose by more than 40 percent. This is about 20 times as fast as the increase in their exports of the same products in unprocessed form. As noted above, however, the increase in net foreign exchange earnings would have been smaller to the extent that the processing industries involved foreign exchange costs.

The value of exports of fiber and rubber manufactures rose by about 50 percent, apparently at the expense of exports of the raw product. Exports of processed forest products rose by more than 80 percent, but because of an even more rapid increase in roundwood exports there was a fall in the share of processed products in the total. The growth was slowest in the case of food products, for which the share of processed products is also lowest at about 20 percent. For both wheat and vegetable oils the more rapid increase was in exports of the raw product.

The problems involved in obtaining further increases in the developing countries' foreign exchange earnings from processed agricultural products are discussed in the final section of this study.

REVIEW OF INDIVIDUAL INDUSTRIES USING AGRICULTURAL RAW MATERIALS

Some of the industries using agricultural raw materials will now be reviewed in more detail. In addition to the macroeconomic aspects, an attempt will be made to indicate, on the basis of practical experience, the key factors involved for individual industries or groups of industries in the successful establishment and operation of an economically efficient enterprise, especially in the conditions prevailing in the developing countries. Where possible, information is included on such factors as the size and location of plant, technological aspects, costs, and the managerial and other skills required. Some of these questions are taken up again in the discussion of feasibility studies in the final section of this study.

It is not possible to cover in detail each of the many industries using agricultural raw materials. Those that have been selected for illustrative purposes are those for which FAO has made case studies or has accumulated substantial practical experience in its operational work. They cover a wide range, however, from the improvement of primitive fish smoking and coir fiber processing on the one hand, to large-scale modern industries such as flour milling and pulp and paper manufacture on the other.

Food industries

Similarly, technological aspects can only be briefly mentioned. Before beginning a review of the food industries on a commodity basis, however, it is useful to look briefly at some of the main technological processes and some of the more recent developments in food technology that are common to a large number of products. This applies particularly to the technology of food preservation; other aspects will be mentioned in the sections on individual industries.

[42] FAO. Op. cit., p. 97.
[43] FAO. *Prospects for expanding forest products exports from developing countries.* (Mimeographed). Rome, 1964, p. 2.

Dehydration

In dehydration, the water content of a food is reduced to such an extent that enzymes are unable to act and micro-organisms are unable to grow. Deterioration due to other factors is also usually retarded by a low moisture content. Quality (including the ease of rehydration), consumer demand, cost, and storage behavior are the major factors determining the usefulness of dehydrated products and, therefore, the choice of the method of preservation used for a given product. Where the climate is suitable, sun-drying is an inexpensive method. Some fruits, like peaches, apricots, figs, dates and various raisin grapes, are still sun-dried on a large scale, but even with these products there is a tendency to use more controllable artificial means of dehydration. Drying is particularly important for the preservation of milk protein in dried skim milk.

Artificial drying methods include the use of cabinet dryers, kiln dryers or evaporators, tunnel dryers, vacuum shelf dryers, drum dryers, rotary dryers and spray dryers. Freeze drying is a method that has been considerably developed in recent years; damage to color, flavor, and texture is low but it is still an expensive procedure and is therefore used mostly for specialty products or important ingredients of dehydrated soup mixes, etc. Foam-mat drying is another recent development, involving making a foam by whipping air or an inert gas into a concentrated foodstuff in the presence of an edible foam stabilizer and drying the foam; the flavor and color of foam-mat dried products are superior to those dried by other methods, but the process is limited to liquids and concentrates.

Salting and fermentation

These too are relatively inexpensive methods of preservation. Although salt has been used in food preservation for hundreds of years, its action is not clearly understood. Whatever may be the mechanism of salt action, the fact remains that, especially in combination with acids, it has a selective action on micro-organisms. This effect is extensively used in the manufacture of pickles, sauerkraut, and many other products. There is little doubt that most fermented foods were discovered by accident and there seems to be even more uncertainty concerning the mechanisms involved in their production. A number of chemical preservatives are used for a variety of products, but the possibility of their masking the unsafe condition of the food has obliged the public health services in various countries to control their use in a drastic manner. Similarly, even though the use of antibiotics could theoretically be effective for the control of the spoilage agents of foods, the health authorities have objected to their utilization owing to various secondary effects.

Canning

The principle of preservation of foods in hermetically sealed containers rests on the destruction by heat of the micro-organisms that cause spoilage, and the use of a closed container to prevent reinfection. Suitable containers may be made of metal, glass, plastics, or other materials. While properly prepared canned food will keep indefinitely, deterioration of quality and nutritive value will occur during the prolonged storage of many products. The aseptic canning of foods that have been sterilized by a high-temperature, short-time process is receiving a great deal of attention in several countries. This minimizes the heat damage that accompanies traditional long-time processing of food, and it is also suitable for large containers.

Freezing

In the developed countries there has been a rapid expansion of freezing in recent years, but in developing countries its use is still limited by its high cost. Whereas cold storage will only retard the main detrimental changes in foods, freezing will often slow them down to such an extent as to allow prolonged storage of the product. However, the inactivation of some of the enzymes by blanching is often necessary before freezing. As far as flavor, odor and color are concerned, the changes caused by freezing are usually less marked than when the same foods are canned. Syruping or mixing with sugar is used with many fruits in order to assure better quality in the frozen product.

There are three main direct-contact freezing methods, with many variations: freezing in still air, blast freezing and immersion freezing. There are also several indirect-contact methods, including the multiple-plate freezer. New techniques are constantly proposed to meet special product requirements and to attain greater economy. Among these, mention may be made of dehydrofreezing, in which the product is partially dehydrated before

or during freezing. This procedure has certain advantages over both dehydration and freezing, but its practical possibilities are at present limited by its high cost.

Irradiation

The principles of preserving foods by exposing them to ionizing radiations are now fairly well understood. They are based mainly on three modes of action: physiological effects, such as the prevention of sprouting of potatoes and onions; inhibiting the growth of micro-organisms or destroying them altogether; and the killing or sterilization of insects, leading to considerable possibilities for food disinfestation. Among the products showing the most promising possibilities are potatoes, dehydrated fruits, fresh fruits, marine products, meat and meat products.

WHEAT [44]

In recent years there has been a rapid and widespread increase in modern flour mills in developing countries, both those which produce their own wheat and those which depend almost entirely on imports, in order to meet the sharply increasing consumption of flour associated with higher incomes and urbanization. In wheat-producing countries, primitive mills (generally cottage-sized units using stone grinders) account for a large share of total milling capacity, for example, 20 to 40 percent in Algeria, Brazil, Lebanon and Turkey, 60 to 75 percent in Morocco, Pakistan and the United Arab Republic, and as much as 85 percent in India and Iran. Moreover, the predominant type of modern commercial mill in these countries is a relatively small or medium-sized unit (with an annual capacity of up to 30,000 tons of wheat), serving the requirements of rising but often localized wheat production and reflecting the general shortage of transport and storage facilities in many developing countries. For such reasons a number of governments (as in Brazil, Ecuador and India) have encouraged the continuing existence of small units. In nonwheat-producing areas, on the other hand, not only are primitive mills virtually nonexistent but the typical mills constructed in recent years have been comparatively large units (with an annual capacity of more than 165,000 tons of wheat in Nigeria and Senegal, for example) which, because of the different supply conditions and the relatively late start of the industry, have been in a better position to make use of the economies of scale inherent in the production and marketing of flour.

The degree of utilization of the existing milling capacity varies greatly from country to country. The problem of surplus capacity is less acute and less general in developing than in developed countries, and where it exists the reasons are different. In most developed countries there is substantial excess capacity, primarily as a result of demand factors such as the declining commercial export outlets for flour. In the developing countries with excess capacity, this reflects mainly difficulties which interrupt the flow of wheat for milling, such as the scarcity of foreign exchange, import restrictions, the lack of working capital and of transport facilities, and the high cost of unloading wheat at the ports.

In most developing countries, the larger and more modern mills appear to be working near to capacity, while the underutilized element tends to be concentrated among relatively small and obsolete mills, many of which are in need of modernization and amalgamation into larger units. In a number of these countries (including Lebanon, Sudan, Turkey, Uganda, the United Arab Republic, and possibly India) the overall milling capacity is extended to the point of necessitating new constructions in the near future.

Both the capital outlay and the operating costs of modern mills in developing countries decline per unit of output the larger the size of the mill and its scale of operation. For instance, the total expenditure on buildings, land and equipment per metric ton of wheat tends to be nearly twice as high for relatively small mills in Colombia and Costa Rica, with a daily capacity of 25 metric tons of wheat, as in large mills in Ghana and Sudan, with a capacity of over 200 tons (Table III-7). Similarly, the operating expenses (excluding the cost of wheat, which is by far the largest item) in a large and fully utilized mill in Sudan are a third to a half of those in smaller or less fully utilized mills in some other developing countries (Table III-8). These data are in line with the situation in developed countries. Sample figures for western Europe indicate that construction costs per ton of milling capacity per 24 hours decline from U.S. $19,000 to $5,000 as capacity rises from under 10 to over 200 tons per 24 hours; over the same range of capacities operating

[44] FAO has recently carried out a preliminary survey of modern wheat flour milling in developing countries, on which the present account is largely based. See *Economic survey of modern flour mills in developing countries and some policy implications*, FAO Group on Grains, CCP: GR 66/7. Rome, January 1964 (based on replies to questionnaires).

TABLE III-7. – ESTIMATE OF CAPITAL OUTLAY FOR MODERN FLOUR MILLS IN SELECTED DEVELOPING COUNTRIES

	Year	Capacity (wheat input per 24-hour day)	Total cost of buildings, land and equipment	Cost of buildings, land and equipment per metric ton of daily capacity of wheat
		Metric tons	*Thousand U.S.$*	*U.S.$*
Philippines	...	167.0	3 124.7	18 711
Venezuela: I	1962	270.0	3 777.8	13 992
II	1962	90.0	1 157.2	12 858
Costa Rica[1]	1962	24.5	321.9	13 134
Colombia	...	24.0	300.0	12 500
El Salvador	1961	128.0	1 580.0	12 344
Morocco	1964	...	...	9 880 to 11 860
Nicaragua[2]: I	1965	74.4	614.3	8 257
II	1965	61.6	571.4	9 276
Ethiopia	...	60.0	...	8 000
Ghana	1965	210.0	1 400.0	6 667
Sudan	1962	240.0	1 511.9	6 299

SOURCE: FAO. *Economic survey of modern flour mills in developing countries and some policy implications.* Rome.
[1] Figures refer to government mill which closed down in 1962. – [2] Preliminary calculation for 2 new mills.

costs fall from $30-40 to $11-14 per ton of grain milled. The absolute level of costs per ton of wheat for mills of a given size also appears to be roughly comparable as between developing and developed countries, in the case of both capital and operating costs.

By-products of milling (mostly bran) account for 20 to 30 percent of the total volume of wheat milled in developing countries, and their utilization is therefore a major factor in the economics of the industry. Generally, however, this does not appear to have been a problem as the by-products find their way in most cases into animal feeding at home or into exports, mainly to developed countries. In fact, some developing countries appear to have built up a profitable and rapidly growing export trade in milling offals, while in a number of countries the by-products of milling have given rise to the establishment of local compound feed plants.

Modern mills are capital-intensive, labor-saving enterprises. Initial capital costs range from at least one million to many millions of dollars. Manpower requirements are relatively modest, particularly for unskilled labor, and are estimated to amount to only 0.5 to 1 man per ton capacity per 24 hours, depending on the degree of mechanization of the storage of grain and finished products. Nevertheless, their indirect effects on employment can be significant, in that milling operations give rise to a variety of food processing industries, such as bakeries and the production of cakes, pastry, biscuits and pasta. A particularly striking example is Nigeria, where there are now about 3,000 bakeries, including one employing 220 persons.

Flour production in developing countries tends to be a costly undertaking, compared with the price of flour available on international markets. This, however, as already indicated, does not appear to be due to higher milling costs in developing countries, but may rather reflect the high cost of wheat production and the poorly developed infrastructure of basic services (especially port and storage facilities), as well as the policy of subsidizing flour

TABLE III-8. – ESTIMATED OPERATING COSTS OF MILLING 1 METRIC TON OF WHEAT IN SELECTED DEVELOPING COUNTRIES

	Chile (1964)		Peru (1963)		Costa Rica (1962)		Guatemala (1964)		Venezuela (1962)		Senegal (1964)		Sudan (1963)	
	U.S.$	%	U.S.$	%	U.S.$	%	U.S.$	%	U.S.$	%	U.S.$	%	U.S.$	%
(1) Cost of wheat	54.64	74	96.10	82	95.44	76	114.78	90	95.22	82	72.92	75	79.07	88
(2) Variable costs[1]	16.74	23	17.22	15	13.12	11	3.35	3	...	...	...	...	7.96	9
(3) Fixed costs[2]	2.01	3	3.84	3	16.57	13	9.85	7	...	...	...	...	2.38	3
(4) Subtotal (2) + (3)	18.75	26	21.06	18	29.69	24	13.20	10	21.16	18	24.31	25	10.34	12
TOTAL EXPENSES	73.29	100	117.16	100	125.12	100	127.99	100	116.38	100	97.23	100	89.41	100
Less value of by-products	4.24	6	[3]11.71	10	16.34	13	12.69	10	19.22	17	6.08	6	1.92	2
ACTUAL COST (adjusted for value of by-products)	69.15	94	105.45	90	108.78	87	115.30	90	97.16	83	91.15	94	87.48	98

SOURCE: FAO. *Economic survey of modern flour mills in developing countries and some policy implications.* Rome.
[1] Fuel and power, repairs and maintenance, wages (temporary workers) and social security, selling expenses. – [2] Depreciation, interest on capital, insurance, taxes, interest on loans, wages (permanent staff) and social security. – [3] Rough estimate.

exports practiced by developed countries. Notwithstanding the high cost of locally produced flour, the balance of economic advantage may still favor milling activities in developing countries, depending on the importance of other objectives such as the saving of foreign exchange, the absence of equally attractive alternative investment opportunities for private capital of both domestic and foreign origin, and the fact that wheat can be transported more cheaply than flour and can be more readily stored in tropical conditions.

The basic economic problem of milling industries in developing countries which produce wheat is to encourage the modernization of obsolete primitive mills, or the establishment of new mills in areas of new production, without adding to the excess capacity of the industry as a whole. For other countries which depend on imports of flour, the question is whether the direct and indirect benefits of establishing local flour mills offset the costs involved.

Finally, mention may be made of some recent developments in the technology of wheat utilization. The development of turbo milling or air-classification of flour has made possible the separation of flour into fractions of different protein content by means of a vortex classifier using centrifugal force in an air medium. Flours prepared by turbo milling may be enriched with amino acids and vitamins to produce high protein food suitable for infant and child feeding. Interesting possibilities are also opened up by mechanical dough development, whereby mechanical energy is used within a mass of dough to bring about within a few minutes structural changes that would normally require several hours of fermentation.

Rice

A recent survey of 32 countries carried out by FAO [45] indicates that the basic economic structure of rice-milling industries varies greatly from country to country. The available equipment ranges from crude hand implements or small-scale village units to highly complex and capital-intensive processing factories. Mechanical milling (which includes the small-scale village huller) is spreading, and probably more than half the world's rice supply is now processed in this way. Yet the traditional hand-pounding by pestle and mortar is still the more important method in many countries. For example, in Pakistan about 75 percent of the crop is hand-pounded, in Indonesia 60 percent, and in India 50 percent, while in Africa frequently less than a tenth is mechanically milled. In contrast, hand-pounding is comparatively rare nowadays among the Asian exporters (1 percent in Thailand, 8 percent in Burma and the Republic of Viet-Nam) as well as Latin American countries.

The average capacity of the mills was found to range from only 200 kilograms per hour in Japan and the Republic of Viet-Nam to as much as 3 tons in China (Taiwan) and Morocco. The great majority of mills are located in villages or on farms in the rice-producing and -consuming areas. In such areas, smaller mills generally possess economic advantages over larger ones. They are situated close to the source of raw materials and have closer contact with growers. Their overhead costs are lower since their organization is simple and requires less skilled manpower. They are not so dependent, therefore, on a continuity of supply. The larger mills at the ports are vulnerable to a long-term trend toward decentralization which seems bound to occur when inland transport becomes easier and as farmers market more of their crop. This trend can be seen in Thailand, where today 80 percent of the export rice (a third of the total crop) is milled up-country and shipped as milled rice to Bangkok; this is a complete reversal of the earlier position and reflects the rapid spread of rice-milling facilities in rural areas. A unique pattern exists in Japan, where husking (carried out on the farms) is separated from the polishing and removal of bran layers (effected at the retail stage).

Underutilization of rice-milling capacity is widespread. The FAO surveys have indicated that the mills in most Far Eastern countries operate for only about six months or less in any year: the utilization tends to be greater in importing countries such as Ceylon and Malaysia (average 7 to 8 months used) than in exporters like Burma and Thailand (5 to 6 months used). With some exceptions such as Cuba and Madagascar, there is less underutilization outside the Far East. However, it is to be doubted whether such data alone can conclusively demonstrate a real excess of usable milling capacity on economic grounds; and, if they do, whether they provide a case for reducing capacity rather than for action to reduce bottlenecks on the supply side.

There has, no doubt, been an overexpansion of rice milling in some areas because there is little other industry in which private capital can be prof-

[45] FAO. *FAO rice report 1965*. Rome. 1965, p. 26-32.

itably invested. There are also problems arising from the shifting patterns of demand due to rapid urbanization. But, equally, some of today's apparent excess capacity is of a transitional nature, having been caused by the spread of more advanced or larger scale machinery before traditional mills have been closed down, or before the establishment of complementary facilities in the form of storage or communications, which would be needed to make the new mills fully efficient.

Overcapacity or underutilization may be concentrated in small and obsolete plants: this should not obscure the fact that there is a great need in many developing countries for the systematic modernization and replacement of existing mills. It is, indeed, for this reason that most countries follow a twin policy of simultaneously limiting the spread of new mills, while encouraging the existing mills to renovate their equipment.

In India, for example, government policy was to protect the hand-pounding industry, which gives more nutritious undermilled rice and provides 10 times more employment for the same quantity processed. However, the mills play such a crucial role in the marketing and distribution of rice that the Government has now decided to try to dominate the industry by establishing a large number of publicly owned modern mills during the fourth plan. In many countries, for example in the Republic of Korea, the processing facilities are very small and require modernization, but the Government prohibits new construction because the present capacity is considered excessive. Similarly, Madagascar is closing down several of its obsolete rice mills, even though production is rising. At the same time, Ceylon wishes to erect more modern types of mill but lacks the capital resources, and Burma is establishing a number of modern mills.

The capital costs of new equipment can be estimated with some precision. In the Far East they range very widely: from the inexpensive pestle and mortar made of wood to U.S. $560-720 for a simple huller-type mill with a capacity of 250 kilograms per hour; or for power-driven mills proper, from $2,000 for a small-scale polisher mill (500 kilograms per hour) to $8,000 for a Japanese-type self-contained mill (1 ton per hour), and $120,000 for a large-scale European mill (Annex Table 16).

It is much more difficult to find representative figures of the operating costs of existing equipment under local conditions. These will depend on the services rendered by millers, the extent to which the machinery is used to its full capacity, the type of mill and its scale of operation. It also depends on such factors as local costs of power and labor, the milling qualities of the varieties of paddy grown, and the way in which by-products are disposed of. Nevertheless, the cost data collected by FAO, though incomplete, are in line with the generally accepted estimates for new machines. Among the larger producing countries, the full charge for milling, cleaning, husking, whitening and polishing ranged between 3 percent and 5 percent of the price which the consumer pays for his milled rice, or about $4 to $7 per ton. Comparable data for developed countries are not available. Operating costs are reported to range between 10 and 15 percent of the retail price in the United States and Australia ($20 or more per ton) but these figures usually include a range of additional services such as drying and packaging.

Medium- or large-scale mills are only justified when there is enough concentration of paddy production to keep a large installation running throughout the year. The establishment of such mills usually involves high capital investment but there are no great technical problems. From the technological viewpoint, modern milling facilities are of great advantage, especially if they have paddy drying and storage facilities so that the moisture level of the paddy can be adjusted when necessary, thus reducing the amount of broken grains. Furthermore, such mills can separate the bran from husk and brokens so that this valuable by-product can be further utilized.[46]

SUGAR

Next to the milling of the staple grains, sugar manufacture is generally the largest food industry in developing countries. Most of these countries have substantially increased their production of sugarcane (sugar beet in a few countries) in recent years, but many of them depend at least partly on imports to meet the rapid increase in the domestic consumption of sugar.

Most of the developed importing countries import raw sugar, as do those of the developing countries that have their own sugar refineries. Bulk handling, which lowers costs, is possible with raw sugar, while the importing countries prefer to use their own

[46] For details on technical aspects of rice processing, see FAO. *Equipment for the processing of rice.* Agricultural development paper No. 27, Rome, 1953; FAO. *Illustrated glossary of rice processing machines.* Rome, 1957.

factory capacity for refining (the economic size of a refinery is much larger than for a factory producing raw sugar).

During the postwar period there has been a trend toward increasing concentration in the sugar industry. For example, the number of sugar mills in Mauritius has decreased from 49 in 1937 with an average production of 7,900 tons of sugar per year to 23 in 1961/62 with an average annual capacity of 24,000 tons. This concentration is the result of economies of scale, as well as the difficulties of producing first quality sugar in smaller mills.

Nevertheless, small-scale sugar mills remain important to supply the local population with sugar where the establishment of a modern sugar industry is not economic. These small-scale mills produce noncentrifugal sugar (gur or jaggery). While the quality of the product is inferior to that of centrifugal sugar, it is still consumed in many areas. The essential difference between the two processes is that, in the production of centrifugal sugar, the juice is concentrated under vacuum and thus at a much lower temperature, and that crystals and molasses are separated in centrifuges. The equipment needed for noncentrifugal production is very limited and its operation requires little skill. Apart from the low capital requirements, the major saving is in the transport of cane. A problem is the difficulty of storing the product because of its high moisture content.

A modern sugar factory, with its expensive equipment, is generally only economic for capacities of 2,000 to 4,000 tons of cane per day, depending on the price of sugar. This requires adequate facilities and organization for the transport of cane to the factory since, if processing is too long delayed, the sugar turns into a form (invert sugar) that does not crystallize and is unsuitable for refining, and some of the sugar content is lost. In some developing countries, however, large-scale schemes, integrating raw material production and processing, have been successfully established in recent years, sometimes in irrigated areas.

From a technical point of view, the sugar industry is an old industry, as the basic principles of modern sugar manufacture, such as extraction by a mill-train, clarification methods, use of filter presses, multiple effect evaporation, sugar boiling in vacuum, etc., were invented long ago. Machinery is, of course, steadily being made more efficient, with a general trend to make all processes continuous. In the chemical field, the modern plastic ion-exchangers make possible the removal of Na and K cations so that the proportion of molasses is sharply reduced.

Sugar manufacture gives rise to a great number of by-product industries, including alcohol from molasses, cattle feed from sliced beet as well as molasses, and pulp and paper and particle board from crushed cane (bagasse).[47] It also provides an essential ingredient for many other manufacturing processes, including confectionery, preserves, fruit canning and the production of fruit juices and soft drinks.

Oilseeds

The processing of oilseeds (following such operations as shelling and drying) is a technically simple process of extraction of the oil by pressure or by the use of solvents and its subsequent refining if meant for human consumption. More advanced forms of processing include the improving of the oilcake for human consumption, but this is not yet commercially important. Oils (and fats such as tallow) are also the main ingredients in the manufacture of soap and of margarine.

When oilseeds are to provide food or feedstuffs for local consumption, they must normally be processed within the producing area, and there are in fact substantial oilseed crushing industries in developing countries such as Ceylon, India and Indonesia, where there is a large domestic demand for vegetable oils; in some of these countries, goods manufactured from vegetable oils are also produced, including, soap, margarine and *vanaspati* (vegetable ghee). Processing has also developed in a number of primarily exporting countries, including Senegal, Nigeria (where in addition to a considerable expansion of groundnut crushing capacity in the Northern Region, a palm kernel crushing mill has recently been established in the Western Region), and the Philippines.

In the developing countries, there are, however, a number of problems encountered in processing more of the oilseeds that are destined for export. There is keen competition from industries in importing countries which are protected by tariffs on processed imports, and are also in a better position to offset the effects of unstable world market prices (by blending or switching between different

[47] In the siting of new sugar plantations and mills, the possibility of establishing an integrated operation with pulp and paper deserves careful consideration.

kinds of seeds)[48] than processors in developing exporting countries. Capital requirements are substantial, while a high level of technical and organizational skill in management is also needed.

Apart from the potential increase in export income, processing in the exporting country appears to have several other advantages. It provides more flexibility in choice of markets, so that the oil and the cake may be shipped to different markets. It allows the establishment of associated industries, particularly soap and margarine, based in large part on local raw materials. Furthermore, the availability of oilcake is useful in the development of a livestock industry.

Other factors determining the advisability of the developing countries processing more of their oilseeds for export include the comparative costs of processing in producing as against importing countries and rates of return on investments.[49] The extent to which oilseeds are processed in developing countries has been determined to a great extent by government policies. Ceylon has long had export duties on copra and its products at rates favoring the export of oil. In Senegal, where about half of groundnut exports are now in the form of oil and cake, crushing was begun during the war, and prices and markets were subsequently guaranteed by France. India virtually banned the export of oilseeds in the early 1950s, and the export of linseed was also banned in Argentina.

The value added by oilseed crushing appears generally to be relatively small. The crushing margin (the difference between the market price of the oilseed and the returns from the sale of the products) is often only $15 per ton or even less which, in the case of groundnuts for instance, would be little more than 10 percent of the value of the products.

Fruit and vegetables

The demand for processed fruit and vegetables is very largely in the high-income developed countries. In most developing countries there is still ample scope for expanded consumption of fresh fruit and vegetables before demand is likely to increase for the more convenient but more expensive processed product. Furthermore, in many tropical countries, where the seasons are less pronounced, there is less need for the processing of fruit and vegetables to make them available out of season. Thus, for the time being at least, processing establishments in developing countries are likely to have to aim primarily at export markets.

The first essential, an adequate supply of raw material, is often difficult to secure. In many developing countries the processing sector is regarded as purely residual, to be used to absorb surplus quantities of fresh fruit and vegetables, for which the processors pay low prices. Thus in Morocco, for example, citrus juice factories have consistently operated with considerable excess capacity.

A processing plant can operate economically only when assured of a more or less continuous supply of raw material. Incidental surpluses provide no adequate basis for such a plant, nor should it be assumed that low-quality produce, which cannot be sold on the fresh market, can provide the raw material basis for processing. The most modern processing method will not be able to produce high quality products from second-grade material. To assure regular supplies of raw materials, the specialized production of fruit and vegetables for processing, possibly under contract, must generally be envisaged.

Varieties suitable for the fresh market are often not suitable for processing purposes, particularly for juicing, which has expanded rapidly in some developing countries. For the manufacture of citrus juice, for example, suitability depends generally on the juice content of the fruit combined with its sugar content. In the case of oranges, bitterness can be a problem, and for this reason as well as their low juice content, navel oranges are generally unsuitable for processing. Another undesirable quality is the formation of precipitate in the juice, as in blood oranges. Oranges of the common blonde or *shamouti* varieties are also unsuitable because of low sugar content, lower juice yield and flat flavor. On the other hand, the Valencia variety generally has ideal qualities for juicing. Similar considerations apply to other fruits and vegetables.

Even where a steady supply of good quality fruit or vegetables is assured, this will generally reach the market during only a limited season of the year. The processing capacity of a plant will therefore be utilized only very briefly, placing a heavy burden

[48] Because of hydrogenation (which raises the melting point of oils) and improvements in refining, there is a high degree of interchangeability between the main vegetable oils, which gives manufacturers some freedom of choice according to prevailing prices. In fact it seems that in recent years large crushing firms in developed countries have made very little profit on the crushing process itself, and that the decisive factor in the profitability of their operations has been the degree of their success in buying and blending raw materials.

[49] These and other factors affecting the location and development of oilseed processing industries, particularly in developing countries, are dealt with in more detail in FAO. *The economic aspects of the location of oilseed crushing industries.* CCP: OF 66/12, Rome, 1966.

on the final product in the form of overhead costs. In the planning of processing facilities, care must therefore be taken to ensure that a number of commodities can be processed one after the other. In several developed countries, for example, factories for canning peas are used to process surpluses of beans and other products coming onto the market after the pea season is over.

Before setting up a plant, careful investigation of market possibilities must be carried out. Although, unlike the raw material, the processed commodity can theoretically be stored until prices are favorable, such a policy is normally not economic owing to the high storage costs involved. It may even be more economic to destroy or neglect a fresh product than be forced to store the processed commodity and sell it at prices that do not cover raw material and processing costs.

Processing, if carried out for foreign markets, will prove economic only if costs (including raw material, processing and transport) are directly competitive with other producing countries. Processing costs, apart from the influence of multiproduct utilization of a plant already mentioned, also depend on the capacity of the equipment. Economies of scale play a very important role (see Table III-3 above concerning canning), and almost all processed fruit and vegetables entering international trade come from large-scale units. Smaller plants can only compete on the international market if they have access to cheaper raw materials.

Finally, the lack of integrated planning has caused considerable difficulties for the canning industry in several countries. There are several instances where the government has continued to place a heavy import tax on tin or on sugar after the establishment of a canning industry.

Meat

When planning new abattoirs and meat processing plants, particular attention must be given to location, water supply, transport, capacity, design, operation and management, and to the choice of processing method.

The location of abattoirs in livestock-producing areas or in meat-consuming areas is a major issue in many countries. A shift from the transport of live animals to the transport of meat is often considered an obvious step toward greater marketing efficiency. It is argued that, by avoiding losses in weight and quality in live animals, saving feeding and labor costs, and carrying only the salable part of the carcass, the overall transport costs could be greatly reduced. This is true in many economically advanced countries, where these savings are greater than the additional costs of maintaining the meat at a low temperature to keep it in good condition, and has led to the current interest in slaughter in producing instead of consuming areas. However, this practice is not applicable in all developing countries, particularly in those where, because of the lack of good roads, reliable rail services and qualified maintenance staff, refrigerated transport with refrigerated stores at the dispatching and receiving ends is considerably more expensive than in industrialized countries. Where thorough investigations on the comparative costs of livestock and meat transport have been carried out, as for instance in Madagascar,[50] it has been found that meat transport, although technically more efficient, would cost twice as much as the transport of live animals. The neglect of careful transport studies has led in several countries to wrong decisions on the location of abattoirs and has jeopardized their efficient operation.

The determination of capacity depends upon the market outlets, as well as the possibility of obtaining supplies. Unfortunately, in certain instances abattoirs have been planned on too large a scale, with the result that the capacity is not fully used and they are burdened with heavy overhead costs. Cost calculations and actual cost records of abattoirs of varying sizes in Europe have shown that slaughter costs per head of cattle decrease considerably up to a capacity of 30,000 to 40,000 head of cattle per year.[51] Beyond this capacity, slaughter costs decrease theoretically only very slightly with the size of the plant. In practice, however, there is a risk that in large abattoirs the advantages gained by the use of mechanized equipment may be jeopardized by inefficient operation. When labor costs are high it may happen that larger abattoirs (more than 100,000 cattle slaughterings a year) cannot withstand competition from medium-sized units, which have higher labor productivity and are more easily managed. In addition, the development of small and medium-size equipment for the processing of by-products, such as fat rendering and the processing of meat, bone and horn meal, has enabled medium-

[50] M. Lacrouts *et al. Etudes des problèmes posés par l'élevage et la commercialisation du bétail et de la viande à Madagascar.* Paris. 1962.

[51] FAO. *Informe para el Gobierno del Uruguay sobre aspectos técnicos y económicos de la reorganización de la industria de la carne en Uruguay.* Rome, 1963.

size abattoirs, provided they are well located and efficiently operated, to compete with larger plants.

For the export marketing of meat and meat products, large-scale abattoirs have definite advantages. These, however, are due more to the benefits to be derived from larger scale marketing operations to developed countries (transport, negotiation of contracts, introduction of brands, etc.) which do not carry so much weight in the internal marketing of meat and meat products in developing countries, where there is close contact between customers and processors.

With regard to the method of slaughtering and the internal design of the slaughter plant, a distinction can be made between the booth system, whereby space is provided for individual butchers to carry out killing, bleeding, flaying and evisceration on a single dressing bed, and the line system, whereby the various operations are performed by employees of the abattoir placed at the slaughterline along which the carcasses are passed.

Mechanized slaughter operations are only economic where a sufficient throughput of animals (at least 20 cattle per hour) justifies the capital investment. Moreover, since mechanization apart from serving hygienic purposes is mainly a means of saving manpower, the local wage levels and the labor situation in general should be taken into account when deciding whether or not to adopt it.

The efficiency of slaughtering depends to a large extent upon the management of the plant. This is often related to ownership, which can be vested in municipal authorities, special public bodies, mixed enterprises combining both public and private capital, purely private firms or farmers' co-operatives. A large number of abattoirs in developing countries have been built by municipal authorities. They have several advantages, but they tend sometimes to try to maintain their position even though an alternative marketing system might become economically more advantageous. Some also tend to regard slaughter fees as a convenient source of revenue and charge too much for the services rendered. In some countries, mixed ownership has been favored, as for instance ownership by a stock producers' co-operative society associated with public development capital and subject to central government control. Private and municipal management experience and initiative may also be combined with a measure of public control in mixed companies.[52] This form of ownership and management has proved particularly successful in developing the export trade, which requires special experience and market contacts, and often established brand names for the sales product. In some countries, as for instance in Kenya and Rhodesia, public bodies with a monopoly in large-scale slaughtering have been established, where the abattoirs are integral parts of special marketing systems established to achieve objectives unlikely to be attained by unco-ordinated private enterprises. Private abattoirs are often neglected. There is, however, no reason why private investment should not be encouraged, provided conditions are hygienic and there is some guarantee against the possibility of local monopoly being abused to the disadvantage of the community.

Particular attention has to be given to good management, which can often compensate for less than ideal design and equipment. Unfortunately, in developing countries, personnel of desirable caliber and experience are seldom readily available. The training of personnel, not only in the supervision of meat hygiene but also in the marketing and management aspects, therefore requires special attention. Where local personnel cannot be made available immediately, outside agencies with special experience can be engaged to run an abattoir for a standard charge.

There is a great need to improve rural slaughtering facilities and organization. Since the improvement of these facilities requires only limited funds, which could be provided from local sources, governments should provide villages and small towns with more assistance and advice in establishing low-cost rural abattoir facilities operating under more hygienic conditions.[53]

In many developing countries inadequate use is made of the by-products from the slaughter and dressing of livestock. Much valuable material is wasted, which if conserved would make a notable contribution to the economy of the country. Blood, bones and inedible offals are examples of material which can be processed in the country, thus eliminating or reducing the need to import certain types of feed additives or fertilizers, for instance blood meal and bone meal.[54]

The processing of meat and by-products is a main

[52] Successful examples are in Tanzania and Bechuanaland. See FAO. *Report to the Government of Bechuanaland on the beef cattle and meat industry*. FAO/EPTA Report No. 1783. Rome, 1963.

[53] See FAO. *Meat handling in underdeveloped countries: slaughter and preservation*. Agricultural Development Paper No. 70, Rome, 1960; FAO. *Meat hygiene*. Agricultural Studies No. 34, Rome, 1957; FAO. *Marketing of livestock and meat*. Marketing Guide No. 3, Rome, 1960.

[54] See FAO. *Processing and use of animal by-products*. Agricultural Development Paper No. 75, Rome, 1963.

part of the operations of many slaughter plants in industrialized countries. The demand for processed meat in developing countries is, however, still limited, and large-scale equipment for the processing of meat into sausages or other products is not often required. Only where exports or import substitution are envisaged and where meat for export has to be canned for other than marketing reasons does the choice of processing equipment require particular attention.

Milk

Rapid advances have been made by the dairy industries of many developing countries since the war, to a large extent through government-sponsored schemes. Although the dairy projects undertaken have generally been successful, some of them have not been economically viable, primarily because of inadequate preinvestment surveys and faulty production planning.

The principal problem in establishing a new milk plant is the determination of its capacity and production pattern. This involves a correct assessment of the currently available milk supply and of the likely effects of the plant on actual and potential milk producers. These effects are frequently overrated. Even in countries with advanced dairy industries, capacities of new plants are often misjudged, though here the more frequent error is an underestimate of supplies. In developing countries, where overoptimistic assessments of the development of milk production are more common, it is generally advisable to provide for the phased expansion of a milk plant, without burdening it with excessive overheads from the start. Such an approach implies the careful selection of a location allowing for future expansion and the need for a road network capable of handling larger deliveries.

Perhaps the most important obstacle to a high level of utilization of capacity within a given volume of supplies is the wide fluctuation between the high and the low production seasons. A plant designed to utilize supplies during the peak season plus a small safety margin, will necessarily operate on an annual average basis with considerable excess capacity. Assuming a production ratio between low and peak season of 1:2, annual plant capacity utilization would be 71 percent, at a ratio of 1:3 it would be 63 percent, and at 1:4 only 59 percent. If an overoptimistic assessment of milk supplies adds to this unavoidable underutilization of capacity, it might rise so high as to endanger the economic balance of the scheme.

As liquid milk demand is, by and large, reasonably stable throughout the year, the capacity for liquid milk processing is generally geared to the minimum level of supplies rather than to the maximum. This implies a high degree of utilization of the liquid milk equipment with a correspondingly lower utilization of plant capacity for manufactured products. The choice of the right production mix is one of the most important factors for the economic success of a milk plant. Only very large urban milk plants, which draw their supplies from distant sources, can afford to concentrate entirely on liquid milk, thereby throwing the problem of utilization of seasonal surpluses back to their sources of supply.

A very common error made in the planning of a new milk processing plant in developing countries has been the neglect of local consumer preferences. For example, yogurt is appreciated more than fresh milk by consumers in the Near East. It was found that many consumers in one city of the region bought milk only for the home production of yogurt even after a costly pasteurization plant had taken over the supply of the market. Similarly, the production of cheese for local consumption has not received the attention it deserves as a result of preoccupation with the production of pasteurized and sterilized milk.

A special type of milk plant is the recombining plant established primarily in the Far East and to a lesser extent in west Africa and the Near East. As a consequence of lack of local supplies and the high perishability of milk, dairy surplus countries export dried skim milk and butterfat which are then reconstituted and recombined in the consuming areas. The end product is generally cheaper than locally produced milk or imported condensed and evaporated milk. These plants provide the training ground for local dairy personnel and, even more important, form the basis for the establishment of a domestic dairy industry by creating consumer demand and thus encouraging local production.

It is difficult to give hard and fast rules as to minimum or maximum sizes of milk plants or to give any precise information as to labor and processing costs and their relation to plant capacity. In general it can be said, however, that in areas with an average daily milk supply of less than 5,000 to 6,000 liters, the costs of pasteurization would be so high as to discourage consumption; for sterilized milk production, the minimum daily average intake should even be as high as 20,000 liters (Table III-9). Where

TABLE III-9. – PRODUCTION COST OF STERILIZED MILK IN DIFFERENT PLANTS AND AT DIFFERENT LEVELS OF CAPACITY UTILIZATION

(Federal Republic of Germany - Stork process)

Hourly output, bottles..	2 000		4 000		6 000	
Working hours per day..	3	6	3	6	3	6
Total production cost per liter, U.S. cents.....	4.84	3.83	3.96	3.26	3.61	3.03

SOURCE: FAO. *Milk sterilization*. Agricultural Studies No. 65. Rome, 1965.

local production is below these figures, governments must decide whether to support the plant continuously, so as to keep consumer prices within reason, or whether to concentrate upon the production of other milk products.

Taking the example of a milk plant producing pasteurized milk (apart from small quantities of butter from fat left as surplus after standardization, and limited quantities of cheese), the following production cost data can roughly be assumed:[55] 3.0 to 3.3 U.S. cents per liter for a plant with a capacity of 5,000 to 6,000 liters in one shift of 6 hours; 2.7 to 3.0 U.S. cents for 10,000 to 20,000 liter capacity; and 2.5 to 2.8 U.S. cents for 20,000 to 75,000 liters. It is assumed that these plants are equipped with a pasteurizer with a capacity according to the daily intake, a pasteurized milk storage tank, a storage tank for surplus cream, a bottle-filling machine, and the necessary cheese production equipment and storage rooms. With increasing capacity, a higher degree of internal mechanization can be achieved. This is particularly true for cheese production, where larger plants can diversify much more. But it must be borne in mind that, if hard cheese is produced (and this should only be considered in larger plants), the necessary prolonged storage and ripening of this product increases the need for working capital. To make any of these plants economically feasible, a minimum operation time of 5 hours per day must be assumed.

Plants with capacities of more than 75,000 liters per day face entirely different management and operation problems. When these sizes are reached, sooner or later the problem of specialization arises. Very large plants in urban centers with daily throughputs of 200,000 to 500,000 liters will generally be more economic when specialized for liquid milk production with a processing unit for seasonal surplus milk in the producing area. Fully mechanized plants of this kind can bring their total operating costs down to little more than 1.5 U.S. cents per liter, depending upon the degree of mechanization and labor saving.[56]

[55] These costs include operating, maintenance, depreciation and interest costs, as well as labor. They do not include collection and distribution. The costs of the former must be reckoned to be between 0.5 and 1.2 U.S. cents per liter, depending upon density of production.

FISH

Fish are among the most perishable food products. As markets expand beyond the landing area, facilities for preserving catches are essential. One of the simplest methods of preservation is by icing, but this delays spoilage for a limited period only. When fish is to be preserved for longer periods it must be processed in some form.

Fish processing ranges from primitive sun-drying, requiring virtually no capital investment, to modern large-scale freezing, canning and fish meal industries. In developed countries, small-scale local processing survives only in isolated coastal areas. Only up-to-date industries are in a position to compete with industries manufacturing products which the consumer may substitute for fish, and rising incomes tend to increase demand for more elaborately processed and packaged products.

The two most striking features in the fish utilization pattern in recent years have been the growth of fish freezing, partly at the expense of sales of fresh fish, and the spectacular expansion of fish meal production, for the most part from fish stocks which previously had not been fished.

The general trend in demand toward prepackaged frozen food and the wider diffusion of frozen food storage facilities in wholesale and retail establishments and in the home have expanded the distribution potential for frozen fish. At the same time, the extension of the radius of fishing operations, with larger craft making longer trips, has made it necessary to preserve catches on board by better methods than simple packing in ice; in most instances, this has been accomplished in recent years by freezing fish at sea.

In developing countries, fish freezing, and in some instances fish canning installations, have been set up in recent years mainly because of a rapid expan-

[56] For a discussion of some technical aspects of milk processing, see FAO. *Better utilization of milk*. Agricultural Studies No. 7. Rome. 1949; FAO. *Milk pasteurization: planning, plant operation and control*. Agricultural Studies No. 23, 1953; FAO. *Milk plant layout*. Agricultural Studies No. 59, 1963; FAO. *Advances in cheese technology*. Agricultural Studies No. 38. 1958. The major points to be considered in planning a new milk processing plant are summarized in FAO. *The economic impact of dairy development in developing countries*. CCP 65/9/3 and CCP 66/11/12. April 1965 and April 1966.

sion in exports of high unit value products, mostly shrimp and tuna, to developed countries. In general, modern fish processing in these countries has developed largely in response to export demand, not only for high unit value products, but also for fish meal and other industrial products produced from species for which a demand for human consumption does not exist.

Not all fish processing in developing countries, however, is for export, and efforts are under way to raise the technical standards and economic efficiency of traditional fish processing operations. Fish processing in developing countries can perhaps best be discussed on the basis of two examples: one relating to smoking operations for distribution in regional markets in Africa, the other to Latin-American fish meal production for export to developed countries.

Fish smoking

Smoking fish dates from prehistoric times, and the only appreciable advance that modern man has made over primitive open-air smoking is the addition of a roof and walls around the fire. In developed countries, where curing is generally diminishing in relative importance among methods of fish preservation, controlled processes have come into use only recently.

In tropical Africa nearly all fish which are not exported or consumed fresh locally are cured in some form. Dried fish, salted or unsalted, are consumed in greater quantity than smoked fish, but the latter are usually preferred and sold at higher prices. Traditional smoking operations vary substantially within the region, according to the tribe, type of fish used, quantity processed, and material available locally for the construction and operation of ovens. The most primitive ovens are small wooden or metal grids on which the fish are cooked and smoked in the open air. The simplest equipment can handle no more than from 10 to 20 kilograms of fresh fish at a time, but larger ovens may have a capacity of up to 300 kilograms.

Where local catches are small and where the fishermen are accustomed to migrate in order to adjust their fishing operations to seasonal changes in the availability of fish, portable equipment such as the Tanganyika-type oven may be used. This consists of a firebox with fire trays placed on top and a cover made of two pieces of corrugated iron sheeting. The total cost of the oven and smoking facilities was estimated at about $85 a few years ago, or about six times as much as the traditional facilities.

In the Delta province of Western Nigeria, where the above comparison between the Tanganyika-type and the traditional oven was made, neither type offered a satisfactory solution to local supply and market problems.[57] Experiments with bulk-smoking were consequently initiated with the Altona-type oven, developed in the Federal Republic of Germany, in order to find a method that would permit the smoking of larger quantities in a shorter time, and would not use much scarce wood. The cost of the Altona oven,[58] built of galvanized iron plate and angle-iron, with a wooden frame, was 11 times as high as that of the traditional facilities and nearly double that of the Tanganyika-type oven. In addition to shortening the processing time and a substantial economy in the use of wood, the Altona-type oven made it possible to obtain a better and more uniform quality and permitted greater flexibility in operation.

A modified traditional oven has recently been introduced in Ivory Coast.[59] Old gasoline drums with a capacity of 200 liters are used in the construction of the firebox, and the other parts are built with whatever material is available locally (topless gasoline barrels, old crates etc.). The cost, including frames and plate-iron covers, comes to U.S. $60 to $80. The advantages cited for this oven, apart from cost factors, are simplicity in construction and operation, maintenance of a uniform temperature, economy in wood consumption, and ease of adaptation of existing traditional ovens to the modified model.

Among the factors which must be considered in determining the capacity of a smoking oven are the type, size and degree of freshness of the fish, the skill of the fish smoker and the conditions of work, and atmospheric conditions.

Two ways of smoking fish are generally distinguished. Cold smoking is done for several days and sometimes even weeks with temperatures from 20° to 30°C. The fish keeps because it is salted before processing, gradually dries and absorbs some of the preserving elements of the smoke. Hot smoking requires temperatures in excess of 60°C; "cooking"

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[57] M. Piatek. *Improvements in the bulk smoking of bonga.* FAO/EPTA Report No. 1756, Rome, 1963.

[58] Batch capacity 290 kilograms for bonga 20 centimeters in length (compared with 85 kilograms for Tanganyika-type oven, and 95 kilograms for local ovens).

[59] FAO. *Rapport au Gouvernement de la Côte-d'Ivoire sur la conservation du poisson en Côte-d'Ivoire.* FAO/EPTA Report No. 2032. Rome, 1965.

time is limited to a few hours, and the fish consequently cannot be preserved for more than a few days without further drying, where no salt is used.

Under the climatic conditions of Africa, cold smoking is rarely feasible. Hot-smoked fish is either dried to a point where the fish loses 25 to 50 percent of its weight (soft-smoked) or 70 percent or more (hard-smoked). Soft-smoked products can be preserved for only a few days because of bacterial action and infestation by insect larvae. Hard-smoked products keep for a month or even longer. The more important the "hinterland" market in relation to the market adjacent to the processing center, the greater the emphasis placed on hard-smoking.

Although African consumers have sometimes been thought to spurn salted smoked products, recent experiments in Ivory Coast have shown that hard-smoked fish brined before processing were readily accepted when the fish were served in a sauce. The salted smoked product kept in good condition for three to six months. Furthermore, at times of large catches and low prices, it was found possible to double processing capacity by smoking as much as the ovens could handle and at the same time salting a similar quantity for smoking on the following day, when the fish smoked the first day were already sufficiently cured to keep for a few days.

Because of the rising volume of frozen landings at African coastal markets by foreign trawlers and the lack of a frozen food distribution network in most countries, the technical and economic aspects of smoking such landings are currently under investigation. So far it has been demonstrated that frozen fish of acceptable quality can be used for producing a satisfactory smoked product.

Information on the costs of fish smoking available from both the Western Nigeria and Ivory Coast studies indicates that the cost of the raw material is by far the largest component. The daily cost of operation in Western Nigeria of an Altona-type oven of the dimensions described above plus packing boxes was estimated at U.S. $40.85 in 1963. The cost of fresh fish represented about 70 percent of the total cost, labor 12 percent, monthly resmoking (to combat insect infestation) 6 percent, and transport 6 percent; wood for fuel and depreciation of facilities account for very small fractions of the total cost. The operation of five ovens, which was possible without increasing labor costs and was expected to result in further economies, was calculated to give a wholesale profit on sales of about 25 percent and a retail profit of 22 percent.

In Ivory Coast, the production cost of soft-smoked products (40 percent weight loss, shelf-life of several days only) was estimated at 37.5 cents per kilogram (fresh fish prices were assumed to be at an average between seasonal lows and highs). Nearly three quarters of the total cost was made up by raw material, 10 percent by packaging, and less than 5 percent each by transport, losses through spoilage, and wood. Depreciation and labor costs represented relatively small proportions of total cost. Hard-smoked products (70 percent weight loss, shelf-life of over a month) were estimated to cost 72 cents per kilogram to produce. Raw material accounted for nearly 77 percent of total cost. The cost of wood was significantly higher (nearly 7 percent of total unit cost) than for soft-smoked products, while packaging costs were lower.

Fish meal production

The fish meal industry has its origin in the reduction of waste material from other fish processing operations. At one time, fish meal was produced by primitive methods and was used mostly for fertilizer. The main developments in the evolution of the industry have been the utilization of whole fish, of species which either were not accepted or could not be utilized economically for human consumption; the introduction of special methods and equipment for reduction into meal and oil; and an upgrading in the market (in the case of meal, utilization in animal feeds and more recently though still largely experimentally, in the form of fish protein concentrates for human consumption).

The last few years have seen a spectacular growth of fish meal operations, in large part because of the increased use of fish meal in compound pig and poultry feeds. In response to this demand it was possible to produce large quantities of fish meal at low prices because of the availability of substantial stocks of industrial-type fish, like the anchoveta off the Pacific coast of South America, which had remained virtually unfished.

A few major industrial countries in Europe and North America are the users of the bulk of the meal produced. Their domestic production is for the most part supplemented by imports from a small number of large-scale producers of industrial fish. Among the latter, some developing countries (Angola, Chile, Morocco, and especially Peru) have been manufacturing fish meal almost exclusively for export. The following observations on the main factors involved

in the successful establishment of fish meal enterprises are based on experience in Peru, where the fish reduction industry expanded very rapidly in the late 1950s.[60]

The fish canning plants, where fish meal was first processed, were established at locations favoring canning. When many of these plants eventually shifted to the exclusive production of fish meal, locational disadvantages became apparent. Climatic factors have played an important part in the development of the new fish meal facilities set up more recently. Because of favorable weather conditions, roofed facilities were not required for the protection of machinery or for product storage. Storage facilities did not have to exceed daily raw material requirements, since fishing was on a year round basis close enough to shore to permit daily landings. Some plants, however, were located at points where water supplies were inadequate, while the lack of roof cover was a disadvantage from the standpoint of machinery maintenance.

In 1956, only 12 of the 27 plants engaged in fish reduction operations did so on an exclusive basis, but today plants which do other processing in addition to meal and oil production represent only a small fraction of the total. Most of the companies own fishing boats which supply them with raw material, and the number of plants depending entirely on purchases from independent fishermen is small.

Data on capacity illustrate a tendency toward increased size of plant facilities. The bottleneck capacity, in which these data are expressed, represents the theoretical processing potential of the entire plant in terms of raw material that can be handled in an hour. In 1956, the average hourly production capacity of Peruvian fish meal plants was 7 tons, in 1962 30 tons. The increase in capacity was achieved more often through the addition of new processing lines than through the introduction of equipment that could handle a larger quantity of raw material.

Fish reduction may be carried out by the dry-reduction or wet-reduction process. The choice depends mainly on the quantity of raw material available and its quality and oil content. Where large quantities of whole fish, rather than waste material, are used for processing, as in Peru, wet reduction is employed. The reduction process consists of the elimination of oil and water from the fish, which requires relatively complicated processing procedures.

In some countries, oil was for many years the principal product of the fish reduction industry. Today, fish body oils (fish liver oils are produced from species other than the Peruvian anchoveta) are used in Europe primarily in margarine and other food products, whereas in the United States they have a market in the manufacture of various industrial products, including soaps, paints and varnishes, floor coverings and oilcloth. Because of the steeply rising demand for fish meal, fish oil has virtually dropped to the position of a by-product of the reduction industry in countries such as Peru. In Peru the average oil yield is only about 2 percent, but it has been slowly rising with the introduction of improved processing methods. In the United States, which has important overseas markets for the oil, it has been about five times as large. For Scandinavian producers, fish body oil is also a significant source of export income.

A few years ago, approximate cost estimates were prepared for the operation of a hypothetical fish meal plant in Peru (Table III-10). Conditions then varied too much, as they still do, to allow the operations to be characterized as typical. Moreover, there has since been a considerable evolution in the industry, as a result of expansion of plant size, modernization of equipment, consolidation of enterprises, and rising costs. Nevertheless, the data are indicative of the economic structure of fish meal operations of a kind likely to be established in a developing country by domestic entrepreneurs, without substantial financial support from abroad.

Table III-10 shows that raw material is the principal cost element in the production of fish meal; it would represent an even higher proportion of the total if the value of the oil could not be treated as an offset in accounting. Manufacturing costs are relatively low and may represent less than a third of total costs, as in the example chosen. Thus, only a modest proportion of total costs can be controlled directly by the manufacturers. Sales expenses, which in the example include taxes and other expenses, are high in relation to the other costs. The relationship of variable to fixed costs (under the given assumptions with respect to output) is approximately 6:4, indicating that fixed costs play a relatively modest part and that operations are not capital intensive. (This is apparently not true for the more modern installations, where fixed costs are said to represent a considerably higher proportion.)

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[60] FAO. Production capacity in the Peruvian fish meal industry, by I. Tilić. *Report on Meeting on Business Decisions in Fishery Industries.* Fisheries Report No. 22, Vol. 2. Rome, 1964. Material has also been drawn from unpublished studies prepared under the auspices of the Institute of Marine Resources Research, La Punta, Callão, Peru.

TABLE III-10. – STRUCTURE OF COSTS IN A HYPOTHETICAL FISH MEAL PLANT, PERU[1]

	Percent
RAW MATERIAL	
Fish	54.0
Unloading and suction pump operation	7.3
	61.3
Less proceeds from sale of oil	—6.7
	54.6
VARIABLE EXPENSES	
Packaging materials (jute sacks)	7.8
Fuel	4.9
Electricity	0.6
Other	0.2
Labor: (a) wages	3.8
(b) social security	0.3
(c) gratuities and transport	0.6
storage and internal transport	0.4
	18.6
FIXED EXPENSES	
Maintenance and repair	1.7
Administration: management	1.7
overhead	1.1
materials and services	0.2
other	0.2
Rent and insurance	0.2
Interest on working capital	2.2
Depreciation	4.2
Other	1.7
	13.2
SALES COSTS	
Transport	0.8
Customs duties	4.6
Export taxes (not reimbursed)	4.4
Stamp duty, etc. (for meal and oil)	3.8
	13.6
TOTAL	100.0

[1] It was assumed that fishing and processing were separate activities (in reality they are, for the most part, integrated in Peru), and that the plant had no equipment for the utilization of "stick-water" or for the elimination of odors. Annual production of fish meal was assumed as 10.000 tons, capacity 25 tons raw material per hour, number of workdays 250 per year, yield 1:5.8 for meal and 2.5 percent for oil, labor force 60 workers (20 per shift), and capital investment approximately U.S. $370.000.

Because the raw material constitutes so high a proportion of total production costs and because the individual producer has no influence on fish prices, it is essential to avoid raw material wastage. In Peru, labor costs are relatively low in relation to total production costs. They could be further lowered with greater mechanization of operation; although depreciation charges and other capital costs would rise as a consequence. Capital costs are relatively high in Peru because of the rate of interest charged on borrowed funds. Under the conditions assumed in the example, a capital turnover rate (investment to value of annual production) of 1:2 was calculated.

Raw material costs will depend on the price paid for the fish, the yield in fish meal, and the yield and price of oil (since the proceeds from the oil can be offset against fish meal raw material costs). The fish meal yield, in turn, depends principally on the character of the raw material, the efficiency of the machinery, and the technical skill of the labor force. A few years ago, fish meal yields of Peruvian plants ranged from 1:5.1 (19.5 percent) to 1:6.9 (14.3 percent).

Fuel oil is the principal fuel used in processing. Fuel costs depend on the type and quality of the machinery, as well as on the way it is operated. Labor use and costs per unit of product produced vary substantially from plant to plant. The principal determinants of total costs are the rate of production or utilization of capacity, size of plant, location of plant, technology, prices of the factors of production, and managerial efficiency.

Not many countries are in a position comparable to that of Peru with respect to possibilities for the development of fish meal production. A primary requirement is to have a plentiful and very low cost source of raw material. This means that, unless sufficiently large quantities of trimmings and waste from food fish processing are available, only species which occur in great abundance and are readily accessible to highly productive types of gear can be considered. Owing to the usually much higher price which can be paid for food fish, it is only under very unusual circumstances that the establishment of a fish meal plant could help to sustain food fish prices during periods of temporary overproduction by removing surpluses from the market.

In many developed countries, fish meal production has been based on the large quantities of offal available from fish filleting at the port, a process which has arisen from the modern preference of retailers and consumers in such countries for fresh fish fillets rather than whole fish. Large-scale fresh fish processing for freezing at the major ports has also made greater supplies of offal available to fish meal works. A further factor in the cost picture in some developed countries is that the fish meal works are often owned on a co-operative basis by the fish producing and marketing companies, so that the revenue from the fish meal manufactured from these residues is "added back" to their main revenue.

Nonfood industries

FIBERS

A very large variety of animal and vegetable fibers is used in industry, either alone or increasingly in combination with various man-made fibers. The present brief review is confined to a few examples: cotton, jute, hard fibers, and coir fiber.

Cotton

In terms of tonnage produced, cotton is the most important fiber. Its production is very widespread and its industrial use even more so.

The quality and marketability of the cotton crop depends to a great extent on the efficiency of the ginning operation (when the lint is separated from the cottonseed).[61] Roller gins are generally used for long and extra long staple cotton, and saw gins for short staple. The capacity of a roller gin is about 135 kilograms of lint per 8 hours, depending on the speed and length of the roller, which varies for different types of cotton. Saw gins have a much higher capacity.

Cottonseed generally represents about two thirds of the weight of the unginned seed cotton, and ancillary to a ginnery there is often an oil expressing plant for the production of cottonseed oil and cake. Investment for storage and ginnery capital works is estimated in Uganda as about U.S.$80,000 for a complete ginnery (roller gins) with a throughput of 3,000 bales (about 550 metric tons) in six months. Personnel requirements would be 8 managerial and technical staff, and 30 unskilled workers.

Because of the rapid increase in demand for cotton goods in developing countries, most of which is at present met from imports, the production of cotton textiles represents an attractive line of development to many of these countries. Since the war, cotton manufacture has spread to a large number of developing countries. The existence of a local supply of raw material and an abundant labor force encouraged the setting-up of mills. Capital was often provided by foreign firms or governments. Domestic markets were generally heavily protected. The main obstacles lay (and still lie) in the scarcity of managerial and technical skills, and the lack of adequate transport facilities, distribution channels and sources of power.

[61] See FAO. *Equipment for the ginning of cotton.* Agricultural Development Paper No. 25. Rome, 1953.

TABLE III-11. – CHARACTERISTICS OF COTTON MILLS IN INDIA AND PAKISTAN IN COMPARISON WITH MANUFACTURING INDUSTRY AS A WHOLE

	Fixed assets	Fuel and electricity consumed	Value added
	Value per person employed as % of value for manufacturing industry as a whole		
India	60	72	78
Pakistan	79	86	80

SOURCE: FAO. *Trade in agricultural commodities in the United Nations Development Decade, FAO Commodity Review 1964*: Special Supplement. Rome, 1964. Vol. I. Part III. p. 51.

Cotton mills tend to be less capital intensive, and to use less fuel and power per worker, than the average manufacturing plant in developing countries. The value which processing adds to raw cotton, however, is also smaller than the value added to raw materials in other industries. This is illustrated by the data for India and Pakistan in Table III-11.

The low capital and power intensity (though cotton textiles are tending to change from a labor-intensive to a capital-intensive industry) and the relatively low wage rates give developing countries a comparative advantage in the manufacture of all staple types of cotton goods, including hosiery and knitted underwear. Raw cotton accounts for a high proportion of total manufacturing costs (43 percent in Pakistan in 1959-60, for example)[62] and transport costs are negligible where cotton is produced domestically. Gross value added by manufacturing tends to be of the same magnitude as the cost of raw fiber. The import content of the finished textiles consists chiefly of the cost of capital, fuel, chemicals and dyes, and rarely exceeds 25 percent of the gross value of output.[63]

For textiles in general, an economical size of spinning plant for a mill not integrated with weaving is probably about 10,000 spindles, and for an integrated mill about 30,000 spindles. There is also an upper limit for economic size determined by operational, commercial and administrative, rather than economic, considerations, since at a certain level management becomes complicated, capital requirements increase, and additional qualified labor may be difficult to

[62] FAO. *Trade in agricultural commodities in the United Nations Development Decade, FAO Commodity Review 1964.* Special Supplement. Vol. I. Part III. p. 54.

[63] However, in countries such as Hong Kong and China (Taiwan), where the cotton itself is imported, the import content is a half to two thirds.

find. From about 7,000 to about 25,000 spindles, investment and production costs per unit of output become progressively smaller, and a unit of 25,000 spindles, costing about U.S. $2.5 million for machinery only, may be regarded as the optimum size. Smaller mills, with future expansion adequately provided for, may be installed in developing countries, but very small installations (say less than 4,000 spindles) would give rise to a disproportionate increase in costs.[64]

Jute

Jute, kenaf and allied fibers are used primarily in the manufacture of sacks and other containers. They are also used in substantial quantities in the manufacturing of floor coverings, mainly in the developed countries.

As for other fibers, initial processing to produce the baled fiber takes place in the growing area. The usual method of initial processing for jute and all other bast fibers is retting for 10 to 15 days in stagnant or slow-moving water. During retting, the outer bast layer separates from the stem by bacterial action and can afterward easily be stripped off by hand. By energetic washing of the retted bast, clean fibers are obtained. While this method is still predominantly used in India, Pakistan and Thailand, which are responsible for the great bulk of world production of jute and allied fibers, it is less practical for other countries, where water is not so abundant or labor not so plentiful and cheap. Attempts have therefore been made, and are still being made, to extract kenaf and similar fibers without retting, by mechanical decortication. While equipment has been developed for this purpose, it is by no means an ideal solution because bast or soft fibers are really too fine for mechanical decortication, with the result that fiber losses are high or the fibers are not opened up sufficiently. A more satisfactory solution is a two-stage process: the stems are first treated in a "ribboner" (a crude decorticator); this delivers the bast in the form of small ribbons or fiber bundles, which are then retted.[65]

The further processing of jute and allied fibers by spinning and weaving into finished goods (twines, fabrics and sacks) is carried out mainly in the principal fiber-producing countries (India and Pakistan), in western Europe, and also in a number of other producing countries. The cost of the fiber is by far the most important item in the costs of production of jute or kenaf sacks (42 percent of the total value of output in Pakistan, for example).[66] With their low labor costs and abundant supply of locally produced fiber, jute mills in developing regions are generally fully competitive with those in developed countries in the manufacture of sacking and common hessian, though not in the production of speciality goods such as yarns for floor coverings and high-quality cloth.

In the hypothetical case of a country having an annual demand of 6 million bags, the capital investment required would be approximately U.S. $1.26 million for machinery, furnishings, spare parts, and electric motors (excluding the powerhouse) and $630,000 for buildings. All except about half of the cost of buildings would have to be imported. The length of time involved from the date of the placing of the order for machinery and plant will be about 2½ years; if a fiber is to be grown locally, starting from scratch, a period of at least five years would probably be required before establishing a factory. About 50 to 60 percent of the cost of the finished bag would be the raw material cost, including batching oil. The raw material required is 7,000 tons of fiber for 6,000 tons of bags. Assuming that the fiber costs $160 per ton and the bags $270 per ton, the gross value added by manufacture would be $770,000. If the fiber were all produced locally, the annual saving in foreign exchange would be $1.62 million; if the fiber were imported, the net savings of foreign exchange compared with the import of the sacks would still be about $500,000. If a soft fiber is to be grown locally to supply the sack factory, a labor force of around 12,500 will be needed for cultivation, harvesting, retting and drying, during a period of, say, four months each year.

Hard fibers

The principal products of the hard fibers (abaca, sisal and henequen) are ropes for marine and industrial use, and binder and baler twines used in mechanized agriculture, while subsidiary uses are in carpets, upholstery and paper manufacture.

Initial "on-the-spot" processing consists in extracting the fiber from the leaf by means of hand stripping or scraping in a power-driven decorticator,

[64] United Nations, Center for Industrial Development. *Textile industries in developing countries*, Recommendations and Summary Report of the United Nations Interregional Workshop on Textile Industries in Developing Countries, New York, 1965, p. 17.

[65] See FAO. *Equipment for the processing of long vegetable fibers*, Agricultural Development Paper No. 26. Rome, 1953.

[66] FAO. *Trade in agricultural commodities in the United Nations Development Decade, FAO Commodity Review 1964*, Special Supplement, Vol. I, Part III, p. 45.

either a hand-fed raspador or an automatic continuously working decorticator. A by-product of decorticators is sisal waste (flume tow) which after retting and/or mechanical cleaning can be used for upholstery or sack manufacture. Automatic decorticators are huge stationary machines with high capacity, often requiring mechanized transport for the leaves. They involve considerable capital investment by the large plantations employing them. While production in most countries is largely on these lines, there is now an increasing demand for smaller, transportable decorticators which are within reach of groups of smallholders.

Conditions in developing countries which grow the raw material lend themselves well to the manufacture of cordage and other products from hard fibers. The industry need be neither power nor capital intensive, technology is or can be simple, and economies of scale are not large. The raw material accounts for a considerable part of total costs of production, and since spinning mills can be located near plantations, transport costs are small. The gross value added by manufacture varies between half and two thirds of the value of raw fiber. The import content of the finished product consists mainly of depreciation and fuel costs, and probably does not exceed 10 percent of the gross value of output (Table III-12).

Since the war, the manufacture of cordage and other hard fiber products has been expanding rapidly in Latin America, and more than half the volume of sisal and henequen exported from this region is now in processed form. Despite a shortage of modern machinery, the abundance of cheap fiber and the low cost of labor make Latin America's cordage mills competitive with those of North America, the main import market.

The postwar development of the Mexican cordage industry may serve as an example. Though old established, the industry suffered a decline early in the century, and did not begin to expand until the end of the second world war. During the 1950s its consumption of henequen doubled, while its exports of cordage almost trebled. Mexican mills employ about 100 workers each and produce an average of about 1,500 tons of henequen manufactures a year. Average capital investment amounts to U.S. $200,000 per mill, or some $2,000 per worker. The value of output is about $375,000 per mill, and thus $3,750 per man employed.

Judging by the experience of Mexico, there is little difficulty in setting up cordage mills where there is a plentiful supply of raw fiber and an abundant labor force. Training workers seems to create few problems, and the low level of wages obviates the need for the latest machinery.

TABLE III-12. – COMPOSITION OF GROSS VALUE OF OUTPUT AND IMPORT CONTENT IN HARD FIBER MANUFACTURING, MEXICO, 1955

	Total	Import content
	..... *Percent*	
Raw fiber	60	0.5
Fuel and power	2	1.0
Other net inputs	6	2.0
Total inputs	68	3.5
Labor	11	—
Profit (estimate)	10	—
Net value added	21	—
Capital depreciation (estimate)	11	5.5
Gross value added	32	—
GROSS VALUE OF OUTPUT	100	9.0

SOURCE: *Censo Industrial 1956 (Información Censal 1955), Resumen General.* Secretaría de Industria y Comercio. Dirección General de Estadística. México, 1959.

Coir fiber

Coir, or coconut fiber, is obtained from the husk of the coconut, and is therefore a by-product of copra manufacture. It is of particular interest as a product which is at present largely wasted, but which with suitable processing can make a valuable contribution to the economy.

The finest and longest varieties of coir fiber are used for making cordage and floor coverings. A coarser variety is used in manufacturing brushes and brooms, and a short variety is employed for filling mattresses, or as a substitute for horsehair in upholstery. Rubberized coir is used in furniture, aeroplane and automobile upholstery, and coir dust is useful for acoustics, insulation and air-conditioning filters.

About 95 percent of the world supply of coir is produced in India and Ceylon. Coir production is one of the biggest cottage industries of India, and is a means of supplementing the low earnings of small coconut growers and fishermen, and of providing employment for the otherwise unutilized female labor of the densely populated coastal areas. Attempts to produce coir are also made in other countries, and as about five sixths of the world's coconut

husks are still burned as fuel, used as manure or wasted, the potential production is very high.

The extraction of the fiber from the husks can be done either by hand or by machine. The manual processing involves a long retting period of five to nine months. Spinning coir fiber into yarn is a cottage industry performed almost entirely by women and children, and is done by hand or by means of simple hand-driven machines. At present, almost all the world's supplies of coir yarn are produced in India, where the estimated value added per head per day is more than 2 Rupees, probably the highest figure for all the cottage industries in that country.

In the mechanical processing of coir, the husks are crushed between fluted rollers and conveyed mechanically to retting pits. This technique reduces the length of the retting period to three to six weeks, and the labor requirements per machine are very low. To eliminate retting altogether, a dry processing method has been developed in the United Kingdom, but the equipment is built for high outputs and requires high capital investment. Cheaper processing equipment for smaller capacities, making use of the wet method with soaking, is obtainable from Japan. A set of machines for the processing of 1,000 husks a day, producing about 100 kilograms of coir, requires an investment of less than U.S. $2,000, and includes a crushing machine, combing machine and baling press. The labor requirement for such a unit would be six men.

A small brush manufacturing workshop can be constructed for about U.S. $1,300 using simple Japanese machinery, that is, a wooden-holder making machine, a bristle filling machine, a shaving machine, etc., for the daily production of 350 kitchen brushes by six workers. There is also cheap Japanese equipment for the making of cordage on a small scale. A two-ply twine-making machine with treadle drive for a capacity of about 120 meters per hour costs $110 f.o.b., while a three-ply machine driven by a ¼ h.p. motor and with a capacity of about 150 meters per hour can be obtained for $175. The price for a small, treadle-operated floor mat loom is $453.

For various end uses, coir requires refining by chemical and other treatment. There is no reason why this refining could not be done in developing countries, which could then manufacture a variety of high-priced export products. Another product that could be made in developing countries, especially those which are also rubber producers, is the rubberized coconut fiber.

Hides and skins[67]

Hides and skins are another product of which a large part of the potential output is at present wasted. Processing the green hides invariably takes place in the country of origin. The method employed depends to a large extent on the quantity of hides to be processed in a given time, the distance from the market and consumer, climatic conditions and the availability of labor and raw materials (curing salt and building materials). In developed countries, where the abattoir is frequently adjacent to the tanneries and large numbers of cattle are slaughtered daily, and where flaying is carried out under supervision, the wet-salted method of curing is generally adopted. The quality of the product is good and there is little labor involved. In some developing countries with a substantial meat industry handling large numbers of stock at a central factory, the hides are salted and piled immediately after cleaning. They are later suspension-dried, folded, baled and exported in the dry-salted condition. These hides soak back well in the tanneries and, provided they were folded before they were completely flint dry, there is normally little damage, if any, to the grain of the hide. Dry salting is preferred where there are long distances between producer and consumer, because of the saving in transport costs and ease of handling a dry, baled product.

Much of the world supply of hides comes from small producers in remote parts of the tropics and subtropics. More and more of these hides are prepared by the suspension air drying method. Where climatic conditions are less favorable for part of the year, drying sheds are increasingly being erected for individual or communal use. In countries with a long tradition of vegetable tanning processes, production of rough tanned leather has long been carried out; the hides are dehaired and vegetable tanned before drying, and then folded and exported in the bale. The advent of cheap plastic bags has made it possible to transport moist rough chrome-tanned pelts treated with disinfectant over long distances. Taking this into account, together with the difficulty of finding wet-house workers in the European and North American tanneries, this process has become economic, and there is a growing demand for rough chrome-tanned products.

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[67] See FAO. *Hides and skins marketing in Africa and the Near East*. 1963. p. 44-50: FAO. *Flaying and curing of hides and skins as a rural industry*, Agricultural Development Paper No. 49. 1955: FAO. *Rural tanning techniques*. Agricultural Development Paper No. 68. 1960.

The potential production of hides, skins or leather of many of the developing countries is very great, because of their large cattle population. Conditions appear to be favorable for investment in the leather industry in these countries as labor costs are low, raw materials including indigenous tannin bearing materials are abundant, and there is a rapidly growing demand for footwear. Many developing countries at present spend large quantities of foreign exchange for the import of leather and leather goods. However, there is keen competition in the world market (a number of tanneries in western Europe have had to be closed in recent years) and investment in tanneries therefore needs particularly careful planning.

A major question in many countries is whether to invest in the improvement of existing small rural tanneries, or whether to build a few large mechanized tanneries which in a short time would be able to provide the whole country with first quality leather. In areas such as Northern Nigeria and Sudan, where rural tanners have reached a high standard and where government policy favors the further development of rural tanneries, investment in schools to train tanners is justified. This does not, however, eliminate the need for mechanized modern tanneries to provide leather for the local market in place of imports, for many of the types of leather required for modern footwear and other articles cannot be produced in rural tanneries, even if partially mechanized.

Where no traditional tanning industry exists, it is as well to start right at the point of installing a mechanized tannery geared to the immediate needs of the country or to take the surplus raw stock over and above external trade commitments. The advantages of mechanized tanneries are threefold. First, it is easier to inject the necessary technical know-how into a centralized unit or units. Second, a mechanized tannery produces larger quantities of a more uniform product. Third, a mechanized tannery can produce more types of leather. For example, the same group of rural tanners previously working 50 to 100 hides and skins daily would, for an investment of some U.S. $35,000, be able to handle 500 hides daily in a semimechanized co-operative. A fully mechanized tannery costing some $100,000 to $250,000 would have an even greater production and be able to manufacture finished leathers outside the scope of the semimechanized tannery. With full mechanization it is possible to transform a hide of varying thickness into an almost uniform piece of leather, thus improving the efficiency of utilization.

In order that these tanneries may compete with imported leather, their location, capacity, technical equipment, tanning material and marketing arrangements require careful investigation. The principal factors influencing location are the supply of raw hides and skins, water and power supplies (1,350 liters of water are required for the tanning of 50 kilograms of hides and skins, while the quality of the water must also be suitable for tanning), facilities for effluent disposal, and transport accessibility.

As regards capacity, it appears that the cost of leather production generally decreases as the size of the tannery increases, provided it is used to full capacity. In order to determine capacity, a thorough investigation must be made of the potential market, including the quantity and price of various types of leather. Government-financed tanneries are sometimes built on too large a scale, so that capacity is only partly used, capital costs are too high and leather cannot be produced at competitive prices; in order to avoid any breakdown of processing, government subsidies are poured in. It is preferable to build a tannery in which the capacity is fully utilized at the start, and to make provision for later expansion.

In the last 30 years, much progress has been made in the improvement of tanning processes. There has been a change from vegetable tannin materials to mineral tans. The mineral tans are of consistent composition, they can be controlled scientifically, and smaller quantities are required, so that there is a saving in transport costs. Mineral tannage is preferred in most instances for shoe upper leather because of its finer properties, in particular its property of holding its color, and the ease with which the finishing processes can be carried out. With the exception of grain correction techniques, which are economically restricted to fully mechanized tanneries, many recent developments in leather finishing techniques are suitable for the semimechanized tanneries.

Although as a general rule vegetable tannage is diminishing, in order to save costs it is as well to investigate locally available tannin bearing materials, as these may be suitable for the development of a trade in local leather, and also for pre- or rough tannage processes for the export stock sold to more developed countries to finish for fashion leathers. In Sudan, for instance, it has been found that a granular substance containing over 50 percent tannin is recoverable from mechanically disintegrated and separated pods of the *Acacia nilotica.*

Apart from expanding leather production for internal consumption in developing countries, investigations should be made in some main exporting countries of the extent to which hides and skins can be partially processed for export. These should mainly cover the pickling of skins (the first stage of the usual tanning process), and the light vegetable or chrome tanning of hides and skins (as carried out, for example, in southern India). The export of finished quality leathers from developing countries is generally not possible, because of the need for uniformity and the frequent changes in fashion in import markets.

Forest products[68]

Forests provide a renewable raw material for a whole range of industries which have acquired great importance in many industrially advanced countries. In developing countries they are often neglected, or exploited only as roundwood for export.

Wood removed from forests can be used either as fuelwood or for industrial purposes. Industrial wood can be employed either in uses where, though undergoing several transformations, it maintains intact its chemical and physical structure, or as a raw material in chemical processes where it loses, so to speak, its individuality. On the one hand, sawlogs are transformed into sawnwood, which in turn is used for construction, shipping and manufactured products; veneer logs, transformed into veneers, plywood and blockboard, also used for construction and manufacture; logs transformed into sleepers, pitprops, piling and poles. On the other hand, pulpwood is transformed into pulp by mechanical and-or chemical action, and then manufactured into paper and paperboard. An intermediate position between these two groups is occupied by two more recent products — fibreboard and particle board. From the manufacturing point of view, fibreboard is nearer to the second group and particle board to the first, but from the point of view of demand characteristics both should be considered in the first group, since they are put to much the same uses as sawnwood and plywood.

In physical terms sawlogs account for a much greater volume than pulpwood. By far the most important use of sawnwood is construction, followed by packaging, railway sleepers and manufacturing; the latter, however, covers an enormous number of products — from furniture to railroad cars, parts of motor vehicles, handles, toys, ladders, and pencils. In residential building, wood is essentially used for framing, sheathing, millwork and flooring. The major pulpwood product is paper, followed by paperboard; and the most important types of paper are newsprint, printing paper, paper for wrapping, and bags.

In 1958, forest industries (including both wood products and furniture, and paper and paper products) accounted for 8.8 percent of the total value added and 10.1 percent of total employment in manufacturing industry outside the U.S.S.R. and eastern Europe (see Table III-4). The breakdown for the two main branches is the following: 4.3 and 3.5 percent of value added and 7.9 and 2.2 percent of employment respectively for wood products and furniture, and for pulp, paper and paper products. This shows a remarkable difference between the two main branches in labor productivity, which is higher than the average in paper and paper products and much lower than the average in the other branch.

A general idea of the relative importance of the major primary forest industries can be obtained from Table III-13. Some characteristics of the five main groups are compared in Table III-14.

The pulp and paper industry is a good deal more capital intensive than the other forest industries shown in Table III-14, and it yields the highest gross product per unit of raw material. Since both pulp and paper and board products (apart from plywood) operate mainly on small-dimensioned woods, do not make use of high value timbers and are in fact utilizing to an increasing extent wood residues, both from other forest industries and from forest operations, their lead over sawmilling in terms of value added per unit of raw material is even more pronounced than is shown in the table.

These aggregates and averages, however, conceal great differences in the scale of operations (and factor requirements) within each main group, as will be seen shortly when some of the principal features of each industry group in turn are discussed. First, however, it should be noted that there are a number of minor primary forest industries omitted from these tables: other industries concerned with wood transformation, such as charcoal, wood-wool manufacture and wood distillation; and industries concerned with the extraction and refining of tanning materials, resins, lacs, oils, and the like. Thus, total employment in the

[68] The role of forest industries in economic development was surveyed in some detail in *The state of food and agriculture 1962*. p. 88-128. to which reference should be made for further details. See also N.A. Osara. *World trends in the pulp and paper industries, with special emphasis on developing countries*. Paper presented to 20th anniversary meeting of the Empire State Paper Research Associates (ESPRA. Syracuse University. Oct. 1965): *Wood: world trends and prospects. Unasylva*. 20 (1-2). 1966. p. 68-97.

TABLE III-13. – RELATIVE IMPORTANCE OF THE WORLD'S PRIMARY FOREST INDUSTRIES COMPARED, 1961

	Roundwood equivalent of output	Gross value of output [1]		Investments		Labor force	
	Percent	*Million U.S.$*	*Percent*	*Million U.S.$*	*Percent*	*Millions*	*Percent*
Sawmilling	69	13 700	46.9	8 500	17.2	31.2	60.3
Paper and paperboard	24	12 900	44.2	38 300	77.4	1.6	30.2
Plywood	5	2 000	6.8	1 800	3.6	0.4	7.6
Fibreboard and particle board	2	600	2.1	900	1.8	0.1	1.9
TOTAL	100.0	[2]29 200	100.0	49 500	100.0	5.3	100.0

SOURCE: *Wood: world trends and prospects, Unasylva*, 20 (1-2), 1966, p. 68.
[1] At 1960 prices. – [2] Excluding the value of all other wood products ($1,600 million).

TABLE III-14. – SELECTED RATIOS, WORLD'S PRIMARY FOREST INDUSTRIES, 1964

	Gross value of output per unit of raw material	Investment per person employed	Investment per unit of raw material	Employment per unit of raw material
	$ per m³ round-wood	*Thousand U.S.$*	*$ per m³ round-wood per year*	*No. per thousand U.S.$ m³ round-wood per year*
Sawmilling	30	4	18	5
Pulp and paper	60	35	[1]140	4
Plywood	45	4	25	7
Fibreboard	30	18	[1]35	2
Particle board	45	14	[1]35	2.5

SOURCE: N.A. Oşara. *World trends in the pulp and paper industries, with special emphasis on developing countries.*
[1] Based on three eight-hour shifts per day.

primary wood-transforming forest industries reaches close on 6 million, while about the same number are engaged in the secondary forest industries — furniture, container, box, match and other wood-working, and various paper converting industries.

Sawmilling

In the sawmilling industry, the size of establishment varies from small mills (often mobile) in the forest, producing a few cubic meters a day for local needs, to highly mechanized mills with an annual capacity of several hundred thousand cubic meters, producing for export or serving large consumption centers. All have their place; optimum size and location can be determined only in the context of raw material supply, markets served, and communications between the two. Communications bulk largely in determining location, given the high incidence of transport costs on the raw material delivered mill and the finished product delivered to the market. Value added in processing is small, and economies of scale in the mill installation not of decisive importance. Typically the cost of logs delivered mill represents 50 to 70 percent of mill production costs. Because of this, and because of the need to carry an adequate stock of logs to assure continuous operation and of processed sawnwood to meet customers' requirements, working capital needs are heavy, often amounting to as much as fixed investment.

Labor needs vary within very wide limits, depending on the type of material sawn, the degree of mechanization and, of course, on efficiency of operation. To produce 1 cubic meter of sawn softwood in a mill of 10-15,000 cubic meters of annual capacity in a less developed European country requires 10 to 14 man-hours; in a larger mill of 20-35,000 cubic meters of annual capacity, only 7 to 10 man-hours are needed. The more homogeneous the log intake, the greater the possibilities of mechanization and labor-saving. Hence, labor productivity (as measured by output per man-hour or man-year) is normally much higher in sawn softwood mills than in mills sawing hardwood. In predominantly coniferous forest areas — North America, U.S.S.R. and northern Europe — softwoods comprise 85 to 95 percent of the raw material for sawmilling as compared with 10 to 40 percent in Asia, Latin America and Africa.

A large proportion of the raw material entering the sawmill, about 30 to 40 percent for the world as a whole, emerges from the process in the form of slabs, edgings and sawdust. This material, at one time wasted, today can be almost all turned to industrial account if there are appropriate forest industries in the vicinity to use it. The slabs and edgings can be chipped for pulp or board manufacture and even the sawdust and shavings from planing mills can

be utilized in other wood-processing industries. The possibility of utilizing sawmill residues has already considerably modified the economics of wood-based industries in the developed areas of the world and has in many cases encouraged the integration of forest industries. In wood-deficit countries, it has contributed to a considerable broadening of the wood raw material basis.

As yet, these potentialities have scarcely been realized in most of the developing countries. The time is not yet ripe for creating large integrated forest industry complexes, but there are countries where it is already possible to introduce successfully one or more small industries operating wholly or partly on mill residues, manufacturing particle board, or wood composition boards or blockboard for constructional purposes. Alternatively, when a new sawmill is planned, the possibility of associating such a related enterprise with it from the outset may enhance both its prospective financial return and its social evaluation.

Sawmilling is usually the first forest industry to be established. It does not require a high degree of technical skill on the part of its labor force, but only on the part of a few key technicians. It is much more flexible in location, in size of plant, and in finished product than any of the other primary forest industries. If export demand is good, the industry can concentrate on high-quality production of lumber to dimensions required by the overseas market, using substandard production resawn for the local market. Should export demand cease or require different specifications, the industry can quickly adapt itself to the changed requirements.

Pulp and paper

Second of the primary industries in terms of raw material requirements and value of output, but far and away the largest in terms of capital invested, the pulp and paper industry has grown rapidly in recent years. This industry is much more heavily concentrated than the sawmilling industry, mainly because, although wood costs represent the main item in total production costs and a cheap wood supply is essential, other process materials and production factors assume considerable importance. The pattern of production costs varies considerably with the process used, the size of plant, the location, and according to whether the process is integrated (pulp and paper) or not. Some of the main characteristics are deducible from Table III-15, though there is considerable variation between geographical areas and individual mills.

While wood costs still represent a third to a half of total production costs, it will be observed that, firstly, capital charges are high; secondly, process chemicals assume a considerable importance, especially for bleached grades; thirdly, power, steam and water represent a very important element; and fourthly, labor costs are relatively small.

Obviously wood costs have an important, though not as in sawmilling a dominant, influence on total costs. The wood costs shown in Table III-15 are for wood delivered mill. Labor represents the major element in this cost and thus, while the mill operation itself is not labor intensive, the associated forest extraction operations are. Investment needs for this industry are certainly heavy. Typical requirements

TABLE III-15. – RELATIVE IMPORTANCE OF VARIOUS COST ITEMS IN THE PRODUCTION OF PULP AND PAPER

	Mechanical pulp, integrated	Chemi-ground-wood integrated	NSSC-pulp [1] (broadleaved wood) integrated		Sulfate pulp [1] nonintegrated				Newsprint, integrated mechanical pulp	NSSC [1] corrugating board integrated
					Unbleached conifers	Bleached				
			Unbleached	Bleached		Conifers	Broadleaved wood	Straw		
	Percentage of the total production cost at the mill									
Fibrous raw material	40	29	36	32	50	43	35	32	39	31
Chemicals	—	12	3	18	4	12	14	15	—	3
Other materials	3	3	4	3	3	3	3	3	4	5
Power, steam, water	21	18	12	10	2	4	5	5	15	13
Labor, including repair	7	7	9	7	7	6	8	8	9	9
Supervision overhead	5	5	5	4	6	5	6	7	5	5
Capital costs	24	26	31	28	28	27	29	30	28	34

[1] With recovery of chemicals: NSSC - neutral sulfite semichemical process. Production capacities: about 100 tons per day.

(fixed investment in the mill only, excluding working capital and any necessary infrastructural investment) for medium-size mills of 100 tons per day capacity (or 30,000 tons per year) in a developing country range from U.S. $12 million to over $20 million, depending on location, process and production program.

More than half this investment consists of equipment, engineering, fees, etc., normally requiring foreign exchange outlay in a developing country. On the other hand, pay-out time (total investment divided by annual gross output) is not high — ranging from 18 months to 4 years.

However, there are a number of indivisibilities in the technological process which make for sizable economies of scale. These are particularly pronounced for newsprint and for kraft pulp and paper. A general indication of the variation of capital costs with size of mill for some typical mills is afforded by Table III-16. Clearly, given the high impact of capital charges on production costs, a small mill must enjoy compensating advantages if it is to compete successfully with a larger rival.

Power requirements are also high, normally ranging from 350 to 550 kilowatt-hours per ton of bleached sulfate pulp to 1,700 to 2,000 kilowatt-hours per ton of newsprint. The freshwater requirements in pulp and paper manufacture are high, especially for bleached grades of chemical pulp and certain special papers. An integrated paper mill with a daily output of 100 tons consumes about 40,000 cubic meters of water, which equals the needs of a city of some 150,000 inhabitants.

For the production of chemical pulp considerable quantities of chemicals are required, both for cooking and bleaching: for every 1,000 tons of bleached pulp produced, 200 to 500 tons of chemicals are consumed. Where chemical pulp operations are concerned, this shows the importance of convenient access to basic materials, such as saltcake, salt and limestone.

TABLE III-16. – INFLUENCE OF TYPE AND SIZE OF PULP AND PAPER MILLS ON FIXED INVESTMENT

	Daily capacity, metric tons			
	25	50	100	200
	Fixed investment in thousand U.S. $ per ton/day			
NONINTEGRATED MILL				
Unbleached chemical pulp	235	175	135	105
Bleached chemical pulp	325	240	190	150
INTEGRATED MILL				
Unbleached paper	300	230	180	140
Bleached paper	390	295	235	185

SOURCE: FAO/ECAFE. *Report of Conference on Pulp and Paper Development Prospects in Asia and the Far East*, Tokyo, 1960.

Bringing large quantities of raw materials to the mill, and shipping the finished product, entails a considerable transport problem. Thus, not only is good transport organization necessary: heavy expenditure may be required on transport facilities such as roads, rail, harbors and trucks.

Space precludes a detailed discussion of available pulping processes and of the fibrous materials to which each is specially adapted. It is sufficient to mention here that, even though the major part of the world's pulp and paper is still made from traditional coniferous species, there are very few timbers, coniferous or broadleaved, which cannot today be pulped by one or other of the available processes, and that there are processes suited to a wide variety of nonwood materials, including bamboo, esparto and other grasses, cereal straw and bagasse (sugarcane waste). It should be added, too, that one of the cheapest sources of fiber for paper-making is waste paper, which can replace virgin fiber to a considerable extent in many grades, and wholly in some grades of paperboard.

Though quantitative labor requirements for pulp and paper manufacture are modest, a fairly high proportion, ranging from 35 to 45 percent, needs to be skilled.

The question of the feasibility of small-scale pulp and paper production has been the subject of much discussion in recent years. The trend in the world is toward increasingly large production units in order to take maximum advantage of the considerable economies of scale. It is, however, necessary to distinguish between different types of mills and products, and there is no hard-and-fast rule that can be applied to all situations. Small-scale units may be justified in some cases in the developing countries serving as a starting nucleus for developing local markets and skills. Large-scale units, which cannot be supported by local markets, should be considered on a regional basis.

Plywood, fibreboard and particle board

Plywood. The most important factor in the location of plywood mills is the availability of large-diameter logs of good form, whether indigenous or imported, suitable for peeling or slicing. Much of

the industry which has been built up in Europe and Japan has been based on imported tropical hardwoods. With veneer-size logs becoming progressively scarcer, technical progress in the industry has concentrated on making use of smaller diameter logs and lower quality material, for example, by cutting out defects, and reducing core size. The transformation coefficient in plywood manufacture is fairly low, losses on conversion amounting to 50 to 70 percent (40 to 60 percent on veneer manufacture). Frequently all or part of these residues will be used as fuel for steam and power needed in the plant for hot presses, dryers, etc. But, if a commercial outlet is available for them, this can have a decisive influence on the economics of operation. Blockboard manufacture is largely a branch of the plywood industry. There is also a notable trend to integrate the plywood and particle board industries, not only because the latter use the residues of the former, but also because much particle board is veneer-faced and because both industries serve the same consuming sectors, construction and furniture.

The cost of wood raw material represents 30 to 50 percent of total manufacturing costs, the other important process material being adhesives (synthetic resins, casein, blood albumen, soybean, etc.) of which about 25 to 35 kilograms are required per cubic meter of plywood. With the growing importance of moisture-resistant and waterproof plywood, the consumption of urea and phenol resins has increased rapidly.

Investment costs, though higher than for sawmilling, are much lower than for pulp and paper manufacture — about U.S. $100 to $200 per cubic meter of annual capacity. Scale economies are less pronounced than for pulp and paper; they relate mainly to power and presses, and only mills operating on large quantities of uniform material (for example, Douglas fir) and manufacturing standard grades can fruitfully introduce much mechanical handling and some automation control.

Labor needs per cubic meter of output vary substantially, depending upon the degree of mechanization, log sizes, average thickness of veneer, need for patching, and so on. In less developed countries, more than 100 man-hours per cubic meter may be used if circumstances imply heavy reliance on manual handling. The proportion of skilled labor needed may range from 20 to 35 percent.

What has been said under sawmilling concerning the opportunities in developing countries for carrying out further processing before export applies also to plywood manufacture. It is perhaps useful to note a recent trend toward establishing nonintegrated veneer plants, making green or drier veneer, to feed local or overseas plywood plants equipped simply with a press or drier and press. Such veneer mills require less investment, and can operate on a limited supply of veneer logs. Shipment of veneers saves weight and space compared with shipping logs.

Blockboard, laminated board, etc. are included in the broad category of plywood, and output of these products has increased parallel with the production of particle board. Blockboard can be manufactured almost manually, with but limited equipment. It is of considerable interest to many developing countries since it can not only replace imports, but also offers an outlet for thinnings and small-diameter logs from coniferous plantations as well as for sawmill residues.

Fibreboard. This industry has many affinities with the pulp and paper industry. The problems of wood supply are similar, as is the stage of pulp preparation, if the traditional wet processes are employed. Process chemicals are not normally required, and the sizing materials and additives which impart particular qualities to the finished product do not represent an important element in total costs. Wood costs may account for 20 to 40 percent of the total, depending on the size of mill (though they may fall to 10 percent if cheap residues are available), while fixed charges (mainly depreciation and interest on working capital) may account for 20 to 30 percent, again depending on size of mill. Thus, as with pulp and paper, scale economies are significant. Fixed investment per daily ton may range from U.S. $90,000 to $100,000 for a mill of 6,000 tons annual capacity, down to around $30,000 for a mill of 50,000 tons annual capacity.

An adequate supply of fresh water is required; water needs are similar to those for newsprint production. Power requirements, at 300 to 800 kilowatt-hours per ton of product, are less than for newsprint but more than for chemical pulp. Labor needs (in the mill) are modest, ranging from 12 to 40 man-hours per ton. Fibreboard production can be based on a wide variety of coniferous and broad-leaved species, including suitably blended mixtures, and is eminently suitable for utilizing residues (including even bark and sawdust) from other forest industries. There is a growing trend toward the use of unbarked wood.

In recent years several dry processes for fibreboard manufacture have been developed. These processes

may well come to have an interest for developing countries since there is no need for large supplies of fresh water. Resins are, however, needed for bonding purposes.

Particle board. This industry is essentially a postwar development. Like fibreboard, particle board can make use of a very wide variety of species, coniferous and broadleaved, as well as flax, bagasse, and wood residues; indeed, this industry was developed in the first instance to make use of wood residues. It is, in fact, this tolerance in raw material requirements that confers on both these board industries an attraction for countries with tropical forests, wherein frequently only a small proportion of the available timber (species and sizes) are suitable for the other major forest industries.

Investment in a particle board mill of intermediate size represents roughly half that in a fibreboard mill of comparable tonnage. Though there are economies of scale, relatively small mills can be economic, particularly if operating on locally available residues or serving a captive market. Investment cost ranges from about U.S. $12,000 to $30,000 per ton per day, depending on the process used and hence on the type of board produced.

There are fewer restrictions on location than in the case of fibreboard. Water is not needed. Power requirements are modest, 100 to 300 kilowatt-hours per ton of board, as are mill labor requirements, 5 to 20 man-hours per ton. A key consideration, however, is the availability and cost of resin, normally urea, or phenol resin. This bonding material, which represents about 5 to 8 percent of the weight of the finished board, may account for 15 to 35 percent of production costs, depending on the process used and the cost of resin. Thus resin costs may frequently exceed wood costs. Obviously, if resin has to be imported, this sharply diminishes the import-saving value of the project.

Miscellaneous and secondary forest industries

There are very many other industries based on raw materials of forest origin. Though some are little more than extensions of the sawmilling and veneer industries, they may be separately established, particularly where the existence of a suitable resource or the needs of a consumption center make this advisable. In some instances the raw materials may even be imported.

Some of these forest industries have a direct impact on agricultural development. One example is the production of packaging materials. Wooden crates and boxes are widely used. Investment requirements for box-board production are generally low, compared with the production of plywood boxes, or corrugated paperboard and multi-wall sacks. Wirebound veneer containers are extensively used for export fruit packaging; since relatively small diameter logs can nowadays be economically used for veneer and plywood production, the industrial production of such containers is attractive. For tea packaging, plywood chests have been traditionally used. Formerly, all of the plywood had to be imported, but India and Ceylon now have sizable plywood mills and produce substantial quantities of tea-chest plywood.

The use of corrugated board boxes for fruit packaging continues to increase (in the United States their share rose from 5 percent in 1950 to 50 percent in 1960). Such boxes are also suitable for the packaging of tropical crops, but sulfate pulp and liner board, from which they are made, are normally manufactured in large industrial units.

In most developing countries, wood is an inexpensive, locally available raw material for the construction of rural housing, for storage facilities and for many other uses related to agricultural production. Developments in wood preservation have made it possible to use many wood species which hitherto have been considered nondurable. Investments required for sawmills, preservation and wood manufacturing facilities are low, and they can easily be established in the rural areas themselves. On the other hand, larger industrial units of this kind may also be established. Prefabrication of building and construction elements is frequently integrated with the sawmilling or wood-based panels industry.

Wood-based panels, in particular plywood, are now produced in many developing countries or are available at reasonable cost. Exterior type plywood withstands rigorous exposure to moisture, chemicals and manures. It is successfully used for a variety of purposes such as broiler and laying houses in the poultry industry, hog and calf houses and dairy structures, and also in large storage structures for grain, silage, fertilizer and fruit.

Wood turning, with handles for agricultural implements and sports goods, woodenware and spools as principal products, is a further example of the great variety of industries based on raw materials of forest origin. The manufacture of match blocks in the form of sawnwood or veneer is another. Small plants (or units within larger plants) are suitable for

producing shingles, pencil slats and briarwood pipe blocks, often for export, where appropriate raw materials are available.

The chemical distillation of wood yields a large variety of products, the more important of which are charcoal and methyl or wood alcohol. The capital requirements for wood distillation plants are not excessive. Charcoal alone may be produced by simple pit methods requiring no capital. The other products are, of course, lost in this case.

A number of extractives from wood and bark provide the raw material for several small but important industries. Some species of pine are suitable for the tapping of a resinous exudate used for the manufacture, by a distillation process, of turpentine and resin. A considerable amount of labor and little capital are required in the industry. The trees may also be used for their timber. The production of tannins for the leather industries may be based on a great number of woody and herbaceous plants.

The final group of industries to be briefly summarized here are the secondary wood industries, which use as their raw materials the products of sawmills, plywood and veneer plants and board mills. They may be closely associated with mills producing their raw materials or may, in contrast, be widely decentralized near consuming centers. Among the more important of the secondary wood-using industries are furniture manufacture; joinery plants producing such things as doors, window sashes, and moldings; boat-building; manufacturing of vehicle bodies, etc. These industries tend as a group to be labor intensive — calling for a wide range of skills — and to use relatively high-cost raw materials. Capital requirements are generally modest to low. Plants can often be small and decentralized, but there are some economies of scale for the more mechanized. Even in countries with little or no forest resources they can be operated on imported materials saving appreciable foreign exchange on the value added. Many wood-deficient developing countries are now importing products of the secondary wood and paper industries to a value in excess of their imports of all other wood and paper products.

INDUSTRIES SERVING AGRICULTURE

Agricultural production uses as inputs a great variety of industrial products. In traditional agriculture the use of such inputs is generally small, but a main feature of the modernization of agricultural production is the widening range of goods demanded from the industrial sector. In part this reflects increased specialization in the economy, for many activities such as the manufacture and repair of implements, construction work and the preparation of animal feed, which were originally carried out largely on the farm, tend increasingly to be transferred to the nonfarm sector, in the same way as some food processing has been transferred from the farm to the factory.

These inputs originate from many different branches of industry. The chemical industry provides fertilizers. The pharmaceutical industry produces drugs, antibiotics, biologicals, pesticides and herbicides. The engineering industry makes the tractors and other machinery, tools and implements, stationary power units, pumps and transport equipment that represent much of the fixed capital investment in agriculture. Agriculture is also a major consumer of fuel and power, and of construction materials for farm buildings and storage facilities. Forestry requires specialized tools and equipment, and fisheries are an important customer not only for the shipbuilding industry but also for industries producing highly specialized gear and electronic equipment. In the more advanced economies, the preparation of compound animal feedstuffs is an important activity, generally closely allied to the food processing industry and often based on its by-products. Finally, a wide variety of equipment is required for the industries processing, packing and transporting crop, livestock, fishery and forest products.

Although they originate from so many different sectors of industry, the products enumerated above have a certain unity in that they are all destined for the same final consumer. It is therefore of interest to examine them together as the industries serving agriculture, especially those (such as the manufacture of fertilizers, pesticides and farm machinery) that are producing specifically for agriculture rather than for other sectors as well.

Industrial inputs for agricultural production

Tables III-17 and III-18 indicate the role of inputs of industrial origin in agricultural production. The data in Table III-17, which are confined to developed countries, are derived from agricultural sector accounts. Table III-18 is based on input-output tables, which make possible the inclusion of a number of developing countries as well.

The data based on sector accounts show that in developed countries the share of purchases of current inputs from other sectors and abroad (excluding feedstuffs) ranges from 8 to 29 percent of the gross value of output. The ratio is clearly higher in the countries with technologically more advanced farming methods (for example, it averages only 9 percent in southern Europe, as compared with 21 percent in northwestern Europe).

For the developed countries, the data based on input-output tables show a roughly comparable picture, especially when account is taken of the wider dispersion of the data over time, and the fact that most of them refer to a period several years back. The current inputs of industrial products generally range in this group of countries from 7 to 16 percent of the gross value of output, with somewhat higher figures for the Netherlands and the United Kingdom.[69] In addition, industrial products make a

[69] The relatively high figure in these two countries may reflect the input of industrially prepared feed mixes, which in input-output tables are classified as products of the food industry. All feedstuffs are excluded from the data based on sector accounts.

TABLE III-17. – CURRENT OPERATING EXPENSES AND GROSS CAPITAL EXPENDITURE IN AGRICULTURE, 1960-62

	Current operating expenses[1]					Gross capital expenditure		
		of which					of which	
	Share of gross value of output	Fertilizers	Pesticides	Fuels, lubricants, electricity	Maintenance and repairs	Share of gross value of output	New buildings, costruction and improvement	New machines and equipment
	Percent							
United Kingdom	29.1	16.3	...	10.4	32.4	8.8	33.4	66.6
Sweden	26.2	25.0	...	18.8	37.4	14.7	39.5	60.5
Germany, Fed. Rep. of	22.7	25.7	2.6	15.9	39.7	24.6	58.9	41.1
Denmark	22.5	25.5	...	13.5	28.0	9.5	34.9	65.1
Austria	20.8	16.9	2.3	15.0	28.7	17.8	37.0	63.0
Switzerland	19.8	16.1	5.5	13.9	21.6	13.5	39.7	60.3
France	18.6	31.1	3.0	12.2	21.3	9.4	17.1	82.9
Ireland	16.9	25.1	...	15.7	6.0	9.1	48.2	51.8
Netherlands	16.8	35.2	...	10.4	24.0	9.2	57.8	42.2
Norway	15.1	33.2	...	23.5	...	24.7	64.3	35.7
Belgium	14.8	39.4	3.9	10.3	9.6	7.0	40.5	59.5
Finland	14.6	45.6	...	24.6	27.1	14.7	17.2	82.8
Northwestern Europe	21.5	25.5	(3.3)	13.3	(29.6)	13.6	43.1	56.9
Yugoslavia	10.0	28.9	7.5	14.9	18.5	18.0	49.1	30.1
Spain	9.7	51.7	8.8	15.0	12.6	8.6	11.7	40.3
Italy	9.0	30.5	11.7	9.4	...	14.6	72.1	27.9
Greece	8.3	42.2	4.7	6.1	9.0	11.8	12.6	12.1
Southern Europe	9.1	36.5	10.0	11.3	(16.5)	14.2	62.8	26.9
WESTERN EUROPE	17.8	27.3	(5.0)	13.1	(28.4)	13.7	48.1	49.4
Israel	19.2	10.8	8.9	6.5	13.2	23.3	81.3	18.7
Hungary	15.1	15.9	8.4	17.9	28.4	16.4	38.8	43.4
Poland	12.5	29.4	1.9	17.8	32.4	10.7	...	...

SOURCE. FAO/ECE, *Fifth report on output, expenses and income of agriculture in European countries*. Vol. II, Statistical Annex, Geneva, 1965.
NOTE. Operating expenses relate to the purchase of materials and services for current production from other sectors of the economy and from abroad. Thus they exclude purchase of capital equipment (shown separately in the table) and inter farm sales. In the present table all purchases of feedstuffs have also been excluded. For the eastern European countries, the definitions are somewhat different (see original source). Figures in parentheses are estimates.

[1] Excluding feedstuffs.

TABLE III-18. – CURRENT AGRICULTURAL INPUTS FROM INDUSTRIAL AND SERVICES SECTORS

	Year	Industry [1]	Services [2]
	Percent of gross value of output		
United Kingdom	1960	28.4	14.6
Netherlands	1959	23.0	4.6
Germany, Fed. Rep. of	1960	16.3	5.1
Belgium	1959	13.9	4.8
Japan	1960	13.5	3.6
France	1959	12.8	8.3
United States: livestock	1958	12.2	9.8
other agriculture		12.0	20.9
forestry and fisheries		7.4	15.6
Australia	1958/59	11.8	26.6
New Zealand	1954/55	11.4	10.9
China (Taiwan)	1962	9.7	10.9
Norway	1954	9.2	4.1
Italy	1959	7.0	3.8
Denmark	1949	6.8	4.8
Finland	1956	6.8	5.6
Malaysia: Malaya	1960	6.6	2.4
Philippines	1956	3.2	16.3
Peru	1955	3.0	0.7
Syria	1956	2.2	25.1
India	1960	1.8	[3]0.1
Bolivia	1958	0.3	0.2

SOURCE. National input-output tables.
[1] Including mining. – [2] Including construction (maintenance and repair). – [3] Excluding construction.

contribution to agricultural output through their use in services, utilities and construction (repair and maintenance) activities. These are included in the total for data based on sector accounts, but are shown as a separate group in the input-output data.

In developing countries, the current input of both industrial products and of services is a much smaller portion of the gross output. The former ranges, in the countries for which data from input-output tables are available, from virtually zero in Bolivia to almost 10 percent in China (Taiwan). The data on services show an even wider range, probably in part due to differences in definition and coverage.

Although the current inputs of industrial origin in the agriculture of the developing countries are generally so small at present, the high figure for China (Taiwan) in Table III-18 suggests that intensive efforts to raise output and productivity will, especially if land resources are limited, necessitate industrial inputs of comparable magnitude with those in developed countries. Thus, while the share of agriculture in the economy falls as development proceeds, this is likely to be largely offset, as regards agriculture's demands on industry, by the increase in industrial input requirements per unit of output as farming techniques are improved.

The data in Table III-18 refer to current inputs only, and ignore the input of fixed capital, thus considerably underestimating the total demand for industrial products as agricultural inputs. Data on fixed capital inputs are unfortunately very incomplete. Some national investigations suggest, however, that in at least some of the advanced economies the capital stock per worker is substantially greater in agriculture than in manufacturing industry.[70]

The data on actual capital expenditure in Table III-17, available only for developed countries, indicate that this varies from 7 to 25 percent of the value of gross output. It tends to vary less predictably than current expenses, with little obvious relationship with the level of technological development in agriculture and probably is more a reflection of the countries' efforts to mechanize their farming and to bring about structural and other basic changes. In contrast to the current expenditure, moreover, the ratio of capital expenditures to gross output was on the average somewhat higher in southern Europe than in northwestern Europe.

GROWTH OF DEMAND FOR INDUSTRIAL INPUTS

Only for fertilizers and tractors is it possible to present some worldwide tabulations which provide some indication of the growth of demand (Tables III-19 and III-20). These are, however, two of the most important production requisites that industry provides for agriculture. Fertilizers are a major source of increased production and productivity, and tractor numbers give a rough indication of the general level of mechanization.

Between 1945/46 and 1964/65 world fertilizer consumption rose more than five-fold, and even during the more normal period from the mid-1950s to the mid-1960s it doubled. In the developing countries, where the level of consumption is still very low, the growth has been much the fastest.

Among the many items of farm machinery, tractors are usually a key element, because of their many

[70] This is said to be so, for example, in the United Kingdom (see FAO/ECE, *Fifth report on the output, expenses and income of agriculture in European countries*, Geneva, 1965, p. 110) and in the Federal Republic of Germany (see G. Müller and H. Schmidt, *Kapitaleinsatz und Produktivitat in Landwirtschaft und Industrie*, Berlin - München, 1959).

TABLE III-19. – CONSUMPTION AND PRODUCTION OF COMMERCIAL FERTILIZER

	Consumption				Production 1964/65	Surplus or deficit
	1945/46	1954/55	1964/65	Increase 1954/55 1964/65		
	... *Million tons* ...			*Percent*	*Million tons*	
Western Europe	3.2	6.3	12.9	105	11.4	— 1.5
Eastern Europe and U.S.S.R.	0.8	4.1	8.4	105	13.2	+ 4.8
North America	2.7	6.1	10.7	75	12.1	+ 1.4
Oceania	0.4	0.7	1.4	100	1.2	— 0.2
Japan	0.1	1.1	1.8	64	2.0	+ 0.2
Developed countries	7.2	18.3	35.2	92	39.9	+ 4.7
Latin America	0.2	0.5	[1]1.6	[1]220	[1]0.7	— [1]0.9
Far East [2,3]	—	0.5	2.0	300	0.7	— 1.3
Near East	—	0.2	0.6	200	0.5	— 0.1
Africa	0.1	0.3	[1]0.6	[1]200	[1]0.4	— [1]0.2
Developing countries	0.3	1.5	4.8	220	2.3	— 2.5
WORLD TOTAL [3]	7.5	19.8	40.0	102	42.2	+ 2.2

[1] 1963/64. – [2] Excluding Japan. – [3] Excluding China (Mainland).

applications as a mobile and stationary source of power. International comparisons of tractor numbers must be made with caution, because of the differing sizes and capacities of the tractors used in different countries, as well as differences in the intensity of their use. The broad picture presented by Table III-20, however, is very similar to that in the table on fertilizer use, suggesting that the adoption of modern techniques of production tends to move forward simultaneously on a broad front, because of the complementary nature of many of them. For the world as a whole, the growth in numbers of tractors used has been somewhat slower than in fertilizer consumption. However, just as with fertilizers, the increase has been very much faster in the developing than in the developed countries, where (particularly in North America) a high degree of mechanization had already been achieved by the mid-1950s.

TABLE III-20. – TRACTORS USED IN AGRICULTURE

	1954	1964	Increase 1954-64
	... *Thousands*		*Percent*
Western Europe	1 590	4 160	162
Eastern Europe and U.S.S.R.	865	2 139	147
North America	4 827	5 215	8
Oceania	250	385	54
Japan [1]	1	17	1 616
Developed countries	7 533	11 916	58
Latin America	218	488	124
Far East [2]	30	88	193
Near East	55	111	102
Africa	143	230	61
Developing countries	446	917	106
WORLD TOTAL	7 979	12 833	61

[1] The table excludes garden tractors, which in Japan are the main type used in agriculture and rose from 35,000 in 1954 to 2.2 million in 1964. – [2] Excluding Japan.

Agricultural input industries in the developing countries

Even more than the industries using agricultural raw materials, the industries serving agriculture are still very largely located in the developed countries. Their establishment generally requires a much wider industrial base, especially of industries producing intermediate inputs such as basic chemicals, iron and steel, and cheap power. They are often highly capital intensive and subject to substantial economies of scale. Many of them are, therefore, particularly appropriate for establishment in the context of schemes for regional co-operation between developing countries. As already indicated, however, demand for many of the products of these industries is rising rapidly in the developing countries, and as agricultural development proceeds it is likely that the establishment of economically viable domestic industries to replace imports will become increasingly possible. But it is essential that the establishment or expansion of such industries be preceded by a careful assessment of agriculture's likely future demand for their products.

FERTILIZERS

The first requirement for the use of fertilizers by farmers is knowledge of the most agronomically and economically efficient kinds of fertilizers and their rates of application with various crops and soils. This knowledge is a prerequisite to any effort to promote the use of fertilizers as a means of increasing crop yields and farmers' incomes. One of the quickest and most effective ways of obtaining such information and at the same time teaching farmers the use of fertilizers, is through trials and demonstrations put down in farmers' fields.

Before embarking on the domestic production of fertilizers, it is not only essential to obtain this information but also to develop an effective demand for fertilizers by means of an efficient organization for the demonstration of the benefits of fertilizer use, for the distribution and marketing of fertilizers, and for the provision of the necessary credit facilities.

As Table III-19 shows, the developing regions today produce just under half of the very small quantity (in comparison with developed countries) of commercial chemical fertilizers they consume. The rest is imported, mainly from western Europe, the United States and the U.S.S.R. The fertilizer industry of the developing regions is so far concentrated in a limited number of countries. In the Far East, apart from Japan, only China (Taiwan), India, the Republic of Korea, Pakistan and the Philippines have significant fertilizer industries. In India a rapid increase in fertilizer production is expected as a result of new concessions to private foreign capital.

In Africa, fertilizers are produced in Algeria, Morocco, South Africa and Tunisia, and in smaller quantities in Kenya. In the Near East, Israel, Turkey and the United Arab Republic produce substantial quantities of fertilizers. In Latin America, production is somewhat more diffused, with one type or another of chemical fertilizer produced in Brazil, Chile, Colombia, Mexico, Peru, and in smaller quantities in Argentina, Cuba, Uruguay and Venezuela.

The limited number of developing countries possessing chemical fertilizer industries is a reflection of the many difficulties involved in their establishment.[71] For most types of chemical fertilizer manufacturing, costs of both installation and production are relatively much higher for small than large plants, and few developing countries as yet have domestic markets justifying plants of a size that can compete with imported products (for example, the lower limit of plant size for the economic production of nitrogenous fertilizer is about 30,000 tons of nutrient per year). Indeed, the capital costs of fertilizer plants are so high, and have such a heavy import content, that in many situations the use of the available foreign exchange for fertilizer imports, rather than for the construction of a fertilizer plant, may appear distinctly more attractive, especially as such plants tend to "age" fairly rapidly in a technological sense. Nor would the establishment of a fertilizer industry be favored by employment considerations, as fertilizer plants, once in operation, use little labor relative either to the capital invested or to the value of the output, and the labor that is used has to be highly skilled.[72]

On the other hand, in deciding on investment priorities between different industries, it is not sufficient to take account only of the capital-output ratio of the fertilizer industry itself. Decisions should be based on the ratio of the increase in output in agriculture to the total capital invested both in the fertilizer industry itself and in associated activities needed to promote fertilizer use. This ratio will be much more favorable, because of the large increases in agricultural output that can be gained through fertilizer use. Such considerations, together with the urgency of increasing agricultural production in most developing countries in order to improve diets and avoid inflationary pressures, largely explain the emphasis that has been placed on the establishment of fertilizer industries in developing countries despite the many difficulties involved.

Machinery and implements

Far less information is available on the manufacture of farm machinery and implements in the developing countries. The considerations which determine whether or not a country can set up an industry to produce tractors are akin to those determining industrial expansion in general. In particular, most developing countries' demand for increases in and replacements of their tractor stock is still too limited to make a domestic industry economic. Some relief from the limitation imposed by the size of domestic demand is, however, offered by the possibility of setting up, in the first instance, establishments which (as in the case of automobiles) merely assemble the tractors from components which initially are virtually all imported.

Nevertheless, tractors are assembled only in a limited number of developing countries. In the Far East, for example, they are assembled in India, where a large portion of the components is of domestic origin. Tractors are also assembled, mainly from imported parts, in the Philippines, though so far on a very small scale. In China (Taiwan) a joint enterprise with foreign participation produces enough small-size tillers to satisfy domestic demand, with a substantial surplus for export. In Latin America,

[71] The reasons why fertilizer production tends to be more expensive in developing than in developed countries are discussed by J. Tinbergen in *Observations on the planned provision of nitrogen fertilizer for the world.* Leyden, 1956.

[72] See H.W. Arndt. The balance of payments argument for priority of heavy industry. *Sankhya.* 24, 1962, p. 265-276.

tractors are assembled only in Argentina, Brazil and Mexico. In Brazil, the industry operates almost entirely on the basis of domestically produced components; in Argentina, where about 80 percent of the components are domestically produced, there are six tractor plants, with a total annual output of over 10,000 units; in Mexico, production was started in 1965 in two plants, with a combined output of 3,500 units per year, on the basis of about 60 percent of domestically produced components.

For the manufacture of a great many other industrial products needed in agriculture, however, there are no overriding economies of scale, and the production of such requisites is very much more widespread. Thus a number of Far Eastern countries produce much of their requirements for products such as electric and diesel motors for farm power, pumps for farmyard and irrigation uses, sprayers, dusters, threshers, and various hand tools, as well as implements for use with animal draft power, such as plows and harrows, and equipment for poultry and dairy production. India is self-sufficient in the most commonly required types of farm machinery, except tractors and, like China (Taiwan), exports some items. In Latin America, Argentina has a large production of a considerable range of equipment such as plows, harrows, harvesters and tillers, some of which are exported to other countries in the region. Mexico produces disk plows, harrows, tillers and other equipment, and here too there are some exports. A number of other countries also produce various agricultural implements and equipment.

In addition to their import saving potential, the small minimum size of many of these plants, the ease with which they can be expanded (with regard to both the scale and the variety of output) and the steady and predictable growth of the demand for their products make these small engineering industries particularly suitable for the early stages of industrial development. They also make possible the development of equipment that is better suited to the needs of developing countries than that which is normally available on import markets.

Equipment and other requisites for processing industries

Many developing countries exporting particular agricultural products in processed form have developed new industries in response to the domestic demand for machinery and intermediate inputs required in their processing, and in many cases they have even built up an export of these items.

An outstanding recent example is Peru where, as a result of the rapid expansion of the fish meal industry, a series of important related industries were established. Virtually all the machinery and processing equipment used in fish meal production is now manufactured locally, often under licence agreements. As well as supplying domestic demand, the industries have successfully entered the export field. At least one complete fish meal reduction plant costing U.S.$250,000 and boats to a value of over U.S.$1 million have recently been sold abroad. Between July 1962 and July 1963 some five hundred 90- to 100-foot vessels were produced, and almost 100 boat-building yards were in operation. Further products made locally to supply the fishing industry include nets, fish pumps, centrifuges, poly-lined and jute bags, floats and flexible hoses.

Other examples include the manufacture of components and machinery for the cotton or jute textile industry. In the Far East, this is done not only in India, where major portions of complete units of textile machinery are now produced domestically, but also in China (Taiwan), Indonesia, the Republic of Korea and Pakistan. Brazil has a substantial textile equipment industry, and it has been estimated that local production could contribute about 57 percent of the $168.5 million worth of machinery required to re-equip the textile industry in the Centro-Sud region.[73] A number of Far Eastern countries also produce components for sugar mills, oil extraction (India makes complete mills), tea processing, rice polishing and milling, and rubber processing.

Many developing countries have also set up industries to make containers for food processing industries. The forest industries catering to these needs were discussed in the previous section of this study.

A wide variety of machinery is required for the industries processing forest products. Current annual investments in the most capital intensive of these industries, the pulp and paper industry, are of the order of U.S.$2,000 million. More than half of this investment consists of machinery and equipment, the manufacture of which is, however, so far largely concentrated in a few developed countries.

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[73] United Nations. *The textile industry in Latin America: II. Brazil.* New York, 1963. p. 116.

MAIN PROBLEMS

It remains to summarize some of the main problems and policy issues faced by the governments of developing countries in their agricultural planning in relation to industrialization, and in particular in the planning of industries based on crop, livestock, fishery and forest products as raw materials.

The first point for emphasis is the need for the integrated planning of agriculture and industry, if each is to make its full potential contribution to economic growth. This is only a beginning, however, and, within the framework provided by this macro-economic planning, detailed planning and feasibility studies are also necessary at the enterprise level if viable industrial projects are to be established.

Among more specific problems, a key question is the extent to which it is possible for developing countries to choose industrial technologies better suited to their resource endowment than the modern capital-intensive methods that have been evolved mainly in the labor-scarce developed countries, and in particular the extent to which industries using agricultural raw materials lend themselves to such a choice. Another major problem for developing countries is how to expand their foreign exchange earnings from exports of processed products in competition with established industries in developed countries, which are often protected by tariff and other barriers.

These topics are discussed in more detail below, and the two final sections of the study review in turn how governments can assist in the establishment of agriculture-related industries and how international assistance (including that available from FAO) can support these efforts.

Integrated planning of agriculture and industry

The interdependence of agriculture and industry, the main aspects of which were outlined at the outset of this study, is now generally recognized and understood, but its implications are still only rarely reflected fully in economic planning and policy making. More attention is needed to what was termed earlier "agro-oriented" industrialization. Industry can itself contribute to the expansion of food production by supplying the agricultural population both with consumer goods to give them the incentive to increase their production and sales, and with the inputs they require for more efficient production.

An important aspect of the interdependence of agriculture and industry is the close link that is needed between agricultural production and the facilities for processing agricultural products. Processing is only one link in the chain between producer and final consumer, and the need for close contact between the agricultural producer and the processing establishment is reinforced by certain effects of the biological nature of agricultural production. This has been reflected in developing countries by plantation systems of production for certain crops, whereby production, processing and marketing are carried out by the same enterprise, and in developed countries in recent years by various systems of vertical integration based on contracts between producers and processors. The latter are likely to increase in developing countries as the demand for processed products expands, and as technological developments in industry continue to change raw material requirements.

It is especially in projects for the overall development of particular areas within a country that it is possible to take full acount of these interrelationships in economic planning. This is the case in a number of such projects, mainly in Mediterranean countries, for which FAO is the Executing Agency for the United Nations Development Program. The resources of the areas concerned are primarily agricultural, and the development of industries processing agricultural products in these areas has not only given a start to their industrial development but has also expanded the outlets for agricultural produce.

A related question concerns the siting of industries using agricultural raw materials. As noted earlier, because of the perishability of the product or because of the substantial loss in weight or bulk that occurs in processing, many of these industries must be carried out close to the raw material source. In addition, however, it is often advocated that a major part of the processing that is not tied on technical or economic grounds to the raw material source should also be carried out in rural areas. The reasons advanced are the need to relieve rural underemployment and to restrict the growth of vast urban population centers, with their attendant social evils.

Unfortunately, the effect on rural underemployment of the industries that are tied to the raw mate-

rial source tends to be limited by the fact that their demand for labor often coincides with the existing peak demand at the harvest period. This is obviously the case with perishable products, which have to be processed immediately after harvest, but because of the high cost of storage it also applies to many other products as well. Thus, if much impact is to be made on rural underemployment, additional industries must be located in rural areas.

However, there are a number of possible disadvantages in such a policy. Although wage rates are generally lower in rural areas, actual labor costs may be higher, since the labor force is less skilled than in urban areas. Other external economies enjoyed by industries in urban areas derive from the sharing of transport, power and related infrastructure. Furthermore, the relief of urban unemployment is even more urgent in most developing countries than that of underemployment in rural areas, for the rural underemployed generally have the possibility of obtaining at least their own minimum needs for subsistence.

If the agriculture-related industries are to receive due attention in industrial planning, certain special institutional arrangements may be necessary in some developing countries. Agriculture and industry are handled in separate government departments, and that concerned with industry is usually occupied chiefly with the so-called "strategic" heavy industries. Thus the industries processing agricultural raw materials and to some extent also those serving agriculture tend to fall between two stools. Often the best solution will be to establish in the agricultural ministry a special unit to deal with the industries related to agriculture, though clearly such a unit would have to work very closely with the department responsible for industries in general.

Feasibility studies

In the earlier discussion of the industries using agricultural raw materials, an attempt was made to determine the advantages that such industries have for the developing countries and the contribution they can make to their economic development. It must be emphasized, however, that these advantages are by no means inevitable and depend on the establishment of an enterprise of suitable size and type and on its subsequent efficient operation.

Often the margin between success and failure is very small. The capital investment involved is sometimes very large (for example, between $12 and $20 million for a medium-sized pulp and paper plant), but even where it is much smaller the developing countries can ill afford any waste of this scarce resource. Only through detailed planning and feasibility studies is it possible to avoid the further proliferation in the developing countries of the "white elephant" projects that are already all too common in the industrial field. Many such projects, although fulfilling the highest engineering requirements, have failed because their planning has neglected the economic environment in which they must operate. Thus engineers, agricultural specialists and economists must combine in the necessary preinvestment studies, and the initial establishment of plant on a pilot scale may often be advisable. A guide to the carrying out of feasibility studies for agricultural processing industries is at present in preparation in FAO, and the following paragraphs summarize some of the main points that have to be considered, many of which should already be apparent from the earlier discussion of individual industries.

Market research forms a basic part of such a study. The analysis of consumer demand would cover such questions as levels of consumption, the type of consumer who buys the product, the fluctuations that occur in demand, the most suitable packaging, the present quality of the produce and how it could be improved, whether the consumer would pay higher prices for better quality, and the relationship between consumer demand for unprocessed and processed products. Where new products have to be introduced, studies on consumer acceptability must be carried out. Competition from other suppliers must be studied, not only in respect of similar products but also the competition from other products which can to some extent be considered as substitutes. A projection of demand has to be made at least for the lifetime of the processing equipment envisaged. The need for promotional measures will also need to be studied. As well as the main product, market research should cover the possible utilization of by-products and waste products.

Equally important is an assessment of the supply of raw material for processing. Careful study is needed of the present availability of raw material, with regard to quantity and quality, and seasonal and annual fluctuations. Where the available raw material is not sufficient, it is necessary to investigate the scope for expanding the supply, improving its quality and lowering its price. This involves analysis of the introduction of new varieties, the

improvement of cultivation methods, and the feasibility of organizing storage programs. In the case of forest products and tree crops, a long period may be required for the expansion of the supply of raw material. The economics of production in relation to those for other crops have to be taken into account. The possibilities for the multi-product utilization of the plant should be investigated, especially for highly seasonal products such as fruit and vegetables. Attention has to be given to the attitude and behavior of farmers concerning new outlets and their reaction to incentive measures. An analysis of the existing marketing channels and services is also needed, with regard both to the purchasing of raw materials and the sale of processed products. An assessment must be made of the marketing organization that will be required, including the extent and form of vertical integration that is desirable.

Concerning the plant itself, one of the most crucial decisions relates to the determination of the most appropriate capacity. This involves, in addition to the careful assessment of the likely supply of raw materials and demand for the processed product, consideration of economies of scale, the influence of various degrees of capacity utilization on the unit processing cost, the relationship between size, transport costs and other factors, and the effect of fluctuations in supply and demand on the unit processing costs. The determination of capacity should always be based on a dynamic view of the situation, allowing for the future expansion of raw material supplies and of market outlets, especially as in some cases the establishment of processing facilities is an essential prerequisite for the growth both of supplies and demand. This should, however, not be overdone. As was stressed particularly in connection with dairy plant in the above account of individual industries, overoptimism in estimating the capacity likely to be required is one of the most frequent causes of failure. This is sometimes reinforced by a tendency of construction firms to advocate large-scale equipment. Instead of enjoying the economies of large-scale production, such plant must operate far below full capacity, so that unit costs are burdened with excessively heavy capital charges. It is much better to establish a plant whose capacity is fairly close to present requirements, embodying provision for future expansion as supply and demand increase.[74]

[74] This may sometimes make possible the saving of capital. For example, in the pulp and paper industry the new investment needed to add a given capacity to an existing mill is in some conditions only 50-70 percent of that required to establish a separate mill of the same capacity.

A further important consideration is the determination of the most suitable location for the plant. An analysis is needed of how location is influenced by transport costs for the raw material and finished products, by the availability and cost of labor, water supplies and power, and by taxes and other factors. The existence of adequate transport facilities is particularly important for perishable products and for products such as pulp and paper which involve the transport of very large quantities of bulky raw materials. Water supplies are a major factor in the location of a number of industries, including textiles, pulp and paper, and hides and skins.

The choice of technology depends to a large extent on the raw material and the type of finished product. The equipment to be chosen is, however, also influenced by the capacity of the plant, the costs of labor, capital, etc. To attain the lowest unit costs, particular attention has to be given to the full use of the cheap labor available in developing countries. This question is discussed in more detail below.

A careful study should also be made of the investment required and a budget drawn up of income and expenditure, including foreign exchange requirements. The budget should cover several years of operation, not only the first, and a breakdown of the annual budget into monthly periods may also be necessary. Working capital needs should be carefully estimated.

The success of a processing project depends very heavily on the efficiency of its management and administration. Particular attention must be given to training. Although in many industries using agricultural raw materials the requirement of skilled labor is small, it is almost always a key factor.

The overall evaluation of the project must be made according to various criteria: not only commercial profitability but also national economic profitability, foreign exchange benefits, and so on.

Choice of technology

The developing countries face a difficult problem in the choice of the technology they should adopt in their industrial development. On the one hand, the use of the modern technology developed in the high-income countries holds out the promise of a significant reduction in the time and sacrifices needed to achieve a high rate of growth. On the other hand, these production techniques appear ill-adapted to the factor availabilities in developing countries,

where unskilled labor is plentiful and capital (especially foreign exchange for the purchase of machinery) and skilled labor scarce. It is therefore frequently suggested that they should use a technology better adapted to their own conditions.

It is only in certain circumstances, however, that there is a real choice of technology. For example, in comparing two technologies from the strictly economic point of view of resource utilization, if one of them uses more labor or more of any input, in combination with the same quantities of all other inputs, but output remains the same, that technique is clearly inferior. The real economic issue arises when, for the same level of output, alternative technologies require more of some productive factors and less of others. In terms concretely applicable to developing countries, this is when the capital-output ratio can be reduced by increasing the ratio of labor to capital. Developing countries can increase the degree of labor intensity by choosing either labor-intensive industries, or labor-intensive techniques within a given industry, or a combination of the two.[75] Regarding the first, it is clear there is considerable variation in capital intensity in the production of different commodities. In general, consumer goods industries, especially those suited for medium- or small-scale operation and using agricultural raw materials, would seem to be more labor intensive than the capital goods industries, and this is one reason why developing countries are frequently urged to give higher priority to the former in their industrialization programs. But the extent to which it is possible to choose labor-intensive products is obviously limited by the composition of demand and the degree of substitutability between products.

Regarding the second possibility, the freedom to choose alternative technologies is not present in all industries. Thus, labor-intensive technologies would be quite inappropriate in the electronics industries. In some others they can result in such an enormous difference in the quality of the product as to be of very limited use, for example in the Chinese attempt to produce steel by backyard techniques. Nevertheless, there are a number of industries in which there is a real choice of alternative technologies. In weaving cloth, for example, there is a wide range of efficient techniques varying from the handloom to the automated power loom, and in oil seed crushing from hand presses to solvent extraction plants.

[75] An additional method is to increase the number of shifts that are worked. for which there is often ample scope in developing countries.

There are, in addition, certain phases or processes in production which afford greater flexibility in the choice of technology. The choice in the central production process may be restricted, but in subsidiary, peripheral operations, in particular those having little effect on the quality of the final product, labor-intensive techniques could be used. Examples are in the construction phase of a project and in the handling of raw materials.

The choice of technology is also influenced by the objectives, strategy and time horizon of development. Labor-intensive techniques lay emphasis on the short-run aspects and the objective of creating employment. However, if the major objective is the long run maximization of the rate of growth, it might be more appropriate to choose a capital-intensive technology, because the distribution of income to which it gives rise is more conducive to the creation of surpluses and thus reinvestment.

There are some other factors to be taken into account in deciding on the choice of technology. The continuing introduction of new technological processes in the future may be influenced by the techniques chosen now. This has happened in labor-intensive industries which have opposed, often successfully, any innovations. There is a danger that the promotion of labor-intensive technologies in certain industries will create a "dual economy" in industry such as exists already in the agriculture of many developing countries and that, as the modern, capital-intensive sector expands, the labor-intensive sector will require larger and larger subsidies and protection to enable it to survive. Furthermore, considerations of quality and price, resulting from differences in technology, become important especially on export markets. On the other hand, the experience of Japan shows that small-scale, labor-intensive industries and methods are not invariably inimical to technological or economic progress.

Much more information is needed on the range of technological substitutions that are possible, including quantitative data on the levels and variability among the different inputs associated with each technology. There should be continuing research into new techniques especially suited to the conditions in the developing countries. Most of the technological research takes place in the developed countries, where labor is a scarce factor, and it is therefore directed to laborsaving. With the increasing demand of the developing countries for equipment, however, manufacturers have already begun to pay more attention to their special needs.

A related and highly controversial question is the use of secondhand machinery, which is sometimes advocated as a means of limiting capital expenditure in the industrialization of the developing countries. Here there would appear to be no general answer, but the relative advantages and disadvantages of using such machinery should be carefully weighed in the circumstances of each industry.

Trade problems

An expansion of exports in processed form was one of the principal ways singled out by the United Nations Conference on Trade and Development (UNCTAD) in which developing countries could increase their foreign exchange earnings. There are, however, a number of circumstances which tend to hinder the expansion of exports of processed agricultural products from developing to developed countries. These are mainly: the presence of tariff and nontariff barriers in developed countries; difficulties of marketing processed products in developed countries and other new markets; and the weak initial competitive position, in terms of both price and quality, of the products of the developing countries.

Tariff barriers

The question of the protective effect of import duties is a very complex one. Virtually all of the developed countries, while permitting raw materials to enter free or at low rates of tariff, apply tariffs on processed products which as a rule are progressively higher, the more highly processed is the imported product (see columns referring to nominal tariff rates in Table III-21). This naturally tends to inhibit exports of processed products from developing countries, and favors the expansion of trade in raw or relatively less processed forms.

The matter of tariff barriers does not, however, end there. In the first place, as is being increasingly recognized, the nominal duty rates do not in themselves express the degree of protection accorded. That protection is expressed by what is called the "effective" or "implicit" rate of tariff, which takes account not only of the tariffs paid on the final product, but also of the value added in processing and of the duties that may be paid on materials used in the process of production. The effective tariff rate, which thus takes account of the whole tariff structure of the importing country, "rises with increasing duties levied on the product of the manufacturing process, and with decreasing values added. It declines with increasing duties levied on the materials used in the manufacturing process. It is negative if those duties exceed the duties levied on the product itself."[76]

It follows that the differences between the duty rates applied to imports of raw and processed products do not necessarily give a full picture of the tariff protection actually accorded to agricultural (or other) processing industries. This is confirmed by Table III-21, where some calculations of the effective rates of protection are compared with the nominal rates.

The effective rates shown in the table are in all cases higher than the nominal rates of tariff on the processed products.[77] In most cases the effective protection is 50 to 100 percent greater than the nominal rate for the processed products, and in a few cases the difference is very much greater.

Secondly, even the level of the effective tariff rate is not a complete measure of the degree of protection it affords. Another factor is the supply and demand elasticities for the product in the exporting and importing countries. If both are high (and assuming that the tariff change results in price changes), even a relatively small decrease in the effective tariff rate may lead to substantial increases in imports, and vice versa. Clearly these elasticities will vary not only from product to product but also from country to country, so that even identical changes in tariff structures will not always lead to the same changes in trade.

Finally, the effect of tariff changes on trade will also depend on the comparative advantage of the exporting and importing countries in producing the goods in question. The effect of tariffs is restrictive if they offset the comparative advantage of the exporting country. Conversely they are of little or no effect when levied on products for which the importing country in any case has a comparative advantage.

The complexity of the question of tariff protection has several policy implications. In the first place, it remains true that, even though in most cases the effective protection of agricultural processing in developed countries is not known, a reduction

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[76] United Nations Conference on Trade and Development (UNCTAD). *Tariff structures of selected developed countries and their effect on exports of processed goods from developing countries.* United Nations Conference on Trade and Development (UNCTAD) Document TD/B/C.2/9. 7 February 1966, p. 3 (mimeographed).

[77] This need not necessarily be so. Calculations for some nonagricultural products (not shown in the table) showed lower effective than nominal rates of tariff, including one case where the effective rate was negative.

TABLE III-21. – TARIFF RATES FOR SELECTED AGRICULTURAL PRODUCTS IN RAW AND PROCESSED FORM IN MAIN INDUSTRIAL COUNTRIES, 1963

	EEC [1]		United Kingdom		United States	
	Nominal [2]	Effective [3]	Nominal [2]	Effective [3]	Nominal [2]	Effective [3]
	Percent					
Wood and wood products						
I Wood in the rough and roughly squared (SITC 242) [4]	—	...	—	...	—	...
II Veneer and plywood (SITC 631)	10	...	10	...	16.8	37.9
III Wood products, including furniture (SITC 632)	15.1	28.6	14.8	25.5	12.8	26.4
Leather and leather products						
I Hides and skins, undressed (SITC 211)	—	...	—	...	—	...
II Leather (SITC 611)	7.3	18.3	14.9	34.3	9.6	25.7
III Leather manufactures: (SITC 612)						
shoes	19.9	33.0	24.0	36.2	16.6	25.3
leather manufactures other than shoes	14.7	24.3	18.7	26.4	15.5	24.5
Wool and wool products						
I Wool and animal hair (SITC 262)	—	...	0–10	...	0–47	...
II Yarn of wool and animal hair (SITC 651.2)	8	...	17	...	25	...
III Woven wool fabrics (SITC 653.2)	18	...	22	...	46	...
Rubber and rubber products						
I Rubber, natural (SITC 231.1)	—	...	—	...	—	...
II Rubber tires and tubes (SITC 629.1)	20	...	27	...	19	...
Cocoa and cocoa products						
I Cocoa beans, raw (SITC 072.1)	5.4	...	1.5	...	—	...
II Cocoa powder and cocoa butter (SITC 072.2 and 072.3)	20–27	136	0.5–2.0	13	6.5	50
Cotton and cotton products						
I Cotton, raw (SITC 263.1)	—	...	—	...	—	...
II Cotton yarn and thread (SITC 651.4)	2.9	3.6	10.5	27.9	11.7	31.8
III Cotton fabrics (SITC 652.1 and 652.2)	17.6	44.4	20.7	42.2	24.1	50.6
IV Clothing (except fur clothing) [5] (SITC 841)	18.5	25.1	25.5	40.5	25.1	35.9

SOURCE: UNCTAD. Tariff structures of selected developed countries and their effect on export of processed goods from developing countries, Document TD/B/C.2/9, 7 February 1966, p. 4-6 (mimeographed).

[1] Common external tariff. – [2] Tariff rate as actually applied to the specified product. – [3] Calculated rate of protection accorded to the value added in the manufacturing process. – [4] Stage of processing. – [5] Clothing manufactured from any fiber.

in the nominal tariff rate will of necessity result in a decrease in the effective protection. Given the urgent need of the developing countries to expand their exports as well as to develop their industries, the case therefore remains strong for a speedy reduction or elimination of the nominal duty rates on processed agricultural and other products imported from the developing countries.

In the longer run, however, the greatest economic efficiency would be achieved by concentrating the effort to liberalize tariffs on products for which (*a*) the effective tariff rates are now most protective; (*b*) the demand and supply elasticities are such that the lowering or elimination of tariff protection is most likely to result in increased export earnings; and (*c*) the competitive advantage lies on the side of the developing countries. With regard to the latter two points, and particularly competitive advantage, it is important to take a dynamic view, by making allowance for changes both in supply elasticities and in comparative advantage as the exporting countries develop their infrastructure and their industrial base.

NONTARIFF BARRIERS

In addition to tariff barriers, developed countries (as well as other importers) apply a number of quantitative restrictions on imports of processed products from developing countries. Such quantitative restrictions are contrary to the General Agreement on Tariffs and Trade (GATT), to which virtually all indus-

trial countries are contracting parties, but they derive their legal justification from special GATT waivers pertaining to balance of payments reasons and, more recently, the doctrine of "market disruption."

The list of products and countries involved is too vast to summarize in any meaningful way. For detailed information, reference may be made to various GATT and UNCTAD documents on the subject.[78] These restrictions have been particularly common for various textile products, which are of great importance in the exports of manufactures from developing countries. It is therefore the restrictions on textiles that have come under the sharpest criticism.

The GATT "long-term arrangement" regarding international trade in cotton textiles, signed in 1962 for a period of five years, is an attempt to organize internationally the restrictive measures that many industrialized countries had felt it necessary to impose for the protection of their textile industries, and to liberalize the world trade in cotton textiles as rapidly as possible. A major review of the operation of the arrangement was made in late 1965. Although the share of developing countries in the cotton textile imports of the developed countries had risen during the three years of operation of the arrangement, the developing countries expressed their disappointment that frequent use had been made of the clauses permitting import restrictions on grounds of market disruption, so that the liberalization of imports had not proceeded as fast as had been hoped. Both at the review of the cotton textile arrangement and in other forums, hopes have continued to be expressed that greater progress toward the liberalization of imports of processed products will be achieved in the Kennedy Round of trade negotiations.

Marketing difficulties

Even if there were no tariff or other administrative barriers to trade, the expansion of exports of processed products from developing to developed countries would require much time and effort. There are many difficulties in creating new market outlets, particularly for new exporters with little experience in export marketing. The difficulties are numerous enough with raw materials of relatively homogeneous nature, sold through well-established markets to a limited number of processing industries, but they are considerably multiplied with processed products of widely varying characteristics, which often have to meet exacting requirements, and for which the final consumers may need to be "educated" to accept a product which may differ from those to which they are accustomed, if not in objective quality, then at least in some aspects of appearance, packaging, etc. Many processed products, especially canned goods, are difficult to market except under well-established brand names.

Both the first UNCTAD Conference and subsequently the UNCTAD Committee on Manufactures have paid much attention to these problems. It has been pointed out that the developing countries lack information regarding the requirements of buyers in developed countries. Information is required on such varied subjects as technical standards, quality, design, packaging, prices, credit, and deliveries, and on prevailing laws, customs, rules and procedures. Business relations must also be established with the industries and firms that consume or market the processed products. In order to use semimanufactures originating from new sources, industries have to be informed about their costs, and convinced as to their quality and the dependability of the long-term availability of supplies. For the marketing of finished products, skills in advertising, sales campaigns, packaging and presentation are required, and such skills are in short supply in developing countries. These countries are also often short of the financial resources required for establishing new market outlets, including the setting up of agencies, offices, consignment stocks, etc., in the importing countries.

Competitive weakness

Finally, given both the marketing difficulties just discussed and the fact that time is required until industrial production in any given line reaches a certain size and a maturity derived from experience, the products of processing industries located in developing countries may be unable to compete with those of older established industries, even if subject to the same degree of protection. The weaknesses may be in quality or in price. National and international measures, in exporting or importing countries, may be required to assist the processing industries in the developing countries to overcome such initial difficulties. In exporting countries, possible solutions include tax reliefs, duty refunds on imported inputs, multiple exchange rates to favor the exported products, and outright export subsidies. Importing countries can assist the developing countries to overcome such ob-

[78] See, for example, United Nations. Trade in manufactures and semi-manufactures, in *Proceedings of the United Nations Conference on Trade and Development. Vol. IV. Trade in manufactures.* New York. 1964. p. 16-17

stacles principally by granting preferential tariff treatment, unilaterally or in agreement with other importing countries, and by technical and financial assistance to ensure the production of goods of desired quality and type, including joint industrial enterprises. The recently announced Australian tariff waiver on imports of a number of products from developing countries sets a precedent in this field.

A further aspect of the competitive weakness of the developing countries arises from the fact that most of them do not produce any of the various manmade substitutes for natural raw materials, especially synthetic rubber and fibers.[79] In many end uses, mixtures of natural and synthetic raw materials have become firmly established, and in others the final product may be made entirely of manmade raw materials. While in the former case the developing countries may be able to remain competitive by importing manmade raw materials (though at some loss in net foreign exchange earnings compared with the export of manufactures based entirely on domestic raw materials), in the latter case the market will be largely lost to them.

Government action

In some cases the governments of developing countries have themselves participated directly in the establishment and operation of industrial enterprises. This applies particularly to new industries, where the government plant is in the nature of a pilot project, which it is hoped will lead later to the establishment of privately-owned plant. More often, however, government activities in this regard are confined to various measures of assistance to the private sector, and the provision of the necessary infrastructure, especially marketing, transport and power facilities.

One of the most important areas of government responsibility is research. This is needed regarding not only the processing operations themselves but also raw material production, including the development of varieties more suitable for processing. As already noted, research is particularly needed for the development of industrial technologies better suited to the conditions of the developing countries, and into appropriate processing equipment. Investigations are needed into new uses for local raw materials and for by-products and waste products.

[79] Some of the larger developing countries, however, including India and Brazil, have established industries producing such products as rayon and synthetic rubber.

The provision of industrial training is an essential prerequisite for the development of industries in primarily agricultural countries without an industrial tradition and a pool of industrial labor. Until a skilled labor force has been built up, the advantage of low wage-rates remains largely illusory. Many of the simpler agricultural processing industries can serve as stepping stones to the development of more complex industrial skills. Special schemes can be formulated to encourage private industry to provide the necessary training, as for example in Brazil, where a small amount to be used specifically for training is added to loans made by the Banco Nacional do Desenvolvimento. In addition, provision has to be made for the training of the necessary scientific, technological and engineering staff, and also of managerial personnel.

Governments may also need to take special measures to assist new industries with credit and finance. Small plant, processing agricultural raw materials, whose financial requirements are not excessively large, may be a suitable investment for rural co-operative societies. Special reserved funds may have to be made available to these co-operatives to finance small-scale to medium-sized industries. The larger, more complex processing industries can be financed by state credit agencies such as development banks or industrial banks. This type of agency should not only supply financial assistance but also planning, managerial, and technical assistance, as is being done, for instance, by the Industrial Development Company of Puerto Rico. Subsidies, tax relief, tariff protection, and similar assistance may also be required in the early stages of development of an industry, but the danger should be avoided of setting up industries that need permanent assistance of this kind.

In some cases, governments may find it advantageous to seek investment from foreign sources which also bring in technical knowledge, business management, and top level supervisory personnel. Generally, specific guarantees are provided for foreign capital invested in the country. In some cases the governments of developing countries have themselves entered into partnership with private foreign firms for the establishment of industrial enterprises.

Finally, it is essential for the government to have a clear-cut policy regarding industry. If the policy for certain industries is to promote small-scale, labor-intensive enterprises, this should be clearly defined and its economic consequences realistically assessed. A consistent policy is also needed con-

cerning state and private participation in industry. Policies should be fully integrated, so as to avoid situations where, while encouraging the establishment of a particular industry, the government continues to tax the import of essential raw materials (for example, tinplate for canning).

International assistance

A considerable amount of international assistance is now available to back up these efforts. Many different industrial enterprises using agricultural raw materials or producing requisites for agricultural production have been established in developing countries in recent years with financial and technical assistance from the various bilateral aid programs.

Among the multilateral agencies, FAO is itself providing increasing assistance in the establishment of such industries, in particular, following a resolution of the Twelfth Session of the FAO Conference in 1963, which called for the strengthening of its activities in this field. Although this is not the place for a detailed description of FAO's programs in this regard,[80] it may be useful to conclude this study with a brief account of the main lines of such assistance.

Training and demonstration have always been major elements. Permanent training institutes have recently been set up in various countries under the United Nations Development Program for personnel working in different agricultural processing industries and also in agricultural engineering, while many shorter training courses and seminars are also conducted. Research is promoted through a wide range of projects, including the establishment of permanent institutes for research in such subjects as food technology and in the technology of processing specific agricultural, fishery and forest products. Preinvestment surveys, feasibility studies and pilot projects are carried out for industries using agricultural raw materials. Under the FAO/IBRD Co-operative Program, countries are assisted in the preparation of such projects for financing by the World Bank. FAO has also collaborated with UNICEF in the establishment of dairy plants in many developing countries.

A recent development has been the setting up of the FAO/Industry Co-operative Program, through which it is hoped that private industry in the developed countries will make a greater contribution to the establishment of agricultural processing industries and industries serving agriculture in developing countries. The program aims to exchange technical and economic information on development activities, investment needs, and prospects for improving the climate for foreign investment, and to mobilize the managerial ability, scientific experience, technical know-how and capital resources of private industry for the initiation of actual investment operations with industry and government co-operation, including the implementation of the findings of the preinvestment surveys carried out by FAO under the United Nations Development Program.

On the input side, FAO and the fertilizer industry have for some years conducted a joint program under the Freedom from Hunger Campaign, whereby fertilizer trials have been promoted and pilot schemes of fertilizer distribution to farmers carried out. Such activities are an essential preliminary step for the establishment of domestic fertilizer production in developing countries. Assistance can also be provided, under the United Nations Development Program, in the establishment of pilot fertilizer mixing plant.

More recently, the Thirteenth Session of the FAO Conference in 1965 called for some form of international action to make available supplies of fertilizers and other needed inputs, which are at present a severe drain on the foreign exchange resources of developing countries. The possibility of establishing a Food Production Resources Program for this purpose is at present being explored.

These operational activities are backed up by a substantial program of studies on the technical and economic problems of the industries relating to agriculture. A number of these have been referred to at various points in the present study, and mention has also been made of the detailed guide that is now in preparation concerning feasibility studies for agricultural processing industries. Finally, it is appropriate to refer to the Indicative World Plan for Agricultural Development, now being prepared by FAO, which should provide a framework for the better assessment of needs and prospects for both the industries using agricultural raw materials and those producing the requisites such as fertilizers, machinery and implements that are essential if the world's future needs for food and agricultural products are to be met.

[80] For this purpose, see FAO. *FAO's activities in the field of industrial development: Progress Report for 1965 for the Sixth Session of the United Nations Committee for Industrial Development*, Rome. 1966.

Chapter IV. Rice in the world food economy: Situation and outlook in the International Rice Year 1966

MAIN FEATURES OF THE WORLD RICE ECONOMY

Rice is the staple food of approximately half of the human race. For over 1,400 million people in the Far East, including China (Mainland), where nine tenths of the world's rice is grown and consumed, it provides the main dietary source of energy. The number of people relying almost solely on rice for food approaches 200 million in India alone, and probably exceeds 400 million in China (Mainland). Outside the Far East rice is the predominant food in only a few countries, but it is increasingly popular in many parts of Africa, Latin America and the Near East. In total, over 150 million tons of milled rice [1] are eaten annually, contributing half or more of the available calorie supplies in rice-eating countries, as well as a major part of the protein.

The critical importance of rice to many countries as a food, as a crop, and in international trade is illustrated in Table IV-1. This shows for 19 countries from all regions of the world the percentage of the total arable land planted to paddy, the share of the rice crop in the Gross Domestic Product (GDP), its importance in calorie intake, and its contribution to export earnings (or share of the import bill).

The value of the world's rice output cannot be calculated with any precision, but it probably amounts to at least U.S.$20,000 million, even without all the associated industrial and marketing undertakings. For hundreds of millions of people in Asia, this single crop forms virtually the sole livelihood. It occupies between half and two thirds of the arable land available in major producing countries and a much heavier share of the most fertile soils. It contributes up to one fifth of their entire GDP. In international trade, rice earns foreign exchange every year to the value of almost U.S.$1,000 million, most of it for the developing countries.

Rice remains pre-eminently a subsistence food crop. More than half of the world harvest of over 250 million tons of paddy is retained on the farms where it is grown without entering market channels. This makes the task of increasing rice production more difficult, because the farmers are less responsive to monetary incentives than in a commercial farm economy. At the same time, government assistance to farmers becomes essential; otherwise the mass of rice growers will lack sources of capital, the tools, and the expert knowledge to improve their holdings. Production problems are rendered still more complex by the large part of the crop which is dependent upon uncertain rains. The measures taken to improve water control and irrigation since the second world war have reduced the risk of large-scale crop failure, but harvest fluctuations continue to create severe local shortages. Also, although less than one twentieth of the crop crosses national frontiers, it has been seen that rice can loom large as an import item in national trade balances, as well as a source of export earnings. Under such circumstances, rice becomes a key factor in the stability of entire economies as far apart as Madagascar, Ceylon, the Republic of Korea, and Guyana.

Many, though not all, of the major rice-eating countries are characterized by population pressure on the land, which is further aggravated by the rapid expansion of the population, the low productivity of agriculture, and inadequate industrial development. Institutional barriers, faulty marketing systems and many other general impediments to the economic growth of developing countries are, in fact, typical problems facing the world rice economy.

Nevertheless, the rice economy is undergoing a constant process of evolution and change. Nine tenths of the world's rice production remains concentrated in the Far East, but there has been a remarkable extension of cultivation in the Western Hemisphere since before the war and the paddy crop is steadily growing in importance in Africa. Many farmers find it a suitable crop to plant on

[1] On average, 10 tons of paddy (rice in the husk) yield about 6.5 tons of milled rice, the form in which it is eaten.

TABLE IV-1. – ECONOMIC IMPORTANCE OF RICE AREA, PRODUCTION, CONSUMPTION AND TRADE IN PRINCIPAL PRODUCING COUNTRIES

Country	Area		Production (paddy)			Consumption		Trade		
	Paddy area sown	Percent of total arable land	Volume	Estimated value	Percent of GDP	Consumption per caput	Percent of calorie intake	Volume	Value	Percent of total trade
	1 000 hectares	*Percent*	*1 000 tons*	*Million $*	*Percent*	*Kg/year*	*Percent*	*1 000 tons*	*Million $*	*Percent*
EXPORTING COUNTRIES										
Brazil	[1]2 515	[1]13	[2]5 392	[3]222	3	[4]44	[4]16	[5]44	[5]5	[5]0.5
Burma	[6]4 837	[6,7]59	7 783	231	14	*137	*62	1 394	147	62
Cambodia	2 377	[8]69	2 760	140	[9]21	*149	...	487	57	65
China (Taiwan)	749	[10]52	2 623	[3]253	14	134	56	127	20	5
Korea, Rep. of	1 155	55	3 762	370	26	*94	...	13	2	2
Madagascar	[6]764	[6,11]25	1 270	60	11	[5]145	[5]65	28	6	6
Pakistan	[12]9 100	[12]36	[6]14 948	1 010	13	102	47	...	[13]26	[13]5
West	(...)	(...)	[6](1 644)	(94)	(...)	[4](*19)	(...)	(...)	[13](26)	[13](11)
Thailand	[6]6 638	[6]66	10 168	[3]443	14	*123	*57	1 898	211	36
United Arab Republic	[12]400	16	2 213	95	[14]2	[4]31	[4]11	527	70	*6
United States	[15]650	[15]4	3 187	350	0.1	3	1	1 352	206	0.8
Viet-Nam, Rep. of	[6]2 479	[6,11]71	[6]5 205	[3]476	20	...	...	[16]322	[16]36	[16]7
IMPORTING COUNTRIES										
Ceylon	[17]525	[18]23	[6]1 003	[3]109	8	[4]105	[4]50	658	69	17
Hong Kong	8	57	14	...	...	*105	...	410	53	4
India	[19]34 256	[19]21	[6]47 871	3 420	11	71	35	[20]512	[20]54	[20]2
Indonesia	[21]6 613	[22]37	[21]13 151	690	14	*85	*39	[16]1 070	...	...
Japan	3 272	[23]54	16 639	[3]2 999	6	117	48	415	58	0.7
Malaysia: Malaya	338	[21]13	[6]864	70	4	*119	*50	415	51	6
Philippines	[17]3 087	[22]26	3 843	290	8	89	47	299	39	4
Senegal	[2]69	[2]1	106	...	...	...	...	182	20	12
WORLD TOTAL	122 400	8	249 900	20 000	—	27	—	[25]7 247	[25]904	—

NOTE: *Area.* 1963/64. Area figures exclude estimated acreage cropped twice in one year except as noted.
Value of production. 1963/64. Value is estimated from 1964 farm prices, with allowances for waste and loss, except where official figures are available as noted.
Consumption. 1961-63 averages. Compiled from FAO Food Balance Sheets.
Trade. 1964 calendar year.

* Unofficial estimate.

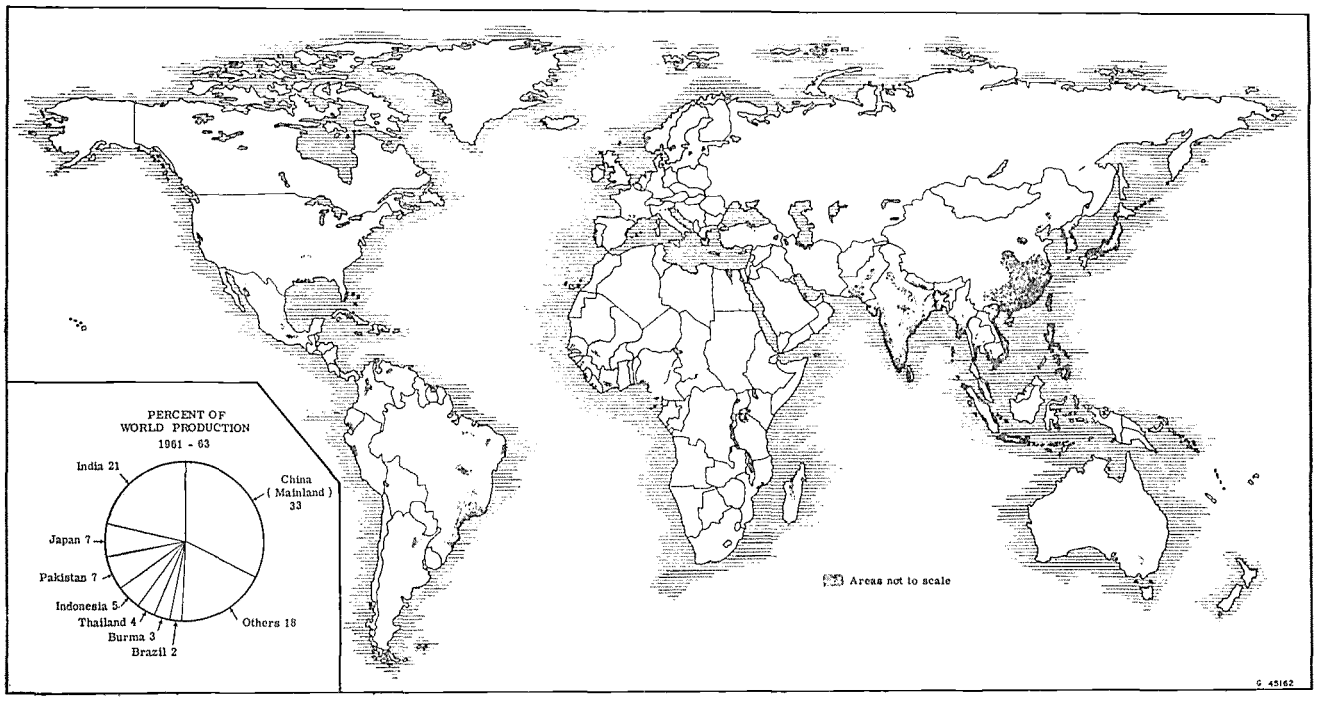
[1] 1957/58. – [2] 1960/61. – [3] Official estimate. – [4] 1960-62 average. – [5] 1962. – [6] 1962/63. – [7] Percentage of sown area of all crops. – [8] Excludes estimated 15% double cropped. – [9] Percent of 1962. – [10] Excludes estimated 40% double cropped. – [11] Excludes 10% double cropped. – [12] 1958/59. – [13] July 1964-June 1965. – [14] Percent of 1961-63 average GDP at 1960 prices. – [15] 1959/60. – [16] 1963. – [17] Harvested area. – [18] Excludes 32% double cropped. area. – [19] 1961/62. – [20] April 1964-March 1965. – [21] 1954/55: harvested area. – [22] Percent of total agricultural area. – [23] Excludes 0.3% double cropped. – [24] Excludes 6% double cropped. – [25] Exports.

newly developed lands, and there is a ready market at home and overseas for their product. In several developed countries, too, and particularly in parts of southern Europe and of the United States, rice is important both in agriculture and in industry. Today, therefore, rice is cultivated under a wider variety of conditions and by more varied methods than any other major crop (Figure IV-1).

On the consumption side, while rice continues to be a major staple for hundreds of millions, it is preferred to other basic foods by many more as soon as they can afford to buy it. For the pressure of demand derives not only from the growing populations, but also from their improving levels of living and from urbanization, which in a large number of developing countries favor the substitution in the diet of rice for coarse grains or starchy roots. Yet there are factors on the other side too, and in a few countries there has been a significant, if limited, shift in demand toward wheat, induced by its relative cheapness and greater availability, and encouraged by governments.

Similarly, international trade in rice cannot be considered in isolation. The Far East is still by far the major international import market for rice, but its wheat imports are today double the volume of those of rice. The region has become the world's largest net importer of wheat, exceeding in importance even western Europe. The structure of trade in rice itself is also altering. The Far East remains the biggest rice-exporting area, but it has lost the virtual monopoly enjoyed before the war, as new exporters from other regions have entered the market. The size of imports into other regions has also in-

FIGURE IV-I. - WORLD MAP OF RICE PRODUCTION



creased, with west Africa, the Near East and eastern Europe all growing in importance as import markets for rice. Another feature of the international rice trade — that it largely consists of exchanges between developing countries themselves — seems a more permanent characteristic, and it will be seen later that this is highly significant in assessing the future outlook for the foreign exchange earnings of rice-exporting countries.

Recent trends in production

The average increase of 3.5 percent per annum in world rice production during the past decade was slightly above the rate achieved in wheat output. This surprising fact arises mainly because half of the world wheat crop is grown in developed countries, several of which — and above all the United States — have deliberately limited the acreage sown. Among developing countries, the rates of growth for the two basic food crops were very similar. In common with wheat, the expansion in world rice output can be attributed equally to increases in area and yields. As Table IV-2 shows, there has been a distinct improvement in the productivity of rice lands, since the average yield for the world as a whole has risen from 1,700 kilograms per hectare in 1950-54 to nearly 2,000 kilograms in 1960-64 (i.e., by about a fifth).

The fact that yields have accounted for half the increase in rice production is a new and encouraging development. Previously, during the first half of this century, the world average yield had shown only a very slight increase, despite the great strides in a few individual countries such as Japan, the United Arab Republic and the United States. Cultivation of the existing area was already intensive, and plantings were extended onto marginal (but less suitable) lands, often in the form of "upland" rice without special irrigation facilities. Since 1950-54, however, the extension of the world paddy area by a further 17 million hectares, or by 17 percent, has sometimes reflected the availability of more land under irrigation, rather than the spread of plantings to new lands, or has at least been accompanied by special efforts to improve yields on existing lands.

In absolute terms the bulk of the increase in production has been in the Far East, excluding China (Mainland), where output has risen from 70 to 80 million tons. Almost all the region's producers have extended their rice area, Japan and China (Taiwan), where agricultural land is particularly scarce, being the outstanding exceptions. India and Pakistan are producers which have secured a substantial improvement in yields in the past decade (see last column of Table IV-2). Countries which have increased their output largely by extending the area sown to rice include Cambodia, the Republic of Korea, and

TABLE IV-2. – AREA, YIELD AND PRODUCTION OF PADDY IN SELECTED PRODUCING COUNTRIES BY REGIONS, 1950-54 AND 1960-64 AVERAGES

Country	Area		Yield		Production		Contribution of yield to increased production
	1950-54 average	1960-64 average	1950-54 average	1960-64 average	1950-54 average	1960-64 average	
	..... 1 000 hectares		*Kilograms/hectare*		*... 1 000 metric tons ...*		*Percent*
FAR EAST[1]	69 986	80 456	1 430	1 750	100 363	140 225	56
of which:							
Burma	3 795	4 407	1 470	1 640	5 564	7 220	39
Cambodia	1 672	2 266	990	1 070	1 653	2 428	21
Ceylon	346	485	1 420	1 890	492	917	38
India	30 483	34 440	1 150	1 480	34 959	50 845	64
Indonesia	6 039	7 063	1 630	1 790	9 832	12 621	36
Laos	752	617	720	820	538	508	—
Malaysia	402	468	1 760	2 090	708	978	50
Pakistan	9 247	9 934	1 370	1 600	12 626	15 852	65
Philippines	2 446	3 186	1 190	1 200	2 905	3 833	3
Thailand	5 411	5 823	1 320	1 450	7 126	8 442	56
Viet-Nam, Rep. of	1 783	2 418	1 350	2 080	2 414	5 037	50
China (Taiwan)	774	773	2 360	3 220	1 824	2 489	100
Japan	[2]3 235	3 291	4 790	5 040	[2]15 503	16 581	75
Korea, Rep. of	925	1 131	2 720	3 000	2 514	3 396	29
CHINA (MAINLAND)	27 122	...	2 240	...	60 800	...	...
NEAR EAST	803	990	2 360	3 030	1 893	3 001	49
of which:							
United Arab Republic	226	316	3 720	5 330	840	1 683	43
LATIN AMERICA	2 972	4 830	1 670	1 720	4 950	8 322	4
of which:							
Brazil	2 060	3 476	1 530	1 600	3 154	5 566	7
AFRICA	2 573	2 752	990	1 210	2 557	3 321	74
of which:							
Madagascar	641	762	1 380	1 580	883	1 205	39
NORTH AMERICA, EUROPE, U.S.S.R., AND OCEANIA	1 277	1 158	3 000	4 060	3 829	4 697	100
World total	104 730	[3]120 130	1 670	1 990	174 390	238 860	52

[1] Excluding China (Mainland). – [2] 1956-58. Average area reported for 1950-54 of 3,007,000 ha. excludes about 5% of the area which was unreported. Regional and world totals include actual 1950-54 figure. – [3] Including unofficial estimates for China (Mainland).

especially the Philippines, where the average yield has remained among the lowest in the world (1,200 kilograms). Outside the Far East, and notably in Latin America, producers have maintained a much faster rate of growth in production and have increased their share of the world total. The main impetus in Latin America, and particularly Brazil, has come from a large-scale extension of the rice area onto newly opened land, and yields have generally remained at low levels. In contrast, virtually all of the sharp increase in output of 36 percent in developed countries (which include Japan) is derived from higher yields; the area is only fractionally larger, and in North America it is actually smaller, than it was in 1950-54.

A feature of world production in recent years has been the achievement of a more rapid growth rate by exporters than by importers; this is a reversal of the trend up to the mid-1950s. In exporting countries — several of them outside the Far East — it reflects the relative profitability of rice as a cash crop and the priority given to it as a source of foreign exchange earnings. This has stimulated private and public investment in measures to raise productivity and to open up lands for rice cultivation. The slower growth in some importing countries reflects

two basic facts: firstly, the enormous expansion of the rice area in the first half of this century was concentrated in these countries, and nowadays further extension often depends on the building of costly irrigation facilities; secondly, the improvement of productivity is more severely hindered than in exporting countries by the greater extent to which rice is a subsistence crop and thus less responsive to economic incentives.

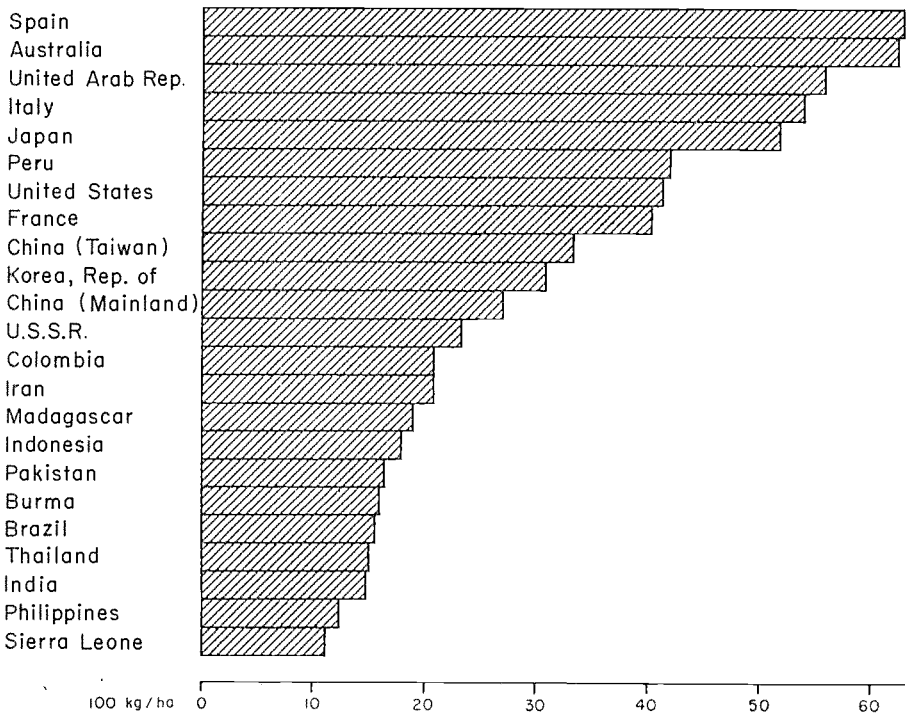
Disparities in yields

There are considerable disparities in the productivity of rice lands among the different producing areas and under different systems of cultivation, and these have widened further in the past decade. The world average yield per hectare of about 2,000 kilograms of paddy, which in terms of grain equivalent (or calories) is similar to that of maize but about double the yield of wheat, inevitably reflects the position in the large producing countries of south and southeast Asia, as well as in tropical Africa and Latin America. In other regions, particularly in the warm temperate zone, considerably higher yields are obtained and, as noted above, productivity is rising at a faster rate. Thus in Japan and the Mediterranean countries of southern Europe and the Near East, yields range between 4,000 and 5,000 kilograms. Land productivity is also higher in China (Taiwan), the Republic of Korea and North America, with average yields of 3,000 to 4,000 kilograms per hectare. Australian rice farmers obtain (on a small area) no less than 6,000 kilograms per hectare (Figure IV-2).

These disparities are partly due to differences in the systems of cultivation but also to differences in ecological and economic conditions, particularly the stage of economic development. In south and southeast Asia, methods of cultivation are simple and implements are primitive. Techniques have changed little in the past thousand years, having evolved gradually out of the local economic and agricultural structure. The usual practice is the cultivation of one rice crop continuously every year under irrigation but without significant application of fertilizer. There is little systematic rotation since the semiaquatic conditions or the nature of the soil preclude the cultivation of any crop other than paddy. In some areas, particularly in parts of Indonesia, Malaysia and the Philippines, rice is grown like any other cereal crop without irrigation, and in such conditions yields are considerably lower than average. This is a typical form of cultivation in South America too — Brazil is the largest producer of dryland paddy in the world — and much of the rice is grown under extensive methods of cultivation. Yields here are further reduced by heavy losses from plant diseases. Rice in much of tropical Africa, with the exception of Madagascar, is to a large extent upland rice grown under a system of shifting cultivation (commonly as little as 1,000 kilograms per hectare is obtained), although production on rain-fed swamp land is increasing.

In contrast, rice in much of the rest of the world is almost wholly dependent on artificial irrigation and it is heavily fertilized. Crop rotation is usual and the less variable climate in these warm tem-

FIGURE IV-2. - COMPARATIVE RICE YIELDS PER HECTARE, 1961-63 AVERAGE



perate regions also reduces harvest losses. Japanese yields (5,000 kilograms per hectare) are the highest in Asia, and there is usually only one rice crop a year. Japan's rice farms are small but, since the postwar land reform, they have been mainly run by owner-cultivators who use highly advanced techniques and seeds carefully selected to suit local conditions. Rains are abundant and well distributed, and Japan possesses the region's most comprehensive irrigation and drainage network. However, an important factor in Japan, and indeed in the majority of high-yielding producers, is the support which rice receives from the relatively high government price guarantees and related measures. A profitable return on capital invested in raising yields is thus assured, and this is further encouraged by controls on the area sown or by the scarcity of land. Similarly, the higher cost of labor and the land tenure and water control systems encourage the use of mechanical equipment and chemical weed-killers. The varieties grown (mainly *Japonica*, a round-grain type) are more responsive to fertilizer, the physical conditions (long and warm day and cold night) of the warm temperate zone favor the physiological activities of the plant, and controlled irrigation and drainage permit the rotation of paddy with other crops within the year.

Thus disparities in yields are due not merely to differences in methods of cultivation. They are the result of a combination of ecological, technical and economic factors, not all of which can be reproduced in the tropical conditions under which most rice is grown. Even so, there is considerable potential for increasing yields in most areas, especially if the varieties of rice now being developed can be successfully introduced on a large scale, and if water control can be improved in developing countries.

TABLE IV-3. – RICE CONSUMPTION: PER CAPUT LEVELS, PERCENTAGE OF TOTAL INTAKE OF CALORIES AND PROTEINS IN SELECTED COUNTRIES ACCORDING TO FOOD CONSUMPTION SURVEYS

	Rice consumption	Calories		Protein	
		Total intake	From rice	Total intake	From rice
	Grams per caput per day	*Number*	*Percent*	*Grams per caput per day*	*Percent*
BURMA, 1954-57					
11 rural areas	444	2 075	77	48.3	62
Urban area, Rangoon families	388	2 088	66	50.7	51
INDIA, 1953-55					
West Bengal	402	2 480	58	57.0	47
Madhya Pradesh	400	2 640	55	65.0	41
Mysore State	324	1 600	73	39.0	57
Kerala State	313	1 440	78	32.0	66
Punjab	79	2 640	11	57.0	9
Gujarat	57	1 760	12	44.0	9
JAPAN, 1963					
Whole country	351	2 083	61	70.6	33
Agricultural households	392	2 170	65	70.0	38
Nonagricultural households	328	2 038	58	71.0	31
Others	362	2 063	63	70.4	34
MALI, 1957-58					
Rice zone	478	2 370	72	70.7	45
Millet zone	120	2 325	19	70.5	11
PAKISTAN, 1962-63 (Eastern Province)					
11 rural locations	505	2 254	81	57.4	59
5 urban locations	311	1 732	65	49.5	42
PHILIPPINES					
Bicol region, 1957	390	2 179	64	61.0	43
Central Luzon region, 1957	424	2 064	74	60.2	47
Metropolitan Manila, 1958	240	1 727	50	49.8	32
Cagayan valley - Batanes region, 1961	267	1 809	53	47.7	38
Ilocos-Mountain Province region, 1960	392	1 972	72	52.6	50
THAILAND					
Ubol province, 10 villages, 1961-62	514	2 092	90	56.1	63

SOURCES: BURMA. S. Postmus. *Final report on nutrition in Burma.* WHO/SEARO, 1959. – INDIA, Indian Council of Medical Research. *Diet atlas of India.* Special Report Series No. 48. New Delhi, 1964. – JAPAN, Ministry of Health and Welfare. Bureau of Public Health. *Nutrition in Japan.* Tokyo, 1964. – MALI, Mission socio-économique du Soudan. *L'alimentation des populations rurales du delta vif du Niger, 1957-58.* Office du Niger. Paris, 1966. – PAKISTAN, Directorate of Nutrition and Research. *East Pakistan nutrition survey, 1962-63.* – PHILIPPINES, Food and Nutrition Research Center. *Nutrition surveys of Bicol and Central Luzon regions. 1957; Metropolitan Manila, 1958; Ilocos-Mountain Province region, 1960; and Cagayan valley-Batanes region, 1961.* Manila, 1962. – THAILAND, FAO. *Summary of average daily dietary intakes per caput in ten villages of Ubol Ratithani Province, 1962. Nutrition education and training program.* (M.M. Anderson) Appendix V. FAO/EPTA Report No. 1978. Rome, 1965.

Consumption and trade trends

The trend in production is closely related to the pattern of demand. Food habits are firmly entrenched in general, and there is a particularly strong preference for rice among the traditional rice-eating peoples. In most developing countries, moreover, the scope for changes in diets is limited by the local cropping pattern and ecological conditions.

The growth of population in rice-growing areas has directly stimulated production by adding to the numbers of rice farmers, and also of consumers. In the Far East, total consumption rose from 55 million tons in 1950-52 to 76 million tons (milled rice basis) in 1961-63, the increase of 38 percent largely reflecting the steady population growth. Per caput consumption, too, is on the increase.

National averages of per caput supplies often give a misleading picture of consumption trends because of the diversity in food habits within rice-eating countries. Detailed statistics are rarely available, but the local variations can be seen from the data derived from food consumption surveys in Table IV-3. In a very large country such as India, the average figure of 177 grams of rice available per caput per day (one third of the total calorie intake) scarcely indicates its overwhelming importance in diets in the eastern and southern states: in four rice-eating states the average per caput level was more than double the national figure in 1953-55, and in Kerala rice accounted for no less than 78 percent of the calorie intake, even more than in Burma.[2] In East Pakistan, consumption in the rural areas surveyed was 60 percent higher than in urban districts. Similar variations are apparent from the data for Burma, Japan, Mali, and the Philippines, while the rice eaters of southeast China are said to consume from 500 to 680 grams per day.[3]

At such high levels of consumption, demand is virtually saturated. Nevertheless, there is clear evidence of a rising national per caput consumption of rice in many countries. This reflects the dynamic influence of urbanization; in contrast to those in the rural areas, urban consumers usually have a wide choice from among a range of imported as well as local foodstuffs. As their incomes increase, this permits the purchase of relatively expensive foods like rice and wheat. This often entails a shift at the expense of barley or millets in the nonrice-eating sectors of countries such as India, Japan, and Pakistan, and also other staples in Latin America (beans and starchy roots) and west Africa (starchy roots). The most striking changes have occurred outside the already heavy consuming areas of the Far East: per caput consumption of rice in west Africa is now 70 percent above the prewar level, while in Latin America it has almost doubled. In the industrial countries of North America and western Europe demand for rice, which is a minor item of diet, is naturally less subject to change, and requirements are now generally rising slowly in line with population.

These trends in production and consumption have determined, in turn, the level and pattern of world trade, although the impact has been partly obscured by national policies. Over the longer run, they have led to a reduction in supplies available for export. Thus, the Far East, excluding China (Mainland), now consumes more than it produces: it no longer has a net export balance in rice and indeed requires considerable imports from North America (see Table IV-4). The growth of west African and Near Eastern per caput consumption has also been reflected in heavy imports, and there has been a sharp expansion in purchases by eastern European countries and the U.S.S.R. under bilateral trade agreements. In Latin America, on the other hand, the increased demand was met from the pronounced expansion of domestic production, which has even permitted a substantial expansion of exports. In total, the trade balance of developing countries has been reversed since 1950-54 and now shows a deficit, while the opposite has occurred in the case of developed trading countries. For world trade as a whole, these trends have slowed down the recovery in exports from their wartime slump, and indeed they are still below the prewar volume.

In the short run, the year-to-year fluctuations in production in individual countries have, in view of

TABLE IV-4. – WORLD TRADE IN RICE, BY GEOGRAPHICAL AND ECONOMIC REGIONS, 1950-54 AND 1960-64

	1950-54 average	1960-64 average
	..... *1 000 tons*	
Trade balances		
BY GEOGRAPHICAL REGIONS		
Far East	+ 191	— 739
Near East	— 85	+ 54
Africa	+ 173	+ 539
Latin America	+ 149	+ 148
North America	— 562	— 1 040
Western Europe	+ 94	+ 306
Eastern Europe and U.S.S.R.	+ 49	+ 558
Oceania	— 6	— 17
BY ECONOMIC REGIONS		
Developing countries	— 502	+ 376
Developed countries	+ 558	— 397
Centrally-planned economies	— 53	— 170
World exports		
Volume	4 550	6 550
	.....*$/ton*.....	
Unit value	151	117
	.....*M'll'on* $.....	
Value	690	770

NOTE. (+) net imports: (–) net exports.

[2] This overdependence on a single cereal in Kerala was a factor underlying this state's food disturbances in 1966.

[3] M.C. Kik and R.R. Williams. *The nutritional improvement of white rice.* National Research Council, Bulletin 112, Washington, D.C., 1945.

the steady rise in consumption, been reflected in corresponding variations in the trading position of particular countries. The Republic of Korea, Pakistan, and Viet-Nam have been net exporters in some years but net importers in others; imports into Japan and Indonesia, the two largest deficit countries, have varied as much as fivefold from one year to the next; many Latin American producers occasionally have considerable export surpluses; and so on. Yet for world trade as a whole, the period since the mid-1950s has been one of relative stability. In contrast to many other commodities, international prices of rice have shown only small fluctuations during the past ten years. This has reflected a combination of factors, including the widespread government control of exports, the restriction of imports to save foreign exchange, and the availability of ample supplies of alternative cereals, mainly wheat, on concessional terms. For although about half of the rice trade flows under bilateral government-to-government contracts, several on a barter basis, concessional shipments account for only one tenth of the total. These are some of the reasons for the contrast between the modest increase in international trade in rice and the dramatic expansion in world trade in wheat and other grains, which has almost doubled since the mid-1950s and now averages over 70 million tons. Rice exports have shown some increase but remain between the narrow limits of 6 to 7 million tons a year compared with prewar levels of 9 to 10 million tons. Only in the past two years have world export earnings from rice shown a more distinct, though still moderate, tendency to improve.

There have been few permanent changes of substance in the broad flows of rice trade since 1950, although lagging production has caused a deterioration in the Far East's net trade position. The two largest exporters, Burma and Thailand, have between them maintained their traditional share of around half of world exports, but non-Asian exporters (particularly the United States and the United Arab Republic) have considerably increased their role in the total trade. China (Mainland), previously a major rice importer, has become the fourth largest exporter, though its imports of wheat have been sharply increased. A number of smaller exporting countries have also expanded their share of the market. On the import side, until recently the main development was the dwindling of purchases by Japan and its replacement by Indonesia as the world's largest importer. Now a leveling out of production, due to labor shortages, has caused the return of Japan as a major importer and the recent food shortages have brought a sharp rise in Indonesian and Indian purchases also.

Thus, the apparently favorable trends in the world rice economy — rising trends in production, consumption and, to a lesser extent, in trade, as well as stable world prices — should not obscure the fundamental instability which arises from the basic economic and technical conditions in which rice is grown and consumed. These conditions, and the scope for improvement, are analyzed below.

DEMAND AND CONSUMPTION

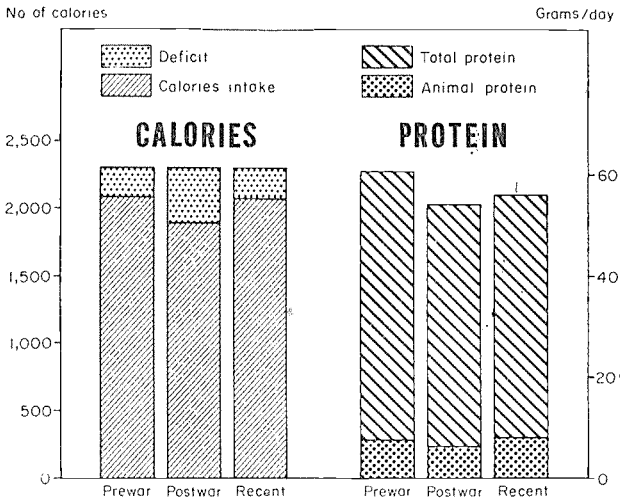
It has already been noted that rice is eaten as a staple food mostly in the developing countries, where there are serious social, economic and technological problems limiting the advance in levels of living. As Figure IV-3 illustrates, even 20 years after the close of the second world war, per caput food supplies in the Far East, the main rice-eating region, have barely caught up with the inadequate levels of the prewar years. Calorie supplies are still short of requirements by some 10 percent, indicating how serious undernutrition continues to be. The degree of malnutrition in the region is reflected by the low protein supplies. This situation generally prevails also in countries in other developing regions where rice is the main food.

The structure of demand for rice [4]

The economic concept of consumer demand as distinct from supply loses some of its meaning when, as in many developing countries, 50 to 70 percent of the rice crop is "subsistence" production. Since the internal marketing system is underdeveloped, the composition of consumption is determined by the pattern of production — people can eat what they or their near neighbors can grow — and this in turn is governed principally by ecological conditions.

[4] A detailed analysis of economic factors influencing demand for rice is contained in *The world rice economy, Vol. II: Trends and forces*, Commodity Bulletin No. 36, FAO, Rome, 1963.

FIGURE IV-3. - TRENDS IN DIETARY LEVELS IN THE FAR EAST



This, however, is an extreme situation which is not typical of rice-consuming areas. Subject to various exceptions, it is not only population growth and the production pattern that govern demand, but market factors such as increases in per caput incomes, prices, urbanization, consumer tastes, and the special nature of rice as a meal rather than a single food.

Rice eaters fall into three main groups. Firstly, there are the habitual consumers who rely on rice for most of their nutrient intake. Their special characteristic is a remarkable preference for rice against other cereals in the sense that they would, if able, eat rice as the central item of virtually all main meals throughout the year. Most of these habitual rice eaters are in the Far East, and they account for the bulk of world consumption.

Their demand is generally inelastic to changes in prices or incomes, although the relationship is complex because often the consumer grows most or all of the rice he eats. In a semisubsistence economy, where the farmer sells part of his rice crop to secure the cash he requires for essential needs, an increase in price may be equivalent to an increase in income; in these conditions higher prices may reduce the amount he needs to sell, and thus stimulate a *rise* in farm consumption.

A separate and less distinct group comprises those consumers who are in the process of changing their diets, shifting from another staple cereal or root (usually a so-called "inferior" food like millet or sorghum) to rice or wheat. To many of these people, who are commonly new arrivals in urban districts from rural areas in west Africa, parts of Latin America or Asia, rice is a semiluxury food which was previously unattainable either because it was not locally grown or because it was too expensive in relation to their incomes. These consumers prefer to buy rice when they can afford it, but they have not yet a well-defined preference for a particular type of rice, and probably they also eat other cereals or cassava as well. For this reason their demand is sensitive to changes in the ratio between prices of rice and other basic foods, and responds sharply to increases in income.

Thirdly, there are the consumers in the bread-eating regions of the Near East, north Africa and Latin America, as well as parts of Asia[5] and in the developed countries of Europe and North America, who eat rice occasionally as a special dish to add variety to their meals, or because it is easy to prepare. Their demand is not greatly affected by economic factors. This group is insignificant in the world rice consumption picture, though not unimportant in world trade.

The habitual rice eater not only strongly prefers rice to other cereals, but has a distinct taste for certain types and varieties and an equally strong aversion to others. These preferences for a particular size and shape are, in fact, merely reflections of the different cooking qualities and flavors of the various types. There are many factors involved, but probably the basic characteristic of long-grain *Indica* rice is its tendency to separate freely when cooked. This type of rice accounts for the bulk of world demand and is strongly preferred by the mass of rice eaters in south and southeast Asia. Round- (or short-) grain *Japonica* rices are soft-cooking varieties which tend to cling together when cooked. Japan, China (Taiwan), Korea and parts of China (Mainland) are the main centers of round-grain consumption; it is also commonly eaten in countries around the Mediterranean area, where it is locally grown, and it is preferred for certain dishes in other parts of Europe. Another complicating factor is the existence of a wide range of qualities of the same variety of rice commanding a wide range of prices.

Because of these consumer preferences the world rice market is not homogeneous and demand among the various groups responds differently to economic changes.

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[5] There are about 150 million people in the Far East, concentrated in north and northwest India, West Pakistan, parts of the Philippines and Indonesia, who eat little or no rice. Also in the northern part of China (Mainland), containing at least 40 percent of the population, mainly wheat and millets are consumed.

Factors affecting demand

POPULATION

Population growth, however, is by far the dominating long-term factor affecting total rice consumption. Demand may be influenced by changes in the age structure and geographic distribution between town and country, but their effect in the foreseeable future will be small compared with that of changes in numbers. The annual increase in population of most rice-eating countries ranges between 2 and 3 percent; moreover, as death rates fall, the population growth will probably accelerate still further in the developing regions. The pressure on supplies of these massive increases in the numbers of rice eaters will be much more powerful than any improvement in individual per caput consumption which may flow from rising incomes. Real incomes per head have usually been rising at a slower rate than population, and only part of that increase (half or less) is spent on rice.

Changes in the distribution of population between urban and rural areas may increase or decrease demand, depending on a number of factors. In Japan, for example, per caput consumption of rice in 1960 was 157 kilograms in rural areas against 99 kilograms in urban areas, and the same pattern is evident in the Philippines and China (Taiwan). In such countries, especially Japan, the decreasing proportion of people living in rural areas results in a declining trend in the national average per caput consumption. In other areas at an earlier stage of economic development, such as eastern India and East Pakistan, although urbanization does not increase demand for cereals as a whole it has stimulated demand for rice and wheat. In this case the number of rice eaters in the country is growing faster than overall population (Table IV-5).

INCOMES

While in many developing countries urbanization leads to a desire among consumers to eat more rice, this often is more costly than other staple foods and the ability to make an actual change in diets depends on the level of consumer income. Income is, of course, one of the major factors governing the per caput level of consumption of foods as a whole, and for rice in particular, because levels of living are low in many rice-consuming countries and people are underfed. When rice is the preferred cereal, experience has shown that its per caput consumption increases as soon as incomes improve. Sooner or later, however, depending on how far it is the only cereal eaten, a dietary maximum calorie intake will be reached. First, the amount eaten is stabilized but expenditure continues to increase because rice of better quality is substituted. At a later stage, with the continuing climb in the level of living, and a consequent greater freedom of choice among a whole range of foods, rice itself may begin to be displaced by sugar, meat and other noncereal foods. [6]

In fact, although per caput consumption of rice appears to have stabilized in several areas, the total calorie intake in the traditional rice-consuming countries is still only about two thirds of that in high-income countries, and there is no firm evidence that the stage of actual displacement has been entered. Even in Japan, since 1950-52 the calorie intake per person from rice has increased by 10 percent in absolute terms although, as total calorie intake is higher, it has declined by 2 percent in relative terms.[7] Generally, since rice remains at all income levels the principal base around which meals are planned, it seems unlikely that it will become supplementary in the way that bread or potatoes tend to be in high-income countries.

Surveys of consumer expenditure provide the main basis for studying the influence of income on demand. These appear to confirm that consumption in rice-eating areas stops rising or falls as consumer incomes increase. In Ceylon (1953) [8] per caput expenditure on rice steadily increased until family income rose to 800 rupees per month, and above this apparently reached a saturation point. For low-income groups (which comprise 75 percent of the people) demand showed a marked response to income changes, whereas in the highest group it was not sensitive at all. Similarly, Indian demand for cereals on the whole showed twice the response to income changes in rural areas than in urban areas,

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[6] In the traditional rice-consuming countries, cereal and other starchy foods usually account for 1,200 to 1,600 calories per person, or 60 to 70 percent of his calorie intake; in most developed countries of Europe and North America, they usually provide 800 to 1,200 calories, only about one third of the calorie intake. However, the fact that some developed countries in the warmer Mediterranean zones (e.g., Italy, Portugal, Yugoslavia) still absorb as much as 1,400 to 1,800 calories from these staple foods suggests that an actual decline in *absolute* per caput consumption levels of rice in developing countries may be very far away indeed.

[7] There appears still to be some latent demand for rice in Japan that is now coming into the open, mainly reflecting a shift away from barley which (like oats) is pressed flat and mixed with rice by the poorer consumers. This trend, however, is believed to be approaching its end, and by 1975 average rice consumption per caput should show an overall decline.

[8] *Survey of Ceylon's consumer finance*, Central Bank of Ceylon, 1954.

TABLE IV-5. – MILLED RICE: RECENT TRENDS IN TOTAL AND PER CAPUT CONSUMPTION (FOOD USES) IN RELATION TO POPULATION GROWTH

Country	Population growth, 1951-62	Total rice consumption			Per caput rice consumption		
		1950-52 average	1961-63 average	1961-63 index	1950-52 average	1961-63 average	1961-63 index
	Index, 1951 = 100	*.... Thousand tons .....*		*1950-52 = 100*	*..... Kilograms .....*		*1950-52 = 100*
FAR EAST							
Burma	124	*2 290	*3 180	139	*122	*137	112
Cambodia	145	*795	*870	109	...	*149	...
Ceylon	130	720	[1] 1 069	148	92	[1] 105	114
China (Taiwan)	142	1 100	1 610	146	130	134	103
Hong Kong	163	*210	*360	172	*100	*105	105
India	123	20 960	32 087	153	57	71	125
Indonesia	128	*5 750	*8 356	145	*75	*85	113
Korea, Rep. of	126	*1 800	*2 460	137	*87	*94	108
Malaysia: Singapore	138	810	*1 050	130	*127	*119	94
Pakistan	131	7 290	9 622	132	99	100	101
Philippines	135	1 840	2 609	142	85	89	105
Thailand	139	*2 600	*3 440	132	*129	*123	95
AFRICA AND NEAR EAST							
Madagascar	133	...	[2] 837	...	...	[2] 145	...
Mauritius	146	*40	64	160	*87	95	109
West Africa (former French)	136	*350	*700	200	*19	*28	147
Afghanistan	127	*[3] 150	[4] 191	127	*[3] 13	[4] 13	100
Iran	123	230	[5] 444	193	14	[5] 22	157
Iraq	124	100	[1] 124	124	19	[1] 19	100
Saudi Arabia	133	*38	90	237	*8	14	175
Syria	139	16	[1] 30	187	4	[1] 6	135
United Arab Republic	123	390	823	211	18	31	172
LATIN AMERICA							
Argentina	139	80	89	111	5	4	80
Bolivia	111	*22	21	95	*7	6	86
Brazil	134	1 770	[3] 3 172	179	33	[1] 44	133
Chile	130	40	[1] 62	155	6	[1] 8	119
Colombia	123	150	[1] 298	199	13	[1] 21	162
Cuba	125	*320	*350	109	*57	*50	88
Ecuador	143	[6] 70	[7] 103	147	[6] 18	[7] 23	128
Guyana	138	*21	*30	143	*48	*50	104
Mexico	140	100	[1] 193	193	4	[1] 5	135
Peru	130	130	[1] 244	188	15	[1] 25	166
Surinam	143	*15	20	133	*70	68	97
Uruguay	119	20	[7] 33	165	7	[7] 11	157
Venezuela	151	40	[2] 69	172	8	[2] 9	113
TOTAL, DEVELOPING COUNTRIES[9]	128	50 257	74 700	149	60	69	115
Japan	112	8 790	11 107	126	104	117	113
United States	120	369	556	151	2	3	126
Western Europe	107	[8] 871	[1] 1 065	122	[8] 2.8	[1] 3.2	114
TOTAL, DEVELOPED COUNTRIES[9]	112	10 030	2 728	127	18	21	114

* Unofficial estimates.

[1] 1960-62 average. – [2] 1962. – [3] 1954. – [4] 1961-62 average. – [5] 1960. – [6] 1954-55 average. – [7] 1961. – [8] 1951-53 average. – [9] Countries listed.

where living standards were much higher.[9] In Japan, on the contrary, according to 1964 expenditure data, consumption shows a steady decrease as incomes increase from the lowest level.[10]

Income elasticity of demand

In the absence of regular food consumption surveys, estimates of the income elasticity of demand (i.e., the percentage change in consumption per caput associated with a 1 percent change in income per caput) must be largely speculative. Only for four major consuming countries in the Far East — India, Ceylon, China (Taiwan) and Japan — can calculations be based on direct evidence from household surveys.

Average per caput consumption among rice eaters in India and Ceylon is already high (100 to 150 kg), but since incomes are still very low the rise in living levels acts as a marked stimulus to demand. The national "expenditure" elasticity[11] of demand in India was stated to be 0.60 to 0.65 [12] and in Ceylon the " quantity," elasticity was placed at 0.52.[13] Since expenditure can be expected to increase more than the actual quantity purchased, reflecting a partial shift to more expensive qualities, it can be taken that, other things being equal, in both countries a 10 percent rise in consumer incomes brings approximately a 5 percent increase in rice consumption per caput.

For most of the traditional exporting countries in the Far East (Burma, Cambodia, Thailand, and the Republic of Viet-Nam) as well as in Malaysia, rice consumption seems to have reached its saturation point at 125 to 150 kilograms per person. In Burma, changes in income probably have little effect on the quantity of rice consumed except in mountainous areas, where people are poor and supplies are lacking. The same applies to Thailand, where the income elasticity of demand for cereals is very low. In the Philippines, too, clasticity has been estimated to be as low as 0.1 in rural areas and –0.1 in urban areas.[14]

Japan enjoys high incomes and China (Taiwan) a high per caput consumption, so that there is little response to income changes in these countries. The average elasticity in China (Taiwan) has been placed at 0.06,[15] and for Japan (for rice eaten as food) at 0.01.[16] The principle that different qualities of rice have different elasticities, depending on consumer preferences, is demonstrated by the Japanese data, which indicate that imported rice had a negative elasticity of –1.6, as against +0.1 for domestic rice.

The fact that per caput consumption is still rising in Indonesia, Hong Kong, the United Arab Republic and some other Near Eastern countries, Latin American importing countries and in west Africa, suggests these countries may be grouped together as having a positive income elasticity. No precise estimates can be made, particularly for Africa, since evidence is so scanty and conditions so variable. Rice, like bread, is almost a luxury food in urban areas. Generally, therefore, the coefficient for rice is higher than the average for food as a whole (perhaps as high as or higher than unity in west Africa), though it falls to zero in Madagascar and other areas where rice is already eaten in large quantities.[17] In Latin America, income elasticity varies widely, generally being lower where consumption per caput is already high. Elasticity is placed at 0.4 in Brazil[18] and at 0.6 in Ecuador,[19] whereas in the high consumption countries of Guyana (50 kilograms of rice per head) and Cuba (55 kilograms) there appears to be little relation between incomes and demand.

Short-term changes in prices

Demand for rice is also affected both by its real cost (its price compared with income and with prices of other products) and by variations in cost.

A survey of the trends in relative prices of rice and other foodstuffs during 1950-62 for 36 coun-

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[9] Expenditure-clasticity for all cereals is 0.32 in urban areas and 0.62 in rural areas. The difference for rice, however, is probably much less than this. *Tenth round of national sample survey. 1955/56.*

[10] *Annual report on the family income and expenditure survey. 1964.* Bureau of Statistics. Office of the Prime Minister. Japan.

[11] That is, the percentage increase in expenditure on rice following an increase of one percent in total expenditure on all goods: "quality" elasticity relates the actual quantity consumed with disposable income.

[12] Based on *Tenth round of national sample survey. 1955/56.*

[13] Based on consumer household survey 1953. See FAO. Price and income elasticities of demand for rice and other cereals. ECAFE/FAO. *The world rice economy.* Vol. I: *Selected papers.* In Commodity Bulletin Series No. 36, 1962.

[14] *The Philippines: Long-term projection of supply and demand for selected agricultural products.* Economic Research Service. United States Department of Agriculture. ERS-Foreign 34). 1962.

[15] Lee. *Statistical measurement of income elasticity of demand for major farm products in Taiwan.* Joint Commission on Rural Reconstruction in China (Taiwan). 1959.

[16] The Japanese demand for rice for manufacturing use (mainly in brewing) is more elastic, being calculated at 0.38. These coefficients are those adopted for making official projections of demand in the 1962-71 period. Planning Office, Ministry of Agriculture and Forestry. *Long-term projections of demand and production of agricultural commodities.* Tokyo. 1962.

[17] See FAO. *The economic relationships between grains and rice.* Commodity Bulletin Series No. 39. Rome. 1965.

[18] *Development plan of Brazil. 1964-66.*

[19] Junta Nacional de Planificación y Coordinación Económica. *Plan nacional de desarrollo del Ecuador.* Informe anual. 1958. Quito.

tries [20] showed that, though the price of rice declined in a number of cases (e.g., in Ceylon, Madagascar, Mauritius, Singapore), there is no evidence of a world-wide or region-wide tendency for one food to become cheaper compared with another. National price patterns showed wide variations. In many countries (Indonesia, Madagascar, Malaysia, the Philippines, Senegal, Thailand, the United Arab Republic) the price of rice became lower relative to wheat flour, maize, or the other main food consumed, but in others in the same regions it became relatively more expensive.

Little is known of the precise impact of price changes because of the lack of reliable time series of consumption and the difficulties of securing fully comparable price data.[21] Common sense, however, indicates that demand should be less affected by price variations at high, rather than at low income levels.

Among the habitual rice eaters demand is generally inelastic to price changes. For instance, the evidence in Ceylon suggests that even sharp price increases do not affect demand significantly, apart from some immediate difficulties in readjusting consumer expenditure. In countries like Hong Kong and Singapore, where internal prices are free and virtually all rice is imported, there is no traceable relation between annual apparent consumption and import prices, although this is perhaps partly because international prices have varied little in the past seven years.[22]

Where rice is the habitual staple food, preference for a particular type makes demand for other grades or varieties of rice highly inelastic, at least in the short run, to changes in relative prices. In Japan, consumers would even prefer to supplement domestic round-grain rice with processed barley, rather than switch to imported long- or medium-grain rice with different cooking qualities.

Among the second group of consumers, who substitute rice for other cereals if it becomes relatively cheap, the price elasticity of demand for rice in general is greater than for all cereals, and is greater for the preferred quality of rice than for all qualities. This probably applies in Brazil, parts of India, and the Philippines, for example.

Another characteristic of demand blunts the impact of price changes: in the event of price increases many consumers may continue to buy roughly the same quantity but shift to cheaper blends of the preferred general type. The reverse occurs when prices fall. (In the Philippines the shift is from *macau ordinario* to *elou-elou* or other fancy varieties.) An additional unpredictable element is added by the high proportion of habitual rice eaters who are also producers, selling their surplus as a cash crop. As noted above, a rise in prices may allow this group to reduce sales, increase their own consumption, and still maintain their cash income. Even in Japan, economically the most developed of countries where rice is a staple food, over 40 percent of rice supplies are consumed on farms (1951).

Price disparities and consumer subsidies

Consumer prices of rice, and the pattern of food prices, show wide differences from country to country, and the relationship between prices of various cereals on international markets, where wheat flour is considerably cheaper than milled rice, is no guide to their levels on retail markets (Figure IV-4). [23]

In general, economies of scale in production and marketing cause the most readily available staple food to be the lowest in price in the local market. Thus wheat tends to be the lowest priced staple in wheat growing areas, whereas rice is cheaper in most local markets of the Far East. Its retail price is usually 10 to 15 U.S. cents per kilogram, with bread at about double the cost.[24] The situation is reversed in the Near East and north Africa. Except in the United Arab Republic (an important rice producer), rice tends to be more than double the cost of bread, which is the cheapest cereal product. In Africa, prices vary greatly between countries, between markets within a country, seasonally, and from year to year, but it appears that the cheapest foods normally are such staples as cassava, maize and sorghum.

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[20] FAO, *The economic relationships between grains and rice*, Commodity Bulletin Series No. 39, 1965.

[21] The fact that 1 kilogram of rice may be dearer than 1 kilogram of wheat or maize is not decisive since the rice is usually in ready-to-cook form whereas the other cereals and dry cassava have to lose 10 to 30 percent of their weight. Rice requires much simpler and cheaper cooking facilities than wheat flour, but bread does not even require cooking and like *gari* (processed cassava) can be consumed without further treatment. Potatoes and cassava lose weight in peeling, whereas cooked rice (unlike bread) develops three to four times the volume of uncooked rice.

[22] Also, actual consumption cannot be reliably estimated because both countries also have purchased considerable (and variable) quantities for government stocks, which are not distinguishable from imports for consumption.

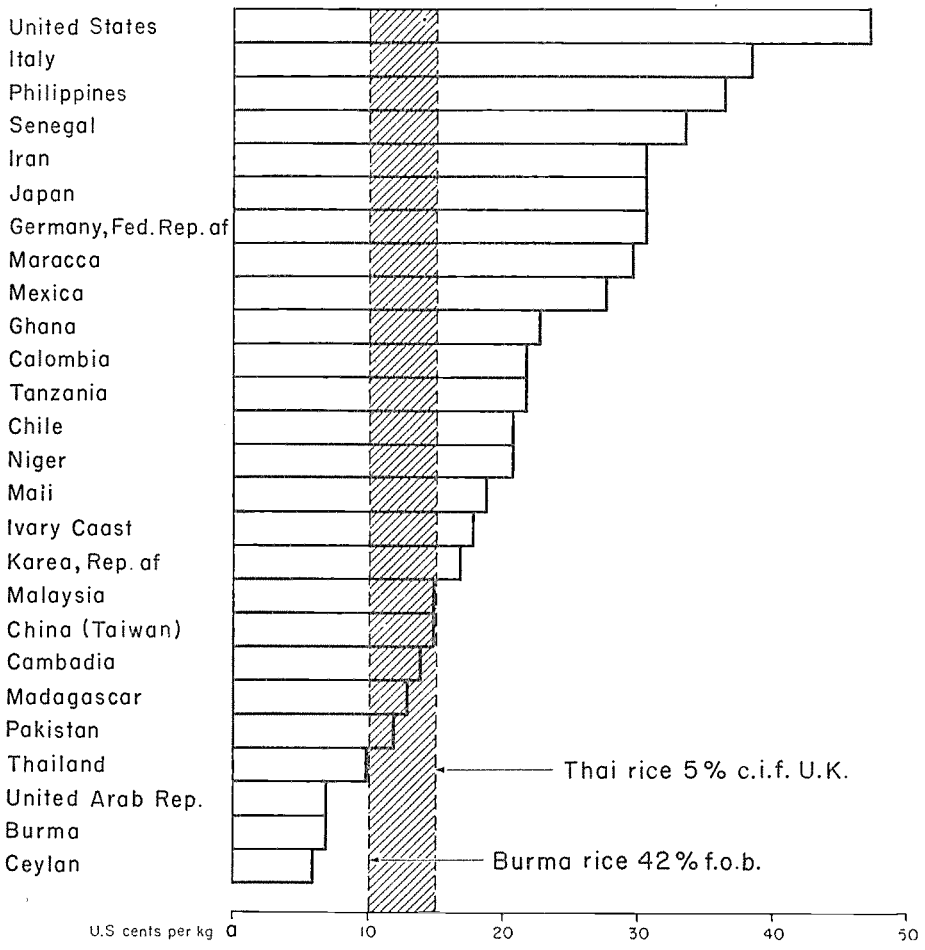
[23] On the world markets the cost of wheat flour is approximately the same as the medium grades of rice imported by India, Indonesia and Ceylon, but less than the more expensive export grades of Thai rice. Both wheat and rice cost considerably more to import than coarse grains or cassava flour. In 1964 the export unit value of milled rice averaged $124 per ton compared with $84 for wheat flour. The comparison would be similar in terms of calories, since the calorie content of milled rice and the other grains and cassava *in terms of flour* is very similar.

[24] There are special circumstances affecting rice prices in Japan (high farm support prices), Indonesia and the Republic of Korea (inflation), and Ceylon (subsidy).

Except in Madagascar, Mauritius, and those west African areas where rice predominates, rice and bread are both usually high priced, with an apparent tendency for rice to be the more costly of the two.

This disparity in national consumer prices is characteristic of a number of agricultural commodities. In many cases (such as tea, sugar and coffee) the differences are due to import duties, consumption taxes, or freight charges, but in rice these factors play a negligible role except in parts of Latin America and west Africa, where import duties are important.[25] The major causes lie in national rice policies and direct controls on trade. In the absence of such restrictions, the flow of trade from lower cost to higher cost countries should tend to narrow the gaps between price levels. In fact, nearly all the major rice-importing countries closely control the size of their imports. Domestic markets and prices are thus isolated from international developments and, in the absence of subsidies, expensive rice reflects the sometimes high domestic costs of production (e.g., in Africa) or guaranteed producer prices (e.g., in Latin America).

FIGURE IV-4. - DOMESTIC RETAIL PRICES OF RICE IN JUNE 1965, COMPARED WITH AVERAGE INTERNATIONAL PRICES IN 1965



Because of their heavy cost, consumer subsidies on rice are used sparingly and today are applied in very few of the major consuming countries. Although they have been important in other countries such as the Republic of Korea and Malaysia in earlier postwar years, the only large impact today is in Japan and Ceylon. In both these countries about two thirds of the total consumption is subsidized, the governments bearing about 20 percent and 40 percent respectively of the actual average retail cost. However, this does not give the consumers any special advantage; the subsidies are in reality more in the nature of producer subsidies, being necessary mainly because the support prices for paddy are unusually high, while Japanese retail prices remain relatively high despite the subsidy. Other countries maintain a subsidy on home-grown rice, but this is more or less offset by a levy placed on imported rice, and on balance the consumer may not gain much (e.g., Indonesia, Jamaica, Sierra Leone and other west African countries).

COMPETITION WITH OTHER FOODS

Changes in food price relationships and price disparities, therefore, have not so far had a marked impact on rice consumption. Clearly the traditional popularity of rice in the Far East, of bread in north Africa and the Near East, of maize *tortillas* in Central America, and of gari (cassava) in west Africa will not be permanently affected merely by year-to-

[25] For example, duties on imported rice amount to about 50 percent *ad valorem* in Ghana and 100 percent in Central American countries.

year shifts in relative prices. Food habits and general living customs govern demand.

The areas where both rice and other cereals are cultivated, and where people habitually eat more than one cereal, are fairly limited. The peculiar consumer preference enjoyed by rice, moreover, places it in a strong competitive position vis-à-vis most other cereals and starchy foods. Consumers are willing to pay a premium for rice, and once they can afford to substitute it for millet, sweet potatoes, maize, barley, or perhaps beans, only a prolonged physical shortage is likely to cause a shift back to these products. Also, ecological conditions in tropical areas are often favorable to the production of rice but not wheat, which has to be imported. At present ample supplies of wheat can be imported on concessional terms, but in the long run a chronic dependence on foreign supplies is likely to lead the governments of many developing countries to place more emphasis on rice in their national consumption policies.

The areas where rice is a competing food with wheat are limited to China (Mainland), certain parts of central India, Korea, West Pakistan, and most of the Near East. It also competes with maize in Cambodia, Indonesia, and the Philippines; with beans, maize and starchy roots in Latin America; and with millet, sorghums and starchy roots in west Africa. Urbanization undoubtedly helps a shift to rice in such areas, as do changes in cropping patterns. In Latin America, the resettlement of people from the high plateaus (where only potatoes and barley can be cultivated) on to lowlands suitable for rice is causing a change in food habits, and the spread of rice cultivation in west Africa has the same effect.

Shifts in the reverse direction, toward the inclusion of other foods in the habitual rice-eaters' diets, require a sustained effort of consumer education. Such programs have met with some success, particularly in the early postwar years, but experience shows that people often tend to revert to rice when it becomes more freely available. The objectives of these programs are mixed: to lessen the overwhelming dependence of the population on rice and to reduce consumer resistance to alternative foods in times of rice shortages; to absorb wheat which is available for import on concessional terms under United States Public Law 480; to give a slightly better nutritional balance to rice diets; and to conserve more of the rice supplies for export markets. Some schemes have made a mark. Thus the postwar school lunch program in Japan, which introduced a whole generation to regular meals of wheat products, undoubtedly had a considerable effect on eating habits, and today wheat provides 10 to 12 percent of Japanese calorie intake against 4 percent before the war. However, despite rapidly rising incomes and a favorable price ratio,[26] per caput consumption of wheat is no longer rising appreciably in Japan, while demand for rice shows no sign of shrinking. The government campaign carried on in East Pakistan to popularize wheat consumption among rice eaters has also shown substantial results since a heavy price subsidy was granted in 1962. The official issue price for wheat to consumers was cut by 30 percent in April 1962 to P.Rs.12.50 (U.S.$2.60) per maund (37.32 kilograms), as against an actual cost of about P.Rs.18 (U.S.$3.80). This reduced the retail price of wheat to about half that of rice, and was immediately followed by a trebling of wheat consumption. Total offtake from government wheat stocks rose from an average of 160,000 tons in 1959-61, to 445,000 tons in 1962 and 667,000 tons in 1963. This is a significant advance, but it is still only 6 percent of total cereal consumption and the heavy price subsidy might not be financially possible if wheat were not available on special terms.

Other campaigns, such as the "Eat-More-Wheat-and-Barley Campaign" in China (Taiwan) in 1962/63 and the "Grain-Saving Campaign" in the Republic of Korea in 1964, were too shortlived to have much impact. There has been a noticeable growth in per caput consumption of wheat, which has more than trebled since 1950, as well as of fish and meat, in China (Taiwan), but this has apparently not caused demand for rice to fall significantly. Since before the war, the influx of mainland Chinese as well as rising incomes have brought an increase in consumption of rice at the expense of sweet potatoes, especially in rural areas.

Wheat flour (all imported) has replaced rice to some extent in Ceylon since the war, but this is mainly because wheat flour, which is subsidized in price like rice, is made available freely whereas rice is rationed. In India, wheat now accounts for 19 to 20 percent of total cereal supplies against 16 percent in 1955. While the growth of incomes and urbanization has brought a shift from root crops and coarse grains to rice, this has been partly offset

[26] During 1951-62, the retail price ratio between rice and competing cereals greatly favored the other cereals. In 1951 wheat flour was only 20 percent cheaper than polished rice in Tokyo whereas by the end of the decade it was about 40 percent cheaper: barley, which initially costs about 10 percent less than rice, was 30 percent cheaper by 1962. Yet per caput consumption of barley has shrunk drastically and, although wheat consumption has risen modestly in rural areas, it fell in urban Japan in this period.

by a tendency in other areas for wheat to replace rice, especially in meals taken away from home. Wheat costs considerably less than rice and supplies have grown faster.

Consumption habits outside Asia are more flexible, partly because (with exceptions such as Madagascar, Mauritius, Sierra Leone and parts of Brazil) rice is not firmly established as a staple food. Rice, as well as wheat, has shared in the market substitution for maize, barley and, to a lesser extent, millet, which has occurred in the United Arab Republic since 1939. West African consumers also, though conservative toward changes in food habits, are adding new foods to the traditional diets. A recent analysis concluded that "the expanding role of rice and wheat flour in African diets are the two trends which appear in evidence in virtually all the territories."[27] Although the evidence is scanty, it suggests that, especially in urban areas, consumers in Ghana, Senegal, and other parts of west Africa will readily shift to rice from millet and sorghums, despite much greater cost. In the long run, this trend appears likely to be accentuated by the fact that there is little likelihood of wheat being widely grown in tropical Africa, whereas vast stretches of potential rice land exist. However, costs of production are often relatively high and a number of countries such as Ghana and Mauritania are now taxing imported rice in order to protect the domestic producer, which may reduce consumption in the short run. In South America, and especially in parts of Brazil, the share of rice in food supplies has shown a pronounced increase since before the war, mainly reflecting the growth in production and widening familiarily with rice.[28]

As consumer incomes increase, a continuation can be expected of these underlying tendencies in many areas of the Far East, west Africa and Latin America toward a greater consumption of rice at the expense of other cereals such as barley and millets, as well as of beans and starchy roots in some areas (particularly outside the traditional rice-consuming areas of the Far East). Only in a few areas, such as the Asian "rice bowl" of Burma, Thailand, Republic of Viet-Nam and Cambodia, also China (Taiwan) and Japan, does demand for rice appear to be virtually saturated. On the other hand, the amount of wheat added to the habitual rice-eaters' diets is unlikely to have a significant permanent impact on the overall demand for rice in the foreseeable future, even though several governments are hoping to encourage it, and price relationships favor it. The addition of supplementary protein-rich foods is likely to be slow (see below). The pace of future changes in dietary patterns will depend greatly on the rate of general economic development and particularly on urbanization and the extension of the market economy. Above all, since import restrictions greatly limit consumer choice, it will be governed by changing patterns of indigenous food supplies.

[27] B.F. Johnston, *The staple food economies in western tropical Africa*, p. 305. Stanford University Press, Stanford, Calif., 1963.

[28] There is some evidence that high retail prices have limited rice consumption. In Venezuela, for example, rising rice prices in 1955 led to a decline in consumption and the replacement of rice by wheat noodles and potatoes. There was an unsold surplus and the Corporación de Fomento had to restrict production (United Nations, *Economic survey of Latin America*, 1956).

Improving the rice-eater's diet

Most rice eaters are too poor to afford any appreciable quantities of supplementary "protective" foods such as milk and milk products, meat, fish, eggs, pulses, vegetables and fruit. In fact, even their calorie intakes are often below nutritional requirements, as is the intake of protein which is mainly derived from the staple rice itself. Table IV-6 shows the insufficiency of the B group of vitamins, vitamin A, calcium and ascorbic acid. There is, therefore, much chronic undernutrition and malnutrition resulting in low vitality, impairment of general health and physical development, and a high incidence of deficiency diseases. Still ranking high among these diseases is beriberi, associated with high consumption of polished white rice which is seriously deficient in thiamine. The incidence of protein-calorie deficiency diseases is reported to be high in Brazil, Burma, Ceylon, Colombia, India, Indonesia, Malaysia, and elsewhere. Also, lack of vitamin A, often associated with protein deficiency, leads to a great amount of preventable blindness in children, and the incidence of anemia in women of childbearing age continues to be high.

Measures to improve the rice-eater's diet have been extensively studied, particularly in regard to the prevention of beriberi, both at national and international levels, but relatively little progress has been made[29].

Improvement of nutritive value of rice as consumed

In its natural state, the nutritive value of rice is good, comparing very favorably with that of other

[29] Since 1947 FAO (and later jointly with WHO) has convened five regional meetings for Asia and the Far East to provide guidance to governments on appropriate measures. In 1948, FAO published *Rice and rice diets* (revised 1954, reprinted 1965), a survey concerned with the nutritive value of rice and rice diets.

TABLE IV-6. – COMPOSITION OF RICE DIETS IN VARIOUS COUNTRIES: FOOD INTAKE PER PERSON PER DAY

	Unit	Burma	India	Japan	East Pakistan		Philippines			Mali
		11 rural areas 1955-57	13 states 1955-58	Whole country 1963	17 rural areas 1962-63	5 urban areas 1962-63	Central Luzon region 1957	Manila 1959	Cagayan valley-Batanes region 1961	Rice zone 1957-58
FOODS	Grams									
Rice	"	444	302	351	505	311	424	240	267	418
Other cereals	"	—	169	78	32	53	14	58	83	125
Starchy roots and tubers	"	—	—	53	56	32	6	11	56	7
Sugars and syrups	"	14	17	14	8	12	15	29	20	—
Dried beans, nuts and seeds	"	14	56	69	28	26	5	7	14	16
Fruit	"	27	5	96	10	17	182	188	308	5
Vegetables	"	88	93	166	151	142				19
Meat and poultry	"	23	3	28	6	19	23	45	39	14
Fish	"	68	6	78	36	42	135	56	66	93
Eggs	"	4	2	28	2	3	13	11	5	—
Milk and milk products	"	8	66	45	17	52	24	73	22	50
Fats and oils	"	24	12	8	6	14	8	14	8	6
Miscellaneous	"	—	—	—	5	4	10	27	17	—
NUTRIENTS										
Calories	Number	2 075	2 127	2 083	2 254	1 732	2 064	1 727	1 809	2 450
Total protein :	Grams	48.3	56	70.6	57.4	49.5	60.2	49.8	47.7	77.1
animal	"	14.2	4.5	27.7	—	—	22.9	22.9	33.4	26.9
vegetable	"	34.1	51.5	42.9	—	—	37.3	26.9	14.3	50.2
Fat	"	35.8	24.3	29.2	17.2	25	—	—	25	25.2
Calcium	Milligrams	171	340	409	304	226	310	350	400	289
Iron	"	8.9	10.9	13	9.5	8.5	10.6	10.1	12	12.4
Vitamin A	I.U.	1 879	1 576	1 452	1 580	1 795	1 054	2 278	2 419	1 287
Thiamine	Milligrams	0.73	1.4	1.03	1.46	1.03	1.00	0.88	0.78	1.35
Riboflavin	"	0.33	0.70	0.79	0.50	0.54	0.62	0.72	0.56	0.68
Niacin	"	9.7	12.9	—	22.8	14.3	19.9	14.8	13.8	18.8
Ascorbic acid	"	32	21.0	79	40	38.5	62	63	83	17.6
Calories from: carbohydrate	Percent	75	79.3	73.9	82.9	75.8	84.7	66	78.5	78.1
protein	"	9.3	10.5	13.5	10.2	11.2	11.6	11.4	9.7	12.6
fat	"	15.5	10.2	12.6	6.9	13	3.7	22.5	11.8	9.3

SOURCES: BURMA, WHO/SEARO. *Final report on nutrition in Burma.* (S. Postmus), 1959. – INDIA - C.G. Pandit and K. Someswara Rao. *Nutrition in India, 1946-58.* – JAPAN, Ministry of Health and Welfare. Bureau of Public Health. *Nutrition in Japan.* Tokyo, 1964. – MALI, Mission socio-économique du Soudan. *L'alimentation des populations rurales du delta vif du Niger, 1957-58.* Office du Niger. Paris, 1960. – PAKISTAN, Government of Pakistan. Directorate of Nutrition and Research. *East Pakistan nutrition survey, 1962-63.* – PHILIPPINES, Government of the Philippines. Food and Nutrition Research Center. *Nutrition surveys of Central Luzon region, 1957; Metropolitan Manila,* 1959; *Cagayan valley-Batanes region, 1961.* Manila, 1962.

major cereals used as staple foods. Husked (brown) rice (i.e., rice freed only of its chaff-like hulls) has about the same content of calories, vitamins and minerals as whole wheat, somewhat less protein and more fat and carbohydrate. Compared with maize, it has the advantage of containing liberal amounts of niacin. White rice (i.e., husked rice that has been milled and polished to remove the bran and germ) loses a portion of its best protein and most of its fat, vitamins and minerals. Washed and cooked, white rice loses most of its remaining vitamins and minerals, especially if it is cooked in an excess of water which is later discarded. Thus, the nutrient content of rice is seriously reduced between harvesting and consumption and it is easy to understand the strong association between consumption of white rice and beriberi.

The best way to prevent beriberi is to raise thiamine intakes where the disease occurs. This can be achieved by:

1. encouraging the use of either home pounded or undermilled rice instead of highly milled rice;
2. replacing highly milled rice in the diet by milled parboiled rice, and
3. reducing the amount of washing to which rice is subjected before cooking.

Unfortunately, action taken so far has been largely ineffective, except in a few instances. There are numerous reasons for this, notably a growing ten-

TABLE IV-7. – CHANGES IN FOOD INTAKE IN JAPAN

	1949	1955	1960	1963
	.. *Grams per caput per day* ..			
Cereals	473	480	452	428
Rice	333	347	358	350
Wheat	66	68	65	65
Others	74	65	29	13
Starchy roots and tubers	170	81	64	53
Sugars	5	16	12	14
Beans	50	67	71	69
Animal foods	68	115	147	178
Fish	56	77	77	77
Meat and poultry	5	12	18	28
Eggs	3	12	19	28
Milk and milk products	4	14	33	45
Fruit and vegetables	222	235	242	262
Processed vegetables	50	56	51	52
Seaweeds	3.4	4.3	4.7	4.6

SOURCE: JAPAN. Ministry of Health and Welfare. Bureau of Public Health. *Nutrition in Japan.* Tokyo. 1961 and 1964.

dency toward power milling in place of the laborious home pounding, the food habits of rice eaters and their preference for white rice.

One important means of increasing the nutritive value of rice is the artificial enrichment of milled raw rice with thiamine and other nutrients (niacin, iron and riboflavin). This has been a valuable weapon against beriberi [30] and has been applied on a large scale in Haiti, the Philippines, and Puerto Rico. Practical difficulties of organizing, financing and enforcing rice enrichment regulations (adding the premix [31] in the rice mill) were encountered in the Philippines. However, where the mixing has been done by the housewife at home, as in Japan, the measure has been largely successful.

IMPROVEMENT OF RICE DIETS

Another approach is to improve the dietary pattern so that it contains less rice and more of other foods, particularly the "protective" foods. Such shifts are unquestionably happening in many countries. This is the most satisfactory approach in the long run, but it takes time, whereas some rapidly effective measures are often needed. A good example is Japan (Table IV-7). As indicated above, during the short span since 1949, Japanese consumption of cereals and starchy roots and tubers has decreased, while there has been a dramatic increase in the intake of beans, foods of animal origin and also fruit and vegetables. This is partly due to the high incomes, but it is also worth noting that food and agricultural planning in Japan has been oriented to nutritional needs, since it is important that the production and consumption of good sources of the nutrients in which rice diets are deficient should be encouraged.

Firstly, the production and yield of rice must be increased, since an increase in supplies of rice itself is often the most feasible method of expanding availabilities of calories in the short run. The partial replacement of rice by cereals consumed whole, such as wheat and millet, is also generally advantageous from the nutritional standpoint. Fish, which has a high protein and also vitamin B content, is of great value as a supplement to rice diets. Potential supplies of fish in most rice-eating countries are large, and there are good possibilities for expansion in the paddy fields themselves. Although the inclusion of any sizable quantity of other highly nutritious foods like milk, meat and eggs is hardly feasible in most developing countries, imported milk products (and particularly dried skim milk enriched if possible with vitamin A) could be used with great advantage in the supplementary feeding of vulnerable groups. As pulses (including soybeans and groundnuts) are rich in vitamins of the B group and are also good sources of protein, their production should be increased in rice-eating areas, where possible.[32]

In view of the shortage in rice-eating countries of milk and of other protective foods for infants and children, attention has been focused on the development of low-cost food preparations, rich in proteins of good nutritive value. The FAO/WHO/UNICEF Protein-Rich-Food Program has been providing support for research and for the testing and development of products in a number of countries. The main potential sources appear to be soybeans, groundnuts, coconuts and fish, and the outlook for supplies of these foods is generally favorable.[33]

[30] FAO. *Rice enrichment in the Philippines.* W.C. Aalsmeer *et al.* Nutritional Studies No. 12. Rome. 1954.

[31] "Premix" is highly milled rice the grains of which have been impregnated by spraying with a solution of the required vitamins in suitable concentrations. One part of premix mixed with 199 parts of ordinary highly milled rice produces enriched rice.

[32] Increased production of vegetables and fruit is necessary also, with special emphasis on those with the highest nutrient content, e.g., green leafy vegetables and fruit (such as mangoes and papaya) which are rich in vitamin B, carotene and ascorbic acid.

[33] Examples of products that have been developed from soybeans are a spray-dried soya extract (*saridele*) in Indonesia, liquid soya milk in Hong Kong, and curds and fermented soya products in Japan. A mixture of groundnut flour with chick-pea flour (3:1) has been developed in India. Trials with fish protein concentrates and fish flour have been carried out in India, Burma, Thailand and Senegal. The utilization of the coconut, after the extraction of the oil, as a source of protein, is being investigated in India and the Philippines.

Organized distribution of appropriate foods and the provision of meals through various institutions to people having special nutritional needs have been undertaken in most countries. However, with the exception of Japan, Mexico and Puerto Rico, very few well organized preschool and school feeding programs covering large numbers of children on a permanent basis are in operation, the main obstacle being lack of finance.

Many rice eaters could have better diets within their resources and cultural patterns, if only their selection and preparation of foods already available to them could be improved through appropriate education in nutrition and home economics. Considerable progress has been made in many rice-eating countries to develop such programs through government as well as voluntary agencies.

All these measures, if applied effectively, will improve the nutrition of rice eaters — a prerequisite for higher productivity and, therefore, for the successful implementation of plans for economic development.

PRODUCTION AND PRODUCTIVITY

Cultivated rice has two origins, the main one, *Oryza sativa* (white grain rice) in the monsoon belt of southeast Asia, and the other, *Oryza glaberrima* (red grain rice) in west and central Africa. But today it has a wider range of cultivation than any other staple cereal. Production extends from the latitude of 48°8′N to 37°2′S. Between the two "temperate" limits, rice can be produced wherever sufficient water is available.

While the rice plant can grow under such differing climatic conditions, it gives a good yield only if the basic conditions of soil, water, variety, etc., are favorable. Some of these factors can be controlled, others cannot. Infertility of soil and lack of water are probably the two most common causes of low yields. Yet it must also be remembered that, because of differing ecological responses, the same variety will produce quite different results under different environments.

Types of rice plant and their ecological response

The rice-growing areas can be divided into two broad sectors: that of *indica* rice in the subtropics and tropics, and of *japonica* rice in the temperate zones. The transition is gradual, without a distinct boundary. In Japan, only japonica (round-grain) rice is grown, while in southeast Asia most of the varieties are indica (long-medium grain). In China (Mainland), japonica rice is grown in the central provinces and indica in the south; in Australia, japonica rice is grown in New South Wales and indica in certain parts of both the Northern Territory and Western Australia; in the United States, indica rice flourishes in the southern states while japonica rice survives well in northern California; both types are grown in Brazil too. However, it is often not possible to interchange these two main types, and even where it is, consumer preferences for the traditional variety are a great impediment. This is important because japonica nearly always outyields indica rice. Even on land where both types can be grown, as in China (Taiwan), japonica rice proves to have the higher genetical yield potential.

Other factors limit the introduction of some otherwise desirable varieties. When a rice variety is photothermal sensitive, it cannot be transferred from the tropics to temperate zones or vice versa without affecting its growth. If a sensitive rice variety from Japan is introduced and grown in the Philippines, the shorter day length and high temperatures make the plant premature and dwarfed, bearing only a few grains. Conversely, a sensitive variety from the Philippines introduced into Japan will, with the long day and cooler temperature, flower late or continue to grow without even flowering.

Rice can be grown on almost any type of soil, the exceptions being peat, and infertile sandy and stony soils. Better crops, however, are obtained on the heavier soil types: the clays, the silty clays and the silty loams. The most suitable soil depends on whether rice is cultivated under the usual semiaquatic conditions (demanding a heavy soil) or as a dry-land crop. But rice is an adaptable crop and its cultivation is governed more by the water supply than by the nature of the soil.

Water is a crucial factor affecting yields. Rice, as a rule, is grown as a summer crop in the monsoon season in southeast Asia, and in other places where rainfall is sufficient (about 1,500 millimeters in a period of four to five months). Yet those countries where rice yields are highest are located in regions where there is little or no rainfall at all in the growing period. The countries around the Mediterranean, the Rostov area of the eastern Black Sea coast in the U.S.S.R., and the Murrumbidgee irrigated area in New South Wales are all dry summer areas. They depend, consequently, upon artificial irrigation for their rice crop. Similarly, irrigation water for the rice grown along the northern rainless coast of Peru comes from summer rain in the Andes, and the yield is the highest in Latin America, reaching more than 4,000 kilograms per hectare.

Since ecological factors such as length of daylight, temperature, and rainfall play such an important role in rice cultivation, the crop in the temperate zones (with mild temperatures and long days) will usually outyield that grown in the tropics. This has to be borne in mind when comparing the yields obtained by farmers in the tropics with those in, for example, Japan or southern Europe. The explanation may be due to long days in the growth period of the crop: more photosynthesis and transpiration functions are performed by the crop plant in the temperate zones than in the tropics. In the Mediterranean area, the high yield is largely due to rainless days with long insolation, which accelerate the photosynthetic and transpirational processes for high production.

Breeding and selection of varieties

It is the role of plant breeding work to counter these natural disadvantages by introducing into the rice seed such desirable characteristics as indifference to photothermal sensitivity, greater response to fertilizer, short culms, resistance to diseases, short growing period, tolerance to salinity, and grain quality. Pioneer work on rice breeding was carried out in Japan as early as 1892, and the rice yield in that country had risen to 5,200 kilograms per hectare by 1964, almost double that at the beginning of the century. The introduction of an improved rice variety in the United Arab Republic increased the yield from 3,700 kilograms per hectare in 1953 to 5,800 kilograms in 1964.

More recently, the International Rice Research Institute (IRRI) at Los Baños in the Philippines has bred a new variety which shows insensitivity to photoperiod and resistance to lodging and blast disease, and gives a yield of more than 6,000 kilograms per hectare under tropical conditions. Because of its insensitivity to photoperiod it could be widely introduced.

Rice breeders are kept informed on parental stocks through the *World catalogues of genetic stocks*, compiled by FAO since 1950. The catalogues register stocks maintained at different plant breeding stations and other institutes,[34] to encourage the exchange of breeding materials. Over 1,400 rice stocks have so far been registered.

Work on induced mutations in rice varieties through irradiation and chemical mutagens has increased considerably in the last few years. A great number of experimental stations are conducting fundamental methodological and practical mutation work in rice, and various mutations have been obtained by X-ray, gamma-ray, neutron, thermal and fast neutron beta-ray and chemical treatment. However, the work on induced mutation has only just started; it will be long before it can be of practical value.

Irrigation, drainage and water requirements

Despite the expansion in the area devoted to dryland rice in recent years, particularly in Latin America and Africa, in most developing countries a more stable or regular water supply is a prerequisite to any substantial increase in productivity or output. Efficient drainage of excess water is equally desirable in the rainy season, while the lack of water during the dry season limits or prohibits double- or multiple-cropping.

The development of irrigation and drainage differs widely. The situation in most rice areas can be placed in one of the following three categories:

1. natural conditions with no provision for water control, so that rice cultivation depends entirely on rain and flood;
2. the conservation of rainwater in the field with low field dikes, small dams or tanks, ensuring some storage; or

[34] There are four principal institutions in the world where many useful stocks of rice have been maintained, namely, that of the United States Department of Agriculture at Beltsville, Maryland; the National Institute of Agricultural Sciences, Hiratsuka, Kanagawa, Japan; the Central Rice Research Institute, Cuttack, India; and the International Rice Research Institute. Seed is produced for distribution and is available for breeding purposes. In China (Taiwan) the seed of useful rice varieties has been multiplied and produced for exchange and sale.

3. irrigation to supplement rainfall during the wet season; no systematic watering facilities provided, irrigation being carried out by flooding.

As Table IV-8 shows, the share of the rice area under irrigation in the Far East ranges from 4 percent in Nepal to 96 percent in Japan. In India, Thailand, the Philippines and Pakistan, one third or less is under irrigation, while the proportion rises to two thirds or more in Ceylon, China (Taiwan), Madagascar, Malaysia, and much of Latin America. The entire crop depends on artificial irrigation in southern Europe, the United Arab Republic, and the United States.

In those areas where the cultivation of wet monsoon rice crops depends upon rainfall alone (which is usually more than adequate in amount but irregular in distribution) paddy fields are inundated naturally by rivers. Drainage practices are usually neglected and lands have become less productive.

Where rainfall distribution during the rice-growing season is so irregular that cultivation is hardly possible without special measures of water control, however, water conservation practices have to be carried out. In most cases, rainwater is stored within the paddy fields by field dikes. The actual degree of water control achieved is a compromise between the water requirements and the permissible depth of flooding for the rice crop.

If the monsoon rainfall every year is inadequate or too irregular to meet the requirements of the rice crop, watering systems have to be focused primarily on supplementary irrigation and the control of floodwater by spreading.

In most cases, existing irrigation systems have no farm ditches and uncontrolled irrigation is performed by flooding. Water flows successively from plots adjacent to irrigation canals to others located away from the canals. Such incomplete irrigation facilities are, however, being gradually improved.

In the tidal reaches of some coastal areas rice yields are often reduced by saline water intrusion, mainly because of the absence of separate drainage and irrigation systems, and inadequate tidal dikes and sluices. Where the introduction of freshwater from the river or other sources is not possible, large storage tanks to store rainfall (as in East Pakistan and Burma) or freshwater reservoirs at the river mouth (as in Japan) are being constructed.

Generally, the production of a second crop of rice or another product is impossible without adequate irrigation water during the dry season. The intensification of rice growing therefore depends not only on breeding suitable quick-maturing varieties but equally upon the availability of more irrigation. Progress is being made, and in the Chao Phraya delta of Thailand, for example, a "ditch and dike project" has recently permitted the successful introduction of second crops.

In certain countries, such as Japan and China (Taiwan), rice improvement schemes, based on modern concepts of water control, have been implemented in conjunction with land consolidation. In these schemes every land parcel is connected with both the irrigation system and the drainage system. Where only limited water is available, various methods such as intermittent or rotational irrigation may be practiced with an equal or higher rice yield to that under the traditional continuous submergence.

To combat the lack of surface water resources, the utilization of groundwater is being developed in a number of countries. Pump irrigation is often considered too expensive, but experience shows that it is justifiable where land productivity is high and water is effectively utilized.

Drainage improvement (particularly subsoil drainage) has been neglected even in some developed rice-producing regions. The main function of existing drainage systems is to prevent flood damage and to provide surface water drainage. When paddy fields are subject to salinity and waterlogging, subsurface drainage improvement plays a key role in increasing soil productivity. In coastal areas of China (Taiwan), Japan, the Republic of Korea and the Republic of Viet-Nam, saline seacoast areas are being successfully used for paddy production following drainage improvement works.[35]

The purpose of irrigation and drainage is to provide optimum soil moisture conditions for crop growth. The exhaustive study of the water requirements of rice at various growing stages and under different soil conditions and farming practices is, therefore, essential. There is also a great need for the improvement of drainage systems, so as to drain not only excess surface waters but also subsoil waters, especially where the field is subject to salinity and waterlogging.

In most rice-growing areas, further utilization of the land and water resources requires major hydraulic works which would completely change the hydro-

[35] Generally the quantity of excess water (caused by monsoon or typhoon) to be drained covers wide areas and is very large. To reduce costs, the paddy fields are often temporarily used to store excess water in order to reduce the required capacity of the drainage system. The Hachirogata polder in Japan is an example.

TABLE IV-8. – RICE PRODUCTION AREA : YIELDS AND METHODS OF CULTIVATION

	Period	Production	Sown area	Yield[1]	Artificial irrigation	Trans-planted	Two crops of rice[2]	Upland rice
		Thousand metric tons	*Thousand hectares*	*Tons/ hectare*	..... *Percent*			
FAR EAST								
Japan	1963/64	16 639	3 272	5.1	96	95	0.3	4
Korea, Rep. of	1964	3 974	1 195	3.3	58	100	—	1
China (Taiwan)	1961/62	2 508	859	3.2	79	...	42	3
Burma	1960/61	6 789	4 334	1.6	11	90	—	—
Cambodia	1963/64	2 760	2 377	1.2	...	...	...	...
Ceylon	1963/64	1 026	[3]632	1.7	60	6	32	2
Hong Kong	1963/64	14	8	1.8	62	100	—	87
India	1960/61	51 861	34 128	1.5	37	...	...	...
Indonesia	1963/64	11 764	7 100	1.7	49	79	...	21
Malaysia: Malaya	1963/64	723	338	2.4	67	94	6	5
Sabah	1962/63	69	[3]38	1.8	71	71	—	31
Sarawak	1961/62	113	[4]113	1.0	—	34	—	67
Nepal	1963/64	2 108	[4]1 090	1.9	4	60	...	9
Pakistan	1963/64	17 724	10 294	1.7	[5]17	74	...	23
Philippines	1963/64	3 843	[4]3 087	1.2	30	80	16	20
Thailand	1962/63	9 279	[4]6 638	1.5	24	80	—	...
Viet-Nam, Rep. of	1963/64	5 327	[4]2 538	2.1	20	81	10	3
NEAR EAST								
Afghanistan	1962/63	319	210	1.5	100	100	—	—
Iraq	1963/64	143	108	1.3	[5]100	[5]100	...	[5]10
Turkey	1963/64	217	55	3.9	[6]100	[6]—	[6]—	[7]...
United Arab Republic	1962/63	2 039	[4]349	5.8	100	84	—	—
AFRICA								
Central African Republic	1964/65	4	6	0.7	—	—	—	100
Chad	1964/65	38	27	1.4	100	—	...	...
Congo, Dem. Rep. of	1962/63	74	140	...	...	—	...	[8]100
Ivory Coast	1962/63	229	260	0.9	1	1	—	99
Kenya	1963/64	18	5	3.5	44	44	—	—
Madagascar	1961/62	1 167	768	1.6	83	57	9	17
Mali	1962/63	180	182	1.0	[8]20	1	—	—
Nigeria	1961/62	203	193	1.3	2	18	—	8
Senegal	1962/63	91	78	1.2	8	[8]45	—	—
Sierra Leone	1963/64	331	264	1.2	—	34	—	61
Tanzania [9]	1962/63	91	81	1.1	...	[10]...	...	...
Togo	1963/64	23	20	1.1	0.5	...	—	—
Upper Volta	1964/65	34	35	1.0	...	—	—	—
EUROPE								
France	1963/64	117	30	4.0	100	...	...	...
Greece	1963/64	83	19	4.4	100	—	—	—
Italy	1964/65	624	120	5.2	100	10	—	—
Portugal	1963/64	166	37	4.5	100	[11]...	—	—
Romania	1963/64	51	14	3.7	100	—	—	—
Spain	1963/64	399	63	6.4	100	100	—	—
Yugoslavia	1963/64	23	6	3.8	100	—	—	—
NORTH AND CENTRAL AMERICA								
Costa Rica	1963/64	65	[4]51	1.3	2	—	—	—
Cuba	1961/62	207	143	1.4	82	—	—	—
Dominican Republic	1963/64	145	60	2.4	65	65	—	10
Mexico	1963/64	296	[4]135	2.2	59	...	...	[5]52
Nicaragua	1963/64	29	22	1.4	25	...	...	...
Panama	1963/64	111	103	1.1	—	—	...	...
United States	1963/64	3 187	722	4.4	100	—	—	—
SOUTH AMERICA								
Bolivia	1962/63	42	[4]31	1.3	—	—	—	—
Brazil	1961/62	5 557	3 350	1.7	...	...	...	...
Rio Grande do Sul		1 170	377	3.1	83	—	...	...
São Paulo		865	572	1.5	5	...	...	95
Colombia	1963/64	550	[4]254	2.2	45	—	45	55
Ecuador	1964/65	167	112	1.5	4	35	—	—
Guyana	1964/65	264	159	2.1	23	5	25	—
Paraguay	1962/63	16	7	2.3	—	100	—	—
Peru	1963/64	341	83	4.3	83	90	—	5
Surinam	1963/64	75	27	2.7	67	63	—	...
Venezuela	1963/64	131	[4]74	1.8	—	18	...	—
Argentina	1962/63	174	59	3.4	100	—	—	—
Chile	1963/64	86	33	2.6	[5]100	—	—	—
Uruguay	1962/63	77	21	3.7	100	—	—	—
OCEANIA								
Australia	1963/64	142	24	5.9	100	—	—	—

SOURCE: FAO. *The world rice economy in figures: 1909-1963.* Commodity Reference Series, No. 3, 1965.

[1] Based on harvested area. – [2] Two or more crops of paddy per year on same land. – [3] Gross area. – [4] Harvested area. – [5] 1961/62. – [6] 1960/61. – [7] Nearly 50 percent of production in 1962. – [8] 1959/60. – [9] Tanganyika only. – [10] 75 percent of production. – [11] 53 percent of production.

logical regimes. There are both technical and economic reasons for adopting a gradual extension of these major water control systems. Major irrigation works require heavy expenditures of capital, and water charges must be within the capacity of cultivators to pay.[36] The various stages of development need to be judiciously planned, so as not to impair the present hydrological conditions.

Better cultural practices

Human, animal and mechanical power

At the one extreme, only human and animal labor is used in rice cultivation; at the other, full mechanization is applied to farm operations. In terms of the hours of labor for producing (and harvesting) one ton of paddy, the figures stand at less than 1 man-day in the United States, 10 to 20 man-days in Brazil and Venezuela, 25 in Japan and 50 to 100 in the Philippines (see Table IV-12, page 175).[37]

Whenever labor is costly, scarce or inefficient, the mechanization of farm operations tends to become economic, but the conditions for the success of full mechanization are challenging. Mud and water are the two greatest enemies of mechanical devices, and mechanization requires heavy initial capital investment, large units of cultivation, and engineering and workshop facilities. Complete mechanization of rice production is now practiced only in Australia, France and the United States, though pilot schemes have existed elsewhere for many years. It may be significant that the minimum size of farm giving satisfactory returns to full mechanization in the United States appears to be about 60 hectares,[38] compared with the average farm size in developing countries of 1 to 2 hectares.

Examples of mechanized rice cultivation in developing countries can be found in the Mahaicony/Albany scheme in Guyana, the Wageningen rice scheme in Surinam, and at the Office du Niger in Mali. Many investigations have been carried out in other countries such as Ceylon and Malaysia. Partial mechanization, largely in field preparation and harvesting, is practiced in several countries in Latin America and the Far East, and there has been a striking growth in the use of tractors for rice in Ceylon and Malaysia. Generally, however, the economy of production in the Far East reflects the ample labor force, including family labor, inadequate drainage systems, and the typically small and irregular plots of land which do not lend themselves to economic tractor use. Human labor and draft animals remain the main sources of power.

The greatest scope for mechanization lies in areas where the development of potential rice land is held up by low population density and consequent labor shortage, as in parts of Africa such as Sudan and Sierra Leone. In such areas, the use of draft animals may be unknown because of tsetse fly, and the heavy grass vegetation makes tilling or clearing with simple implements impossible, so that mechanized cultivation may be the only method of introducing rice cultivation.

A careful assessment of the economics of mechanization is necessary. Machinery accounts for about one tenth of the total costs of production per hectare in the United States, and the inventory value of power machinery and equipment for a well-equipped rice farm of 100 hectares in California is placed at about $25,000.[39]

In traditional rice-producing countries, nearly all the cultivation and harvesting of the crop is still carried out by man and animals. Paddy fields must be leveled skillfully, which often involves an enormous investment of labor for terracing, and provision must be made for water reticulation. Wet paddy soils must be carefully prepared so as to maintain permanent embankments and temporary bunds, and a puddled surface must be established with a compact subsurface for the prevention of water leakage. Planting is performed arduously by hand. Small fields, the weakness of embankment structures and, in many cases, the interplanting of paddy rice with other crops impede the application of harvesting machinery.

From the point of view of cultivation techniques, dry-land rice production is easier to mechanize. In the case of the more characteristic wet paddy production, however, mechanization is extremely difficult. Adequate machinery is either not available or too expensive in relation to the size of the average holding, and it is to be expected that man and animals

[36] Unwillingness to pay for irrigation water has limited the full utilization of new medium-sized schemes in some states of India (e.g., tube-well water). To encourage fuller use, it was recommended that irrigation water be supplied at concessional rates during the initial years of operation of a new scheme. *Report of Food Grains Enquiry Committee*, New Delhi, 1957.

[37] The Japanese figure per ton is lower than the Philippine figure because the greater capital input produces much higher yields per hectare (see Figure IV-2). Man-days of labor per hectare of rice for all growing and harvesting operations are 20.25 in Brazil and Venezuela, 70 in the Philippines and 150 under the intensive methods in Japan.

[38] Based on experience in the Sacramento valley, California. The optimum size varies according to soils, prices and managerial ability. See: Clifford H. MacFadden. Mechanized rice production in California, *Il Riso*, p. 325-328. Milan, December 1965.

[39] Clifford H. MacFadden. Op. cit.

will remain the main sources of power for a long time to come.

A large proportion of the estimated world buffalo population of 100 million is maintained in the rice-producing areas as a source of draft power. The buffalo is the draft animal of choice in the paddy fields and, in a number of countries such as the Philippines, it is regarded as a dual-purpose animal providing a small supply of high butterfat content milk in addition to draft power in the paddy fields, traction on the roads, and a source of power for primitive mills. Draft animals (including horses and cattle) account for 11 to 12 percent of the total cost of production per hectare in the Philippines and the United Arab Republic, compared with only 1 percent in Japan. From the point of view of the average size of farms, the nature of most of the operations required and the utilization of the available family labor force, animal draft power is well adapted to the special conditions prevailing in traditional rice-producing countries. Larger scale investments are hardly feasible and, during most of the year, the family labor remains unemployed anyway. Low-cost traction is, therefore, essential to maximize family incomes from the given land resources and usually, under existing conditions, more economic sources of power cannot be found.

More attention should, however, be given to the better utilization of draft animals. In many countries, animal-drawn implements could be improved without heavy capital investment. Through the establishment of co-operatives for the better utilization of animal working capacities during the year, further improvements should be possible. The greatest potential for an increased buffalo contribution to the income of rice producers lies in their combined utilization for draft, milk and meat. This potential has not yet been realized and should receive greater attention, especially as regards feed production, selective breeding, animal management and marketing problems.

The maintenance of buffalo in a state of health is also essential. When any of the great epizootics, such as foot-and-mouth disease or rinderpest, strikes during the preparation of the land for planting or during the harvest, the shadow of famine may well fall as it has done on many occasions in the past.

Sowing and transplanting

The greater part of the world's crop is not sown direct into the paddy fields, the seed rice being usually sown first in a nursery and then transplanted to the prepared field. As is shown in Table IV-8 above, this planting method is used on about 80 percent of the rice area in most of the major rice-growing countries of the Far East, though India and Ceylon are two exceptions. The practice is less common in Africa and Latin America as well as in those parts of the Far East (for example, the Philippines) where upland rice is widely grown, and in the United States and other countries where large-scale mechanized methods of cultivation are used.

Transplanting is believed by some farmers to increase yields, as healthy and vigorous seedlings give the plant a good start. In areas where double- or triple-cropping of rice is practiced, the establishment of a nursery ahead of the following crop is essential to save time and economize on land. On the other hand, where broadcasting is practiced, as in the United States and increasingly in Italy, it appears that yields are no less than with transplanting, and that much time and labor is saved.

The two clear advantages of transplanting are that it enables the land to carry more than one crop per year and that it reduces costs by economizing on irrigation water and facilitating the control of diseases, pests and weeds.[40] As the cost of farm labor rises, farmers are more likely to sow seeds broadcast and use herbicides for weed control. The balance of advantage between the alternative methods will therefore depend greatly on the structure of local costs of production and particularly the cost of labor, since no wholly satisfactory transplanting machine has yet been devised.

Sowing by plane is commonly practiced in the United States. The spraying of herbicides is also often carried out by plane but its cost and the different structure of landholding, size of plots, etc. make this impractical for rice-growing countries in Asia.

Double-cropping

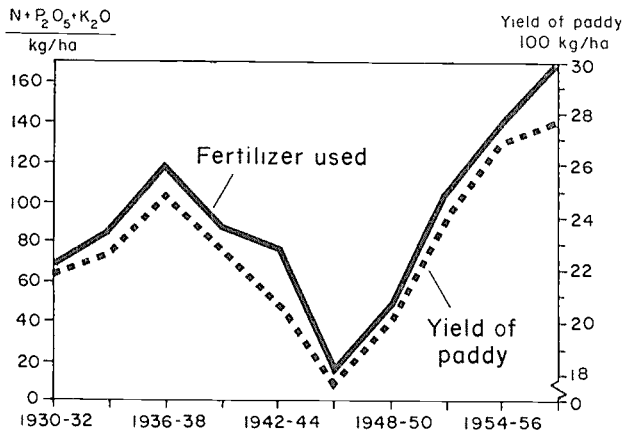
Although double-cropping is common in rice-producing countries, relatively few areas produce two or more crops of rice itself. As Table IV-8 shows, Ceylon, China (Taiwan) and the Philippines all have a considerable amount of double-cropping of rice, but in countries like Japan the second (winter) crop is usually wheat or barley. The reason is

[40] Because of the regular lining and spacing, farmers can use a weeder between rows in a transplanted field. In a field where the seed has been broadcast the weeds have to be controlled by herbicides.

partly climatic (winters which are too cold or too dry) and partly financial, insofar as the heavier costs of production often make double-cropping uneconomic, even though the land itself is used more intensively.

Two rice crops of shorter duration do not always produce a larger total than one crop of long maturation. Double-cropping is much more demanding on irrigation and its adoption usually requires the introduction of new, quicker maturing varieties, which may not be popular with local consumers (a problem which has arisen in Malaysia), and more sophisticated and laborious techniques such as transplanting, to ensure that the land is free in time for the second crop. This, in turn, will require increased mechanization. All these factors tend to limit the spread of the double-cropping of rice.

FIGURE IV-5. - RELATIONSHIP BETWEEN YIELD OF PADDY AND FERTILIZER USE (NUTRIENT), CHINA (TAIWAN)



SOURCE. FAO. Freedom from Hunger Campaign. Fertilizer Program. *Crop production levels and fertilizer use.* 1962.

Scope for using more fertilizer

As has already been made clear, yield improvement depends on a whole complex of improved practices of which proper fertilizer use is only one. Yet the response of rice to fertilizer, particularly to nitrogen, can be so striking and speedy that it is in itself a demonstration to the farmer of the value of improved farm practices generally.

The examples of China (Taiwan) and Japan illustrate the close relationship between yields and plant food utilization. In both countries the adoption of improved practices has permitted farmers more nearly to realize the full potential from increased applications of plant food. In China (Taiwan), the average fertilizer use rose from 100 kilograms per hectare of nutrients before the war to 140 kilograms in 1959, while paddy yields were 42 percent higher (Figure IV-5). In Japan, fertilizer use rose from 250 kilograms per hectare to over 400 kilograms in the same period, while paddy yields increased by 44 percent. The Republic of Korea, Italy, Peru and Spain are other countries generally using heavy amounts of fertilizer on rice. It is significant, of course, that all these countries grow mainly japonica varieties, which are recognized to respond well to fertilizer, and also possess good irrigation systems.

Associated inputs of this kind are important. Lack of them partly explains why so little fertilizer is used on rice in the other major producing countries. Yet even under existing farm conditions fertilizer application has been proved to be profitable. This has been demonstrated by the results of over 9,500 trials and demonstrations under the FAO Freedom from Hunger Campaign.

Large-scale trials in India, which pioneered fertilizer trials and demonstrations in farmers' fields, indicated that 34 kilograms of nitrogen and phosphate per hectare gave a 52 percent increase above the overall average yield of paddy rice in India. Similarly, according to field trials under the FAO-assisted Rapid Soil Fertility Survey Scheme in Pakistan from 1957 to 1962, East Pakistan paddy yields were increased by 50 to 64 percent with nitrogen and phosphate depending on variety, and 62 to 92 percent when the three nutrients N, P and K were used. These yield increases with local varieties resulted in economic returns of from two to three times the cost of the fertilizer dressing. The favorable results of trials on farmers' fields carried out in four countries are shown in Table IV-9.

NITROGEN

Nitrogen is the key element in the production of rice and gives by far the largest response. Paddy can absorb nitrogen in both the ammoniacal and nitrate forms, applied as chemical fertilizer, green manure, oil cake and animal manure. In recent years considerable interest has developed in the fixation of atmospheric nitrogen by the blue-green algae in the wet paddy fields, an additional source of this plant nutrient. Because of the water-saturated anerobic conditions prevailing in wet paddy soils and the nature of the crop itself, the effectiveness of different nitrogen fertilizers depends appreciably on the time and method of their application.

TABLE IV-9 – ECONOMICS OF FERTILIZER USE ON RICE GROWING IN SELECTED COUNTRIES

	Fertilizer treatment N-P-K	Total yield	Yield increase		Total net income	Net return	Value/ cost
		Kilogram/hectare		%	*$/hectare*		*Ratio*
Ghana	Control	1 287	—	—	124	—	—
	22.5-0-0	1 755	468	36	160	36	4.8
	22.5-22.5-0	2 025	738	57	175	51	3.6
	22.5-22.5-22.5	2 734	1 447	112	240	116	6.0
	45-45-45	3 134	11 847	144	256	131	3.8
Iran [1]	Control	2 825	—	—	...	—	—
	30-0-0	3 624	799	28	...	62	6.0
	30-30-0	3 890	1 065	38	...	78	4.7
	30-30-30	4 151	1 326	47	...	95	4.5
East Pakistan	Control	1 512	—	—	...	—	—
	44.8-0-0	2 075	563	37	...	32	...
	44.8-44.8-0	2 464	952	63	...	56	...
	44.8-44.8-44.8	2 710	1 248	83	...	73	...
Turkey [2]	Control	2 530	—	—	423	—	—
	60-0-0	3 353	823	33	538	115	6.0
	60-60-0	4 083	1 553	61	642	219	6.4

SOURCES: GHANA. FAO. *Fertilizers and their use.* Rome. 1965: IRAN. *Edarch Kol Hasselkhizi Khak. UNSF soil fertility program. results of fertilizer field experiments in Iran.* Ministry of Agriculture. Iran. 1964. PAKISTAN. FAO. *Crop production levels and fertilizer use.* Rome 1962: TURKEY. FAO. *Review of trial and demonstration results. 1963/64. FFHC Fertilizer Program.* Rome. 1965. Mimeographed.

NOTE: "Total net income" is the income remaining after deduction of the cost of fertilizers. "Net return" is the difference between the value of the yield increase due to fertilizer application and the cost of the fertilizers applied. "Value/cost ratio" is the value of the yield increase divided by the cost of the fertilizer used to obtain the yield increase. A ratio of 2 indicates a net return of 100 percent.

[1] Round-grain rice. Champa variety. Gilson area. – [2] Black Sea regions.

Ammonium sulfate has been regarded as one of the most suitable nitrogen fertilizers for wet paddy. Ammonium nitrate is slightly less efficient, while ammonium chloride has been found as efficient as ammonium sulfate in China (Taiwan), Japan, Mali, Thailand, and the United States.[41] Liquid and anhydrous ammonium have been tried in the United States and have proved almost as effective as ammonium sulfate. Urea has been shown to be very effective, especially in tests conducted in Italy, Japan and the United States, and the results with this fertilizer are about equal to those with ammonium sulfate.

[41] In Japan, on "degraded" paddy soils (i.e., those poor in iron), ammonium chloride is superior to ammonium sulfate because it does not contain sulfur, which is reduced to hydrogen sulfide under paddy soil conditions. With an insufficiency of iron to precipitate this toxic compound, the paddy roots are damaged.

The examination of over 400 response figures indicates an average of 12 to 13 kilograms of rice per kilogram of nitrogen, but for many countries the response levels off at 30 to 40 kilograms of nitrogen per hectare. Countries in which the responses continue at rates up to 200 kilograms per hectare are those, like Japan, the United Arab Republic and the United States, where rice culture is highly developed and the factors affecting yields are well under control.

PHOSPHORUS

The response of rice to phosphorus is more erratic and less universal than to nitrogen. Although the mean increase of about 3 kilograms of paddy per kilogram of applied P_2O_5 observed on a worldwide basis is probably not economic, the response in individual countries and on specific soils is such that it is an important element in rice production and even a key element on certain soils. (It should be noted that high rates of nitrogen and high-yielding varieties may induce a deficiency of phosphorus on soils which, under ordinary conditions, are adequately supplied with this element.)

POTASSIUM

For long it was thought that the yield of paddy would not be significantly increased by applications of potassium fertilizer. More recently, worthwhile responses have been recorded on sandy and coarse-textured soils, and in Japan paddy crops receiving potassium dressings showed great resistance to disease and adverse climatic conditions.

In general the increase in yields due to potassium is less than with phosphorus, the average increase being about 2 kilograms of rice per kilogram of applied K_2O. On certain soils, however, substantial increases have been obtained and it is expected that with the intensification of rice production greater responses to potassium will occur.

Not much has yet been reported on the effect of secondary and micronutrient elements on the growth of paddy.

GREEN MANURE

Very good results have been obtained by the use of green manure for paddy in a number of countries, notably in India, Indonesia, Italy and Japan, but this practice is not always suitable. For instance,

in the main paddy-growing areas of Thailand, the soils are very heavy and their physical condition presents difficulties, and in Malaysia green manure crops have proved expensive and not easy to grow. General experience has shown that for best results green manure crops should be plowed under, although in a few instances higher yields of paddy have been obtained with the green manure left to rot on the surface of the soil.

Good responses of paddy to farmyard manure, cow dung and compost have been obtained in a number of countries but generally speaking these materials have not proved as effective as green manures or fertilizers when compared on an equal nitrogen basis.

Economics of fertilizer use

The scope for greater fertilizer utilization on rice in many developing countries will depend on a number of factors. It is linked with the introduction of varieties which absorb the nutrients more efficiently, on how fertile the soils already are, and on the relationship between prices of fertilizer and rice. No farmer, even if his rice yields will respond dramatically, can use more fertilizer unless supplies of it are readily available in the right kinds and amounts. Above all, there must be some assurance that a profitable market exists for the additional supplies of rice. When the returns are sufficiently great, relatively heavy rates of fertilizer may be used even under unfavorable natural conditions.

A rapid increase in fertilizer consumption in developing countries is not possible without social, economic and institutional change. Its use involves a substantial increase in farm operating costs and a change from subsistence to market production. This usually requires increased credit, and sometimes subsidies. An FAO team that surveyed the fertilizer economy of Asia and the Far East in 1959[42] considered that the principal factor limiting the use of fertilizers in the region at that time was "the uncertain profitability at the farm level of using fertilizers" and that "the nonavailability of enough fertilizers to meet the existing demand" was of nearly equal importance. Other obstacles were the lack of distribution facilities, security of tenure, credit facilities, research and experimental services, extension services and managerial skills, and ignorance of the kinds of fertilizer needed.

As regards profitability, there is a wide variation in paddy prices received by farmers (see below) and fertilizer costs are sometimes highest (because of transport charges and poor distribution) in countries where the paddy prices are lowest. In Japan, farmers pay 30 to 50 percent less for their fertilizer than the actual cost in many other Asian countries. Limited amounts of subsidized fertilizer have been distributed in recent years in Burma, Ceylon, Malaysia, Pakistan and the Philippines but there are no subsidies in India, where fertilizers are among the costliest in the world.[43]

Though the use of fertilizer on rice can provide an attractive return in India, the net profit is only a tenth of that secured in the United States, and under sharecropping arrangements it may not be profitable at all.[44] The higher return in the United States is due not only to greater response to fertilizer (reflecting the success of United States rice breeding) but also to the higher price received for rice under the price support system. This shows the importance of price incentives which are discussed in more detail later in this study, as well as of other inputs which are complementary to fertilizer.

In the same way, the heavy application of fertilizer in Japan has to be viewed in the context of Japanese costs of rice production, which are the highest in the Far East: fertilizer and manure represent one tenth of those costs, as shown later in Table IV-12. There is a long tradition of use, and a large domestic fertilizer industry, in Japan. Elsewhere, domestic production capacity is small and shortage of foreign exchange limits imports.

Neverthless, fertilizer use on paddy has been rising in some developing countries of the Far East. Fertilizer industries are being gradually built up in rice-growing areas, particularly in India and Pakistan. The strengthening of extension services should also help to remove some of the barriers to increased application on paddy, while fertilizer use in China (Taiwan), Japan and the Republic of Korea may become still more efficient following further improvements in irrigation.

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[42] FAO. *Preliminary report of the survey of the fertilizer economy of the Asia and Far East region*, Rome, 1960.

[43] *Report of the Indian Fertilizer Distribution Enquiry Committee (1960)*. This estimated that it takes more grain to buy a unit of nitrogen in India than in any other country. Sales taxes are imposed in some states. Nevertheless, total demand is reported to be in excess of supply.

[44] Robert W. Herdt and John W. Mellor. The contrasting response of rice to nitrogen: India and the United States. *Journal of Farm Economics*, Vol. 46, 1946, p. 150-160. Analysis based on experimental results on irrigated rice and commonly used varieties in Texas, Arkansas, West Bengal and Orissa.

Reducing crop losses from pests and diseases

Many attempts to increase production through the use of improved varieties or fertilizers alone, without proper regard for plant protection measures, were unsuccessful because they resulted in severe losses from increased pest and disease damage. In Japan, the interrelationship between weather, heavy application of nitrogenous fertilizers and blast disease was recognized quite early. In fact, lacking more effective control measures, for many years farmers were recommended to limit the application of fertilizers so as to reduce damage by blast. It was not until the postwar period that more effective agricultural chemicals decreased the direct damage from blast and, at the same time, permitted the liberal use of fertilizers and the growing of early varieties. Likewise, in the tropical countries of southeast Asia, where yields of rice are among the lowest, blast disease had not been recognized as important until recently when new high-yielding varieties and fertilizers were introduced.

The effect of pests and diseases on rice crops is most evident when environmental conditions become favorable to severe outbreaks. For example, the *hoja blanca* (white leaf) disease caused the loss of up to 40 percent of the rice crop when it first appeared in Central and South America. In India, where farmers live nearer the margin of scarcity, losses even of 5 to 10 percent may already have very serious effects; for example the outbreak of helminthosporium disease in Bengal in 1942/43 was one of the factors leading to the famine.

Encouraging progress is being made in the understanding of many pests and diseases and in the development of more effective control measures. Recent progress on rice blast disease, rice stem borers and nematodes will illustrate this.

Rice blast

This disease is one of the most serious, causing yield losses in the range of 20 to 80 percent. It has been reported from more than 60 countries.

The breeding of resistant varieties, the most promising line of attack, is complicated by the many physiological races of the causal organism. The need for collective efforts has resulted in the establishment of the uniform blast nurseries, initiated by FAO and the International Rice Commission (IRC) as a co-operative program in collaboration with a number of national governments and the International Rice Research Institute (IRRI). This has already indicated possible sources of resistance (such as the S.67 rice variety from India), but much more research is needed into the causal organism and its biology, its physiological specialization and, above all, into the nature of disease resistance.

Chemical control of blast is possible only under certain conditions. In Japan, for example, where blast disease has played a major role in some of the famines of the past, the Government has concentrated on devising effective chemical control methods. This was necessary to make possible the use of high-yielding varieties requiring heavy fertilization. Initially, chemical control was entirely subsidized, but with the appearance of phenylmercuric fungicides in 1953 and their demonstrated profitability, farmers have begun to use them at their own expense. As a result, since the introduction of chemicals on a large scale in 1954, the damage to the rice crop has been cut by half. A new product effective against blast, Blasticidin-S, marketed for the first time in 1961, was already used on 500,000 hectares two years later. Similar materials may well be developed in the future at such a low cost as to be acceptable by rice growers in areas where their use is not economic at present.

Rice stem borers

The amount of damage caused by stem borers varies greatly from area to area, but in the Philippines it is estimated that the rice stem borer and the rice bugs can together wipe out as much as 30 percent of the crop. The ideal control is through the development of resistant varieties and, although much research is still needed before this method can be applied, encouraging work is now under way at the International Rice Research Institute.

Organic insecticides provide effective chemical control of stem borers, but adverse side effects from their extensive use and misuse have made it necessary to look for less toxic materials and for better methods of application. Recent research by FAO entomologists in Thailand has shown that insecticides such as diazinon, dipterex and sumithion, which are less toxic to fish and mammals, are just as effective. Furthermore, the application of granular insecticides (such as BHC and Unden) in rice fields where the water level can be maintained at a certain depth has also shown great promise, though toxicological aspects still need further study.

In more developed countries, such as Japan, chemical control of rice stem borers is on the increase, but the use of chemicals is still limited in developing countries. Other control methods now being explored, such as male sterilization techniques, biological control, and the silicification of rice plants, may prove to be more readily applicable in developing countries.

Rice nematodes

Many nematode species are known to cause damage to the rice plant, but little information is available from the great majority of rice-producing areas. Recent FAO investigations in Thailand have demonstrated the severe and widespread damage to rice seed beds by root knot nematodes, rice-root nematodes, and possibly by some ectoparasitic forms. These studies have also shown that the use of nematocides in the seed bed could be profitable to rice farmers. It is likely that conditions are similar in other countries and that yields can be increased by the application of fumigants.

Other pests

Weeds, rodents and rice-eating birds are also responsible for crop losses in many parts of the world. Many herbicides, such as 2.4-D and STAM-F 34, can provide effective control of weeds, but they are not widely used owing to their high cost and the lack of knowledge concerning their effective application. Rodents cause substantial losses in such countries as India, Indonesia, Malaysia and the Philippines. Rice-eating birds, such as weaverbirds in west and central Africa and sparrow-like birds in Ecuador and Venezuela, infest ripening rice in swarms. Weaverbirds are particularly harmful, but effective control, as by destroying the nesting trees or killing the adult birds with flamethrowers, could be carried out if the authorities provided the necessary encouragement.

Specialized extension programs

Whether the rice farmer will employ the findings of applied research depends on two principal factors. One is his economic environment, which is discussed later. The other factor is the farmer himself. He must be given the necessary training to put new ideas to work.

A feature of recent years has been the organization of concentrated extension campaigns in areas selected for their above-average potential for increased food production. These are the so-called "package programs," which include the Intensive Agricultural District Program in India and similar efforts in Pakistan. The singling out of one or two commodity problems enables a further concentration of effort of all rural services, an example of this approach being the action teams of field specialists established under the National Rice and Corn Production Program in the Philippines.

Instances of specific rice extension projects include the swamp rice improvement project in Liberia, the rice extension program of the Ganges-Kobadak scheme in Pakistan with 16,000 hectares under double rice crop, and the irrigated rice project of the extension service in Costa Rica. All these rice extension projects have aspects in common which were essential to their success:

1. emphasis on rice, and attachment of a rice extension officer specialized and experienced in both rice production and extension;
2. a mass training program for farmers in all aspects of rice production through a system of village-level trainers;
3. limiting the improved practices recommended to those within the farmers' capacity and commensurate with the rural services and finances available;
4. beginning with a pilot area with initial emphasis on training;
5. sustained effort over at least four to six years.

The Liberia swamp rice project financed under FAO's Freedom from Hunger Campaign illustrates the success of the above principles. During the first phase, the project was limited to a few pilot areas, but at the end of the second year it was expanded to cover the whole country. The project includes an applied research program, under which blast-resistant improved varieties have been selected yielding about 25 percent more than unselected seeds, and work is carried out on fertilizer response, optimum planting time and spacing.

Fish production in the paddy fields

An important source of supplementary income to the rice farmer, and of essential protein-rich food for his family, is offered by the large potential for fish production in irrigated paddy fields. In countries

such as Cambodia, India, Indonesia, Japan and the Republic of Viet-Nam a tradition of rice-field fish culture exists, and in recent years it has been introduced or intensified in other areas with very encouraging results, as in China (Taiwan), Madagascar and Thailand.

Harvesting the wild fish which enter through communicating watercourses is the simplest means of fish production in rice fields. Yields will generally be low, however, and will include some species which are not of much economic importance.

Rice-field fish culture falls into three main categories:

1. as a secondary crop after the rice harvest;
2. raising fish during the period of rice cultivation;
3. continuous culture, involving the transfer of fish to specially prepared shelters during the rice harvest.

As fish culture is only subsidiary to rice cultivation, its nature is greatly influenced by the requirements of rice farming.

Not all types of rice fields are suitable. Without adequate irrigation and drainage facilities, floods or drought may result in the complete loss of the fish crop. A greater depth of water than is usually maintained in the fields may be required to grow fish to the desired size, and so only strains of rice that can tolerate deep water and the consequent lower temperature can be cultivated along with fish. Although it is possible to obtain fish of large size through continuous culture, generally they can be grown only to small size on account of the short duration of the rice-growing period, or of the interval between harvesting and the next planting of rice, as the case may be. Consequently, rice-field fish culture has become more popular in areas where there is a good demand for small-size fish for consumption.

Although most of the cultivated fish can be raised in rice fields, the species most suited are those that can thrive in shallow waters, withstand fairly high turbidity, relatively high water temperature and low oxygen content, and grow rapidly to attain marketable size in a few months. The common carp (*Cyprinus carpio*), tilapia (*Tilapia mossambica*) and sepat siam (*Trichogaster pectoralis*) are the main species in the Indo-Pacific region. The common carp is raised in this manner in many other countries, including Madagascar and the United States. The channel catfish (*Ictalurus punctatus*) and the buffalo fish (*Ictiobus* spp.) have been tried with success in the southern United States. The brackish-water rice fields in Kerala, India, produce sizable quantities of shrimps (mainly *Penaeus* spp. and *Metapenaeus* spp.), and in the deltaic area of the Ganges gray mullets (*Mugil* spp.) are also raised in such environments.

Yields vary considerably. Whereas the wild crop may amount to only a few kilograms per hectare, by intensive culture over 2,000 kilograms per hectare per year can be obtained. The total quantity of fish produced is not known, but a rough estimate made over a decade ago of rice fields under fish culture in the Indo-Pacific region was around 144,000 hectares, which is only a fraction of the wet rice fields in the area. It is believed that a good proportion of the irrigated rice fields which are not now used for fish culture are suitable, and that fish production from fields that are already utilized could be considerably increased by the adoption of pond fish cultural practices. A major impediment, however, is the increasing use of insecticides, many of which are poisonous to fish. The use of selected insecticides in doses that are not lethal to fish would be necessary if rice-field fish culture is to survive and develop.

PROCESSING AND STORAGE

The amount of the crop which becomes available for consumption and its quality largely depend on the efficiency of the preprocessing, milling and storage operations. The choice of tools or machines for preprocessing is greatly limited by local conditions, and more immediate benefits could be gained from improvements in the threshing and drying phases. Policy recommendations for rice milling have to reconcile engineering, nutritional, and economic considerations. Several countries suffer from excess milling capacity, although this is more often a transitional problem caused by bottlenecks in supply rather than dwindling demand. Equally serious problems arise from the numerous small mills or crude hand-pounding equipment used, which lead to heavy milling losses. This limits the recovery of

rice by-products, especially rice bran which has great potentialities as an animal feed and a source of oil. Storage losses are even more severe. Both protective and control measures are needed, though the systematic application of preventive measures is usually the more economical in the long run. In general, the desired increase in rice supplies will depend on a balanced expansion of such ancillary operations as processing, milling and storage facilities.

Preprocessing

The farm operations carried out prior to processing — or preprocessing — operations involve four main steps in the less industrialized countries with a high population density: harvesting, field curing, threshing and, when necessary, drying of the threshed grain. Inefficient methods produce wastage of rice grains by physical loss and the spoilage of the crop that is collected, while spoilage in turn affects storage and milling.

Harvesting

The choice of optimum harvesting time is an important element. Where early harvesting is carried out, wastage will be high because of the presence of chalky and immature grains. Where the harvest is late, the great number of sun-cracked grains results in a high percentage of brokens and wastage in the milled product.

Research on optimum harvesting time has been conducted in a number of countries under different climatic conditions, but unfortunately not on a standardized basis. The series of trials conducted under FAO Technical Assistance in 1962/63 and 1963/64 in the agricultural research institute of Gyogen, near Rangoon, Burma, have shown that for long grain paddy a loss of 2 percent in head rice[45] is suffered for every day the harvest is postponed, once the grain is ripe. For the medium and short grain varieties the figures are around 0.8 percent, still sufficiently high to deserve serious attention. It was found that late harvesting, combined with a low moisture content at harvest, are decisive factors in low milling outturn.

By far the bulk of the world's rice is still harvested by hand, mostly with a sickle or hand knives. Hand-harvesting has the advantage of being a selective process in which weeds are left behind. Also there is no problem with shattering, uneven ripening, and machines becoming bogged in the field. Modernization of harvesting operations would make it possible to speed up the process in order to meet optimum harvest time, but there are many impediments. Modern equipment demands large paddy fields and effective water control, with reasonably dry, firm land. Other major obstacles are crop lodging,[46] high capital investment, and the need for trained operators and maintenance facilities. Hence, fully mechanized harvesting is still confined to the industrialized countries.

Extensive trials have been carried out in Malaysia to determine the feasibility and cost of using self-propelled combines. Mechanical failures and delays due to damp and rainy weather made operation difficult. The overall cost was about the same for a combine as for hand-harvesting. Trials with combines in the Republic of Viet-Nam were not successful because of the difficulty of adapting to local conditions. Lodging and shattering resulted in heavy losses. Combines were uneconomic because of the few days of use each year.

The introduction of tractor-powered or self-propelled windrowers and binders has been hampered by a number of factors. Plants must be grown in rows, and water control is essential to ensure that fields are drained at harvest time. An extensive research program has been under way in Japan since 1947 to develop small, engine-powered harvesters, but their introduction is very slow because of the high capital investment compared to the limited output.

Animal-drawn harvesting machines developed in western countries are not suitable for harvesting rice, even under good soil and crop conditions. Nor have western hand tools proved any more successful. Thus, the large scythe of western design has been tried in many countries for rice harvesting, but nowhere has it been completely accepted. This resistance is due mainly to the high proportion of the crop that is lodged, the soft nature of the straw, and the tendency for the grain to shatter. Although experiments have shown that the scythe is the most efficient hand tool, the fact that it requires 1½ times as much effort to operate as other tools accounts for the refusal of farmers to accept the scythe in most rice-growing countries. An interesting devel-

[45] Head rice or whole rice is defined as the rice grains of which kernels are whole or nearly whole except for loss of a part of the protuberance at the germ end of the kernel.

[46] Falling down due to the soft nature of the straw.

opment has been the hand-dropper harvester, of which 50,000 to 70,000 are now in use in Japan. The operator pushes this device along the row and actuates a pair of knives by means of a lever.

In general, it appears that the lack of effective water control will make it necessary to continue hand-harvesting for many years.

Field curing

After rice has been cut, it is left in swaths or bound into sheaves. It may be laid on the ground, hung on racks, or stacked in a variety of ways to facilitate drying. Local weather conditions and customs influence the choice of techniques, but it is hardly possible to find a correlation between the various methods and climatic conditions. The very poor milling yields often obtained dispel any idea of such methods having been gradually perfected over the centuries with a view to producing the highest possible quality of rice after milling. Little experimental work has been done to compare their efficiency and find possible improvements.

As far as possible, field curing should be replaced by efficient methods of drying the threshed grain, following wet threshing by mechanical means. Often, however (for instance, in Malaysia and East Pakistan), there is very little drying of paddy either before or after threshing. There is little incentive for efficient drying where much of the crop has to be handed over to middlemen to whom the producer is indebted or to the landlord under a sharecropping system, while even where there is a grading system specifying a maximum moisture content this is not always properly enforced.

Threshing

Threshing rice involves separating the grain from the panicles, but not removing the husk. Again, a wide variety of methods are employed. An ancient and still widely used method is to beat rice against a solid object. A second type of manual threshing still common is to beat bundles of rice with a device generally referred to as a flail. The work is slow and arduous, and a high percentage of the grain may be cracked. In a number of countries rice is spread on a threshing floor on mats and is rubbed by walking over the heads. This method is slow and inefficient, and is mostly used for small quantities.

The most common method is treading: the crop is spread on a level floor and animals are driven over it. The grain may not be damaged, but it is contaminated by impurities such as stones, mud, etc., which will subsequently reduce milling outturns.

In recent years rice has occasionally been threshed by using tractors with rubber tires instead of animals for treading. A number of adjacent threshing floors keep the tractor in constant operation. Rates of work reported in Ceylon are: 640 kilograms per hour with two, 960 with three, and 1,280 with four threshing floors.

Modernization of threshing techniques requires the introduction of mechanical threshers, but the cost of capital investment does not permit fast progress. The drum type treadle thresher developed in Japan, which is quite inexpensive, has been introduced in various countries, but it has not been widely accepted because it requires the adoption of special techniques. The National Institute of Agricultural Engineering in the United Kingdom has developed a lightweight drum thresher for rice, which has been tested in Malaysia and is now produced commercially.

Mechanical threshing would enable the farmer to thresh his paddy immediately after harvest, when the grains still have a moisture content of 20 percent or even more. This would speed up the process and reduce spoilage, but the paddy would require thorough drying after it had been threshed.

Drying after threshing

Drying after threshing may supplement the preliminary curing or be complete in itself. The purpose is to produce a rice with good keeping qualities without any appreciable loss in substance, any deterioration in nutrients and food value, or change in taste. Other things being equal, drying makes for maximum milling outturn and maximum yield of whole rice (brokens reduce the commercial value of the milled product).

The most common practice is sun-drying on a drying floor, usually made of beaten earth and sometimes covered with lime mortar — a long process. In some instances the operation has been slightly modernized by the introduction of cement floors, but these are likely to crack, and the rough surface causes a certain amount of breakage during handling. On either cement or brick floors the temperature rises to over 60-70°C, and the kernels therefore

tend to split. It is difficult to find a suitable coating for drying floors.[47]

Decisive differences are shown in artificial drying. Trials have demonstrated that it improves the milling quality to the point where the operating costs are largely covered by the higher milling yields. These benefits are known in all rice-producing countries, but the introduction of artificial driers has been only spasmodic so far.

Processing

Processing rice differs fundamentally from that of the other important cereals. When milling wheat, the grains must be ground very fine to obtain flour, while in the processing and milling of rice the aim is to keep the grain as nearly whole as possible. This causes numerous problems, but by and large rice can be milled with simpler and cheaper means than other grains, thereby considerably affecting the economics of processing. On the other hand, rice milling is not such a standardized process as wheat milling, so that several methods of processing and a whole range of milling equipment are in use.

In vast areas of Africa, the Near East and the Far East, rice processing is still frequently carried out by hand-pounding or by crude mechanical processing using very simple equipment.[48] The most commonly used device is the mortar and pestle made of wood and worked by hand, foot or water power. In all these cases, the end product still contains some of the outer covers of the grain and thus a higher portion of the nutrients. Losses in primitive milling, however, are high, primarily because of the repeated winnowing necessary.

The outstanding nutritional problem is to reconcile the consumer's desire for highly polished milled rice with the serious losses of vitamin which this involves. The marketing of undermilled rice with a higher vitamin content has, apart from consumer resistance, the additional problem of a shorter storage life. Also, relationships between the degree of milling and vitamin content are difficult to establish; a comparatively simple test developed in India has not yet been put into practice in the mills.

"Germ rice" of high nutritive value, in which most of the germ is kept in the milled rice, has been produced in small quantities in China (Taiwan) for a number of years, through the introduction of a special type of abrasion milling. However, since germ rice has a short storage life, and is not as acceptable to consumers as milled rice, its production has not made much headway.

Modernization of milling industries

The number of rice mills in operation run into many thousands. There are, for example, no less than 44,000 in India, 40,000 in Japan, and 20,000 in the Republic of Korea, though many of these are very small units (Table IV-10). In general, the milling outturn of whole rice grain is highest in large rice mills (about 65 percent in terms of weight). With a modern cone mill the average yield is as high as 68 to 70 percent (see Annex table 16). Most of the mills at present in use are old and their efficiency is diminishing, though some countries are importing modern machinery to replace obsolete mills. Modernization is slowed down by shortage of foreign exchange and the millers' interest in getting the most out of the existing old mills.

This has led to direct government intervention. The Government of the United Arab Republic, which nationalized the industry when it took over the rice export trade in 1961, has since set up 12 new mills and plans another 10 to replace obsolete mills. In India, 6 new medium-sized mills have recently been installed with funds provided by the Ford Foundation and another mill with funds from a bilateral source, to determine the most suitable type for the local conditions and varieties of rice, and to provide the basis for large-scale development under public control during the fourth five-year plan. Twelve large mills of 100 tons capacity per day have been imported by the Burmese authortities, in order to increase extraction efficiency and replace old inefficient mills. Malaysia has installed a large modern mill to establish extraction standards for the rice-milling industry. The Japanese Government also has a modernization program to replace the multitude of small-scale rice polishers, but generally only modest progress has been made elsewhere.

Large-scale mills are mainly useful for that part of the crop sold off the farm to government agencies or to large traders or exporters. But most of the substantial part of the crop that is used for home consumption by farmers is handled by small mills, which are more suitable because of their prox-

[47] Experiments were carried out in several countries (Cambodia, Madagascar, Surinam, Republic of Viet-Nam, etc.) in order to compare the effect of different kinds of drying floors, and to compare different drying techniques, including drying in the sun and in the shade.

[48] For a description of the implements used, see FAO. *Equipment for the processing of rice*. Agricultural Development Paper No. 27. Rome, 1953.

TABLE IV-10. – RICE MILLS: NUMBER, AGE, CAPACITY AND UTILIZATION IN SELECTED COUNTRIES IN 1964

	Total number	Age of mills		Capacity		Utilization		
		Under 5 years old	Over 15 years old	Average capacity per mill (tons/hour milled)	Total annual capacity (1,000 tons/year milled)	Months per year in operation	Amount milled in 1963 (1,000 tons milled)	Rice crops in 1962/63 milled equivalent (1,000 tons)
Burma	*2 000	...	...	0.9	8 840	6	...	5 040
Cambodia	1 440	341	—	...	1 400	...	...	1 180
Ceylon	1 100	135	22	[1]0.35–1	935	7	462	700
China (Taiwan)	327	...	...	3.0	...	...	...	1 800
Hong Kong	18	—	16	3	248	4	78	13
India	44 057	...	...	...	28 485	...	8 605	32 160
Japan	[2]39 128	...	...	0.2	18 510	5	[2]5 968	11 710
Korea	18 397	6 654	3 012	...	...	...	...	2 220
Malaysia	[3]450	...	...	...	350	8	...	576
Pakistan, West	1 583	...	...	...	...	6	219	995
Philippines	8 100	...	...	...	...	...	...	2 580
Thailand	14 099	...	...	0.8	42 297	5	5 029	6 050
Viet-Nam, Rep. of	2 018	654	64	0.3	1 871	6	971	3 380
Iraq	91	...	...	...	...	...	...	[4]75
Colombia	346	...	*310	0.7	568	10	333	380
Cuba [5]	317	...	...	...	...	...	...	152
Guyana	207	...	...	...	...	...	...	145
Mexico	12	...	...	...	...	...	...	3
Surinam	[6]236	42	93	0.4	198	...	38	47
Gambia	3	...	...	...	...	...	...	[4]20
Madagascar	259	...	...	...	...	...	128	870
Morocco	7	—	3	3.4	31	10	19	10
Nigeria	*400	...	...	...	...	...	...	[4]81
Eastern Region	230	100	130	...	69	10	...	...
Tanzania	[3]35	13	13	...	...	...	...	30
Canada	2	—	2	[3]5	[3]10	[3]12	[3]8	—
United States	55	4	48	7.7	3 115	11	2 223	2 100
Belgium	2	...	...	...	135	...	...	—
France	20	...	...	...	450	...	...	88
Germany, Fed. Rep. of	14	1	8	1.6	480	12	118	—
Italy	470	...	...	...	3 400	...	384	443
Netherlands	4	—	4	...	...	...	...	—
United Kingdom	5	—	5	3	72	12	52	—
Australia	5	—	—	4.8	96	10	80	80

SOURCE: FAO. *Rice report 1965*, Rome. 1965 (based on replies to questionnaire).

* Estimate.

[1] 0.35-0.7 for mills set up 15 years or less ago: 1 ton for those set up 15 years or more ago. – [2] Registered mills only. – [3] Ration rice only. – [4] 1954 estimate. – [5] Converted from paddy at 66 percent. – [6] 1956/57. – [7] Excludes one large mill owned by the Wageningen Rice Scheme. – [8] Reporting mills only. – [9] One mill only.

imity to the farm and because rice is milled for home consumption in small quantities and at frequent intervals. The yield from small mills is low, however, and the outturn of broken rice is sometimes as high as 30 percent. One reason is the outmoded equipment in use, but another important factor is that as the miller retains bran and small brokens as partial payment he is likely to overmill. Rubber-roll hullers are being introduced in many countries but they are often not very effective because such machines were designed to mill only Japonica-type (round grain) rice, and modifications had to be made by introducing softer rubber rollers to reduce the percentage of brokens.

In rice-producing countries, grading standards, even if established, have seldom been enforced at the local level. As a result, millers are often able to sell rice containing a high percentage of brokens without suffering undue financial loss, although the problem is taken more seriously when there is an export market to be considered. Mechanized parboiling plants are being installed in the new rice mills in India, and it is expected that the yield of head (whole) rice will be at least 2 percent higher, which will help to compensate the extra cost of parboiling.

The working party on the agricultural engineering aspects of rice, organized by the International Rice Commission in Kuala Lumpur in 1962, recognized the serious losses in small mills and recommended that a systematic program of applied research be undertaken for the development of efficient small processing units. At the same time, complementary research into the industrial structure and special economic problems of rice milling in developing countries is being carried out under the auspices of the FAO Consultative Subcommittee on the Economic Aspects of Rice.

The most common problem found in the rice-milling industries is underutilization of existing capacity side by side with a need to renovate equipment. It is for these reasons that many rice-growing countries follow a twin policy of limiting the spread of new mills while simultaneously encouraging the existing mills to replace obsolete equipment. A careful balance in policy will be necessary, as the rising trend in production of paddy will, in the long run, demand an expanding rice-milling industry in most producing areas.

In general, experience shows that where rice is produced only or primarily for domestic consumption, processing plants should be located in the growing centers. The major reason is the saving in transport costs due to the bulkiness of paddy compared with that of rice. The utilization of milling by-products is also facilitated, since rice production and livestock holding frequently go hand in hand. Rice bran and brokens thus find a market in the immediate neighborhood of the mills, and so does a certain amount of rice straw.

Manufacture of rice foods and utilization of by-products

A number of processed foods are manufactured directly from rice. In the Far East, they are generally produced in the household or on a cottage-industry scale, and include both foods made from rice alone, and others in which rice is one of the major ingredients. Preparations in the first category include parched rice, beaten rice and parched paddy. These products are commonly used in southeast Asia for breakfast, snacks and in convalescent diets, and are particularly useful when the cooking of rice is not possible for lack of fuel or time.

Beaten rice has a long storage life and is therefore more important from the marketing viewpoint than the other products. The high-heat treatment used in preparing parched rice and parched paddy results in a considerable loss of vitamins, particularly thiamine. On the other hand, beaten rice has a high vitamin content as the heat treatment is mild. The yields of these products from paddy or rice vary widely because processing is carried out mostly in the home. For this reason, adequate control of heating during processing can seldom be maintained. Breakfast foods made from roasted rice are common in the United Kingdom and the United States. These are similar to parched rice, but have not as yet been produced on a commercial scale in most rice-producing countries.

In the second category of products, in which rice is one of the ingredients, the most common is a noodle in which rice is the main ingredient supplemented with wheat and legume flours. The nutritional quality of these noodles is superior to that of milled rice, and sometimes they are also fortified with vitamins and calcium. Generally, efficiency in the use of rice and the quality of these foods could be improved by their manufacture on an industrial scale. In addition, by the use of satisfactory packaging techniques, they would have a longer shelf-life.

Sake, made from very highly milled rice of good quality, is the national alcoholic drink of Japan, and rice wine is also common in China (Mainland). Under Japan's existing rice control system, special consideration is given to the allotment to sake producers of the most suitable rice, and rice for this purpose commands a higher price. More than 400,000 tons of husked rice, or about 3 percent of total production, is used annually for this purpose (Table IV-11).

Rice protein has the highest nutritive value of cereal grains, and high-protein fractions containing about 15 percent protein can be produced by controlled milling methods. They are very suitable for feeding infants and young children, and surveys of rice mills are currently being carried out in the Philippines and Thailand to determine the possibilities of manufacturing this product on a large scale.

Broken rice, which represents 8 to 10 percent of the outturn in large mills and much more in small units, has a lower commercial value, though nutritionally it is as good as the whole rice. Small brokens

TABLE IV-11. – JAPAN: UTILIZATION OF RICE FOR INDUSTRIAL USES

Year [1]	Sake	Other alcoholic beverages	Soybean sauce and paste [2]	Other processed foods	Total	Percentage of total rice production
	1 000 tons, husked rice					*Percent*
1937/38	614	37	93	30	774	7.6
1947/48	49		38	2	89	1
1957/58	243		86	177	506	4
1958/59	266		86	124	476	4
1959/60	301		84	138	523	4
1960/61	369		82	146	597	5
1961/62	433		87	176	696	5
1962/63	432		[3]89	[3]143	[3]674	5

[1] November-October. – [2] Soybean paste, or a fermented mixture of rice, soybean and salt, is peculiar to Japan, where it is an important daily food item. – [3] Partly estimated.

are used for animal feed, for brewing and wine making, and in some countries for the preparation of the household dishes described above. Beer is an important outlet for rice brokens. In the United States over 10 percent of the rice crop was used in beer manufacture in 1959, mainly in the form of small brokens (screenings); the percentage of rice used varies according to the price relationship between this rice and maize grits. The small brokens can also be used in the production of alcohol and other distilled liquors.

Rice flour is used chiefly for cake making and cooking purposes. Rice "polishings" (the white bran of rice) are a good source of protein and vitamins, and are consumed on a limited scale in the form of porridge in Indonesia.

Rice bran, accounting for 5 to 8 percent of the paddy weight, is the most important commercial by-product of the rice-milling industry.[49] Though long neglected, it has considerable nutritive value, being rich in fat, protein and vitamin, and recognition is growing of its use as a feedstuff for livestock and poultry as well as a good source of edible oil. It is also sometimes used for fertilizer.

The production of rice bran is only a small fraction of its potential level because of serious milling, marketing and storage difficulties. The main impediment lies in the type of small mill, often manually operated, which is common to many rice-producing areas, and which results in a mixture of bran and husks. Although this is used for animal feed, its marketability is clearly less than that of a uniform product. Because of its relatively high oil content,[50] rice bran is used for oil extraction, though in a limited number of countries. The main problem is that rice bran quickly becomes rancid because of the high moisture content, so that suitable drying methods must be established before high-quality bran oil can be produced. Japan produces each year over 1 million tons of rice bran, of which about 400,000 tons were used to produce 32,000 tons of refined edible oil in 1963; defatted oil cake (about three quarters of the rice bran used) is used mainly for feed.

Rice husks, weighing about 10 percent of the paddy, have very little commercial value. They are used for various purposes in rice-producing areas, though to a lesser extent than rice bran, as packing materials, litter for poultry houses, inert carriers in fertilizer mixtures, and as an abrasive material for polishing rice, particularly parboiled rice. On a limited (largely experimental) scale, they have been used for making thermal insulating building material as an aggregate for concrete blocks, wallboard, or for refrigerators. However, probably the bulk of husks from rice mills is disposed of as waste. Research is being undertaken into new uses of rice husks as a material for grease- and oil-absorbing compounds, filters for air conditioners, charcoal, furfural, fillers for plastics, glucose, etc., but utilization on a commercial scale has not yet developed.

Although the commercial utilization of rice straw, another by-product, seems to be very small in most rice-producing countries, it can be of some economic value if used for making mats, ropes, bags and bales, or as fertilizer or animal feed. Experiments show that rice straw contains 2 to 2½ times the leaf fibers contained in other cereal straws, an indication of its greater suitability for paper making.

Reduction of losses in stored rice

Losses of stored rice vary in amount and character under different storage conditions and practices. The problem may differ in the storage of paddy and of milled rice (paddy can be stored much longer, more cheaply and more easily than milled rice) of different varieties, and of parboiled rice, particularly in regard to their susceptibility to insect infestation. Problems vary also in bulk storage and bag storage, in prolonged storage and short-term storage, in combine-harvested rice as against hand-harvested crops. Different climates invariably create contrasts in the nature and complexity of storage problems. Furthermore, the types of structures and facilities used for rice storage, their design, construction, state of repair and sanitation, management, location and accessibility also have a bearing on storage losses.

Another important factor is the condition of rice as it goes into storage. Dry rice keeps better than rice with a high moisture content, and clean rice, free from infestation, keeps better than rice that goes into storage with high amounts of undesirable admixtures and impurities, or already invaded by storage fungi, or infested with insects and mites. Rice

[49] With milled rice accounting for 65 to 70 percent of the weight, the remaining 20 to 30 percent consists of rice husks and chaff. See FAO. Rice bran: utilization and trade. *Monthly Bulletin of Agricultural Economics and Statistics*, Vol. 13, No. 1, January 1964.

[50] Oil content varies from 17 to 20 percent in Japan and 15 to 18 percent in Italy, to 11 percent in Ceylon and only 7 percent in Malaysia. The proportion of refined edible oil obtained from crude bran oil (60 to 65 percent in Japan) is far less than from oils such as rapeseed or soybean (95 to 96 percent).

damaged mechanically during harvesting, drying or transport is bound to sustain greater losses during storage than sound rice. The degree of milling also causes differences in susceptibility to infestation.

Losses in stored rice may be in weight, in quality, and in nutritive value. Although there are many contributing factors, the principal and direct causes of losses are storage micro-organisms, insects, mites, and rodents, and any means used for the reduction of storage losses are therefore directly or indirectly aimed at controlling them.

Micro-organisms, especially storage fungi, cause loss in quality, depreciation of grade through the development of odors and kernel discoloration, loss in nutritive value through decomposition and fermentation and, in some cases, the production of toxins. In an advanced stage of damage, the rice is unfit for human or animal consumption. In addition, molds reduce the usefulness of rice for various industrial purposes.

The losses caused by insects and mites are losses in weight through feeding, losses in quality through contamination with excrement and dead bodies, kernel discoloration caused especially by mites, and increase in moisture content through the absorption of metabolic water produced in respiration and through moisture migration caused by heating, with subsequent damage and spoilage by fungi. It is generally believed that half of the storage losses are usually caused by insects.

The losses in stored rice caused by rodents consist of losses in weight, losses in quality, and other losses from gnawing on bags, structures, lead pipes, electric wires, etc. If rat populations equal human populations, as has sometimes been suggested, and if one rat consumes about 9 kilograms of grains per year, the annual loss in quantity alone in a country with a human population of 50 million would be 450,000 tons.

The reduction of losses in stored rice, as in all stored grains, involves the use of protective measures before trouble starts, and control measures after a problem has developed. The measures used for protecting stored rice from storage fungi and other micro-organisms consist of creating conditions under which micro-organisms do not develop. Since storage microflora grow more slowly in dry rice than in rice with a high moisture content, drying the crop has been one of the basic practices used since time immemorial.

Low temperatures, like drying, can be utilized for the prevention of fungus development in stored rice. In countries with low winter temperatures, the air cooling of the rice crop is economical and effective, and in recent years cooling by forced ventilation has become a routine practice in some countries.[51]

For the prevention of infestation by insects and mites, the practices in common use are sanitation, application of the so-called grain protectants, and occasionally refrigeration. Sanitation includes the systematic inspection of premises, facilities, and equipment, the elimination of shelters where pests remain undisturbed, the elimination of grain residues and sweepings in which storage insects can breed, the use of noninfested containers and equipment, and the periodic application of residual insecticides to the walls and the surfaces inside and outside empty storage structures.

Grain protectants are substances mixed with grains to prevent insect infestation. Ten of the most commonly used chemicals for the protection of grain in storage have been studied by a joint meeting of the FAO Committee on Pesticides in Agriculture and the WHO Expert Committee on Pesticide Residues, with a view to recommending acceptable daily intakes of these compounds. Tolerances for these chemicals on grain moving in international commerce together with appropriate methods of analysis are also under study.

Refrigeration has received some attention in recent years as a method of preventing losses in stored rice. It is especially useful in storing rice with a moisture content up to 17 or 18 percent without the need for drying. As indicated above, storage at temperatures below 15°C retards the development of fungi and other storage micro-organisms, and at the same time insect activities are greatly reduced or completely arrested. In climates with cold winters, natural air forced through grains for cooling is highly effective and costs little. Under some conditions, the cold storage of rice by artificial refrigeration is practical, as with the Japanese system of storing rice in refrigerated warehouses.

In general, the reduction of losses in stored rice through a systematic and thorough application of preventive measures is more economical in the long run than the application of control measures. Should rice become infested with insects and mites, the usual method for eliminating the infestation is fumigation with a toxic gas. The toxicity of fumigants to different species of storage pests and to the dif-

[51] The basic principle involves passing outside air through the grain mass when the temperature of the ambient air is lower than that of the grain and the relative humidity of the air is at, or below, the equilibrium moisture content of the grain.

ferent stages in their life cycle varies considerably. The effectiveness of fumigation also varies with the temperature of the grain, the length of exposure, and the concentration of the fumigant.

The prevention of losses caused by rodents requires both sanitation and control measures. Sanitation generally consists of the rodent-proofing of structures, and the elimination of rodents and of food accessible to them. The principal measure in a rodent control campaign is the use of rodenticides, which is often supplemented profitably by gassing and trapping. Rodenticides include not only acute poisons, but also chronic poisons which act as anticoagulants and must be ingested for several days in succession.

Storage facilities

The existence of unused large-scale modern storage facilities in developing countries underlines the need for thorough preinvestment studies before additional facilities are constructed. Such feasibility studies should determine the size and distribution of existing storage facilities, both public and private, as well as future storage requirements. Silos with modern equipment might be less economic than more primitive installations if turnover is very slow; economies of scale in storage facilities become meaningless if capacities are permanently underutilized. Although it would normally be expected that new facilities are established in the consuming region, this may not necessarily be so. A clear assessment of available transport facilities is of the greatest importance in determining location. Detailed cost accountings for various possible transport methods and storage locations are needed to obtain comparable cost data. The size of individual storage facilities will depend upon expected annual turnover, number of harvests and, again, availability of transport.

The type of storage facility needed should also be determined with the help of a cost-benefit study. The most modern equipment is not always the most economic; under semiarid conditions, rice might be stored in more primitive bins or even under tarpaulin, provided it remains protected against insects and rodents. In deciding whether rice should be stored in bulk or in bags, the advantages of bulk storage (lower labor costs, less spillage, easier fumigation and savings on bags) have to be weighed against the greater overhead costs in extra transport and storage equipment; bulk storage presupposes large quantities of rice passing through the silos.

ECONOMIC AND INSTITUTIONAL FACTORS

The application of technological innovations to rice farming in developing countries, as to agriculture as a whole, is closely related to the entire process of economic and social development. Progress in the nonagricultural sector tends to determine the size of the market for farm produce and the availability of farm tools and requisites. Not only public investment in irrigation projects, but also appropriate price, credit and marketing policies, and measures to improve land tenure conditions and other aspects of the institutional framework may be decisive in providing the rice farmer with the incentive he needs to adopt new techniques. For the simple truth is that the individual farmer will not change his traditional cultural methods, nor attempt to raise productivity, unless it pays him to do so. Measures of efficiency, such as yield per hectare, which ignore the cost of associated inputs, give only a partial picture and may lead to faulty policy decisions.

Costs, returns and productivity

The selection of alternative farm practices, or of the use of particular inputs, must therefore be based on both technical and economic criteria. Certain methods of cultivation which are profitable to a farmer working in an environment of high paddy prices, high land values, high wages, and low prices for fertilizer and capital equipment, as in Japan, are less likely to be profitable in areas of southeast Asia where these basic economic relationships are reversed.

The relationship between costs and productivity is illustrated in Table IV-12. This contains estimates of the total expenses and returns per hectare of rice in Japan, the United States, the Philippines, Brazil, Venezuela and the United Arab Republic, compiled from surveys carried out in these countries. Total costs comprise not only fixed costs such as land rent and interest on capital, equipment, etc.,

TABLE IV-12. – RICE: ESTIMATED COSTS AND GROSS RETURNS PER HECTARE IN SELECTED PRODUCING COUNTRIES

	Size of farm surveyed	Labor		Draft animal	Machinery	Irrigation	Fertilizers	Other operating expenses[1]	Returns to land capital and management[2]	Total costs (returns)	Yield per hectare	Cost (returns) per ton (paddy)
		Man-days[3]	Cost									
	Hectares	*Days*	$	..... $ *per hectare*							*Tons*	$
JAPAN (1963)												
National average	1.34	146	350.43	16.02	81.35	17.84	96.79	25.52	526.32	1 114.27	5.95	187.27
Percent of total	—	—	(31.5)	(1.4)	(7.3)	(1.6)	(8.7)	(2.3)	(47.2)	(100.0)	—	—
UNITED STATES (1961/62)												
Arkansas	160	3	32.45	—	41.84	21.50	35.14	64.91	260.08	455.92	4.14	110.13
Percent of total	—	—	(7.1)	(—)	(9.2)	(4.7)	(7.7)	(14.2)	(57.1)	(100.0)	—	—
PHILIPPINES (1960/61)												
Lowland, irrigated	1.94	78	..... 51.74		[4]...	..... [5]13.15			46.29	111.18	1.511	[6]73.58
Percent of total	—	—	..... (46.5)		[4]...	..... (11.8)			(41.7)	(100.0)	—	—
Upland	2.10	68	..... 43.07		[4]...	—	..... [7]5.38		11.94	60.39	0.719	[6]83.99
Percent of total	—	—	..... (71.3)		[4]...	—	..... (8.9)		(19.8)	(100.0)	—	—
BRAZIL (1961/62)												
São Paulo, irrigated	...	26	12.01	—	29.43	6.18	30.11	50.00	219.63	347.36	2.603	113.45
Percent of total	—	—	(3.5)	—	(8.4)	(1.8)	(8.7)	(14.4)	(63.2)	(100.0)	—	—
São Paulo, nonirrigated	...	22	14.84	—	35.51	—	25.65	36.40	169.86	282.26	1.033	138.84
Percent of total	—	—	(5.2)	—	(12.6)	—	(9.1)	(12.9)	(60.2)	(100.0)	—	—
VENEZUELA (1962)												
Guirico, irrigated	50	23	63.08	—	49.45	17.58	19.78	97.36	168.13	415.38	2.700	153.84
Percent of total	—	—	(15.2)	—	(11.9)	(4.2)	(4.8)	(23.4)	(40.5)	(100.0)	—	—
Portuguesa, nonirrigated	100	16	42.20	—	36.92	—	19.78	74.73	87.90	261.53	1.700	153.84
Percent of total	—	—	(16.1)	—	(14.1)	—	(7.6)	(28.6)	(33.6)	(100.0)	—	—
UNITED ARAB REPUBLIC (1953-57 average)												
National average	...	...	53.34	29.93	...	...	19.64	19.59	126.76	249.26	4.949	50.37
Percent of total	—	—	(21.4)	(12.0)	—	—	(7.9)	(7.9)	(50.8)	(100.0)	—	—

NOTE. Data have been compiled from:

JAPAN. Ministry of Agriculture and Forestry. *Abstract of studies on agriculture, forestry and fisheries 1964.* UNITED STATES. United States Department of Agriculture. *Enterprise costs and returns on rice farms in the northeast Arkansas rice area* by Warren R. Grant and Troy Mullins. U.S.D.A. Report Series 125. December 1963. PHILIPPINES. Department of Agriculture and Natural Resources. Agricultural Economics Division. *Cost of production of rice.* 1960. Agricultural Series No. 2. BRAZIL. Divisão de Economia Rural. *Agricultura em São Paulo* Boletin No. 10. October 1962. VENEZUELA. Ministerio de Agricultura y Cría. *Aspectos económicos del cultivo del arroz en Venezuela,* 1963. UNITED ARAB REPUBLIC. Ministry of Agriculture. Department of Economics and Statistics. *Bulletin on rice.* by Pritpal Singh. Commodities Analysis Project. 1960.

[1] Includes cost of seed, herbicides, insecticides, sacks, transport and other miscellaneous expenses. – [2] Net return to farmer for management, rent, and interest on capital. Except in the United States, this was calculated from the difference between total costs per ton (excluding profit) and the gross return received by farmers (usually harvest price in area surveyed). – [3] Based on 10 working hours a day for the United States and Japan, and converted from a 10-hour day basis for the Philippines. Length of working day for Brazil and Venezuela not specified but a possible margin of difference would not invalidate the comparison. – [4] Included under other operating expenses. – [5] Includes seed, fertilizers, containers, food furnished to laborers, insecticides and irrigation fees. – [6] National Rice and Corn Corporation (NARIC) minimum price to producers (11.17 pesos per cavan of 44 kg). – [7] Includes seed, fertilizers, containers, food furnished to laborers and insecticides.

EXCHANGE RATES. 1 U.S.$ = 360 yen (Japan); 3.45 pesos (Philippines); 323.5 cruzeiros (Brazil); 4.55 bolivars (Venezuela); £E 0.3508 (United Arab Republic).

as well as variable operating costs such as labor, fertilizer and irrigation water, but also include the returns to the farm operator for management. The returns to management (or "profits") are often not included in orthodox cost of production figures, but they vary widely and need to be assessed if a complete and comparable picture of the farm cost structure is to be obtained. In Table IV-12, therefore, they have been estimated from the difference between the other specified expenses and the gross return at current prices.

Because the data are not fully comparable, and in some cases are based on only partial surveys, international comparisons of costs of production are difficult and may be misleading.[52] Nevertheless, they do indicate the wide variation in costs which is known

[52] For a discussion of surveys on cost of production of rice, see *FAO rice report 1963.* Rome. 1963.

to exist. The estimates in Table IV-12 of national average costs per hectare of rice vary from over $1,000 in Japan to considerably less than $100 in the Philippines (upland rice). This wide spread reflects not so much differences in efficiency, of course, as the amount of inputs invested in rice. The productivity of Japanese rice lands is no less than eight times greater than Philippine upland culture, but this has been achieved at a cost which many poorer countries could not afford. The expense of producing a ton of paddy in Japan is so high ($187 in 1963) that retail prices for rice have to be subsidized, and even so consumers still pay one of the highest prices in the world for their rice. The most striking contrast is between the United Arab Republic and the United States: about the same yields per hectare are obtained, yet the cost of production per ton in the United Arab Republic ($50) [53] is only half that of the United States ($110), which itself is a relatively low-cost producer among the countries listed.

The choice of methods of cultivation, therefore, requires information not only on the potential contribution of a particular input, but also on the cost or effort required to achieve the output growth. This implies some measure of the efficiency of the action recommended — that is, of its cost/benefit ratio. Before research results are recommended to farmers there should be a careful evaluation of the value of the additional output and the additional costs associated with the introduction of new or improved inputs, such as a new rice variety or a new insecticide, or with the introduction of changed cultural practices or management systems. This, as has already been mentioned, is now the accepted procedure in research on fertilizer use.

Price and marketing policies

The success of government programs to increase food production, improve the position of the cultivator and maintain adequate supplies of basic foods such as rice at reasonable prices to consumers depends to a large extent on efficient marketing systems. In large parts of the world where rice growing is dominant per caput incomes are characteristically low, and the level of production is strongly affected by climatic and other natural factors which in turn affect the volume of supplies reaching the market and, in consequence, market prices and farm incomes. Adverse effects of variations in production in the more developed countries are largely cushioned by efficient marketing systems, but in developing countries fluctuations in output have an immediate effect on producers' incomes.

Rice producers fall into three main groups: (*a*) subsistence farmers who occasionally produce a surplus for the market; (*b*) small producers who plan the production of surpluses for the market; and (*c*) commercial producers who grow on a large scale and whose entire output is destined for the market. The bulk of the world's rice output is grown by the first two groups, and rice production on a large scale is confined to the more developed countries, though there are exceptional instances of commercial rice farms in the developing countries. Unlike wheat, which for the most part passes into commercial channels for processing before it can be consumed, rice is processed in a fairly simple manner; in many countries, as already noted, the producer performs this task himself or takes it to the local mill to be processed for his own consumption. Most of the rice that is produced thus never enters commercial channels. It is estimated that only a quarter to a third of total paddy output reaches the market in India, Indonesia, the Republic of Korea, Pakistan and the Philippines, somewhat less than half in Burma, China (Taiwan) and Thailand, and rather more than half in Ceylon and Japan.[54]

The fact that rice is so largely a subsistence crop gives rise to special problems in improving marketing. The assembly of the crop in small lots from many producers, its transport, processing, storage and eventual sale to consumers involve numerous changes in ownership which have an effect on prices. There is considerable diversity from area to area in marketing practices that have come into use over the years. The lack of detailed information at the village level, particularly on the response of farmers to changes in prices or other factors affecting the marketing of their produce, has hampered governments in the determination of marketing and price policies.

Government intervention

In the developed countries, regulations are in force concerning grading and standardization, processing, fair trade practices and reserve stocks of agricultural products to assure an efficient flow from farm to

[53] The cost data refer to 1953-57 but even if the costs in the United Arab Republic have risen in line with the 20 percent increase in farm prices since then, the comparison remains valid.

[54] FAO. *Report of the Technical Meeting on Marketing in the Asia and Far East Region*, Rome, 1959, p. 12-13.

market. In the developing countries statutory regulations have long been in force for marketing many crops produced for the export market, and also for some cash crops for domestic consumption. For staple foods such as rice, governments in developing countries have given increasing attention in recent years to those aspects of marketing which directly affect the producer and his incentive to increase production for the market, although in many cases price policies have continued to aim principally at maintaining a low level of consumer prices.

As a first attempt to secure regularity of supply and to promote domestic production, most governments introduced and maintained import-export control measures. A first approach to the control of price fluctuations and the provision of price incentives to stimulate production as a means to achieve self-sufficiency in rice production or to increase exports normally involves administrative price fixation and market regulations. However, attempts to iron out seasonal and even year-to-year price fluctuations as well as irregular market practices simply by trying to enforce fixed price levels through administrative control measures have often shown little success. In a number of countries such as the Central African Republic, Chad and the Democratic Republic of the Congo, the Market price for rice is up to 100-200 percent higher than the official price, and even more during the period of shortage between harvests. The results of administrative price control measures have been disappointing even in countries depending to a large extent on imports to supply the domestic market, and where, as in Jamaica, Madagascar and Senegal, they have been complemented by a stabilization fund transferring profits from low-cost imports to domestic producers, or heavy import duties are charged to protect local production, as in Gabon.

Such difficulties induced many governments to intervene more directly in the marketing of paddy and rice. Many countries now attempt to adjust supply to demand through bufferstock schemes, either operated by a government department or by public or semipublic agencies such as marketing boards and corporations with state participation. Examples are the occasional government purchases of paddy and rice at guaranteed minimum prices for voluntary delivery in Malaysia, the Philippines, Thailand, and Turkey. Regular procurement programs at fixed prices for basic foodstuffs, including rice, are in operation in Ceylon, China (Taiwan), Indonesia, Japan, and Pakistan.

Marketing boards intervening in the purchase, storage and sale of rice and other staples in competition with existing trade channels are mainly found in Colombia and a number of Central American countries, including Costa Rica, Guatemala and Honduras. They are also in operation in some Near East countries and have recently been introduced in some parts of Africa such as Ghana, Senegal, and Upper Volta. These marketing boards have been given monopoly powers in certain countries where rice constitutes a main foodstuff or export commodity as, for instance, in Guyana and Burma. In Madagascar, until recently, the aim was to control undue price speculation and provide price incentives to farmers by means of official price fixation, a stabilization fund and strict control of imports and exports; as a result of difficulties in achieving these objectives, a monopoly marketing scheme was introduced in 1965 in a pilot area, which it is intended will eventually cover the whole of the marketed rice supply.

The establishment of such monopoly trading agencies involves heavy financial and personnel requirements often beyond the means of the governments of developing countries. In addition, the enforcement of a single channel marketing scheme for staple food crops such as rice, where the producers cannot be identified easily and transactions kept under control, is a most hazardous undertaking. For these reasons, preference is often given to competitive and even selective intervention through statutory agencies in the purchase, stockholding and sale of paddy and rice. Where monopoly schemes are in force, only that part of the marketed supply which is channeled through registered rice mills or import or export points can really be kept under control.

Co-operatives play an important part in the marketing of rice in several countries in the Far East and the Near East, for example, in Burma, India, the Philippines and the United Arab Republic. Experience has proved, however, that without further government support they do not have a far-reaching impact on supply, price levels and market practices. In India, for instance, a food corporation was recently established in order to increase the Government's impact on the domestic supply and demand position through direct trade intervention. Moreover, in open, fluctuating and largely unregulated markets in developing countries, the co-operative movement finds it difficult to compete with private traders. Frequently, however, farmers' co-operatives are used

as purchasing and sales agents by a marketing board or government buying organization. The success of the marketing co-operatives in Japan is based upon their role as the sole buyers in specific areas for the government food agency.

Implementation of producer price guarantees

It is at the first stage of the marketing process that the greatest obstacles are encountered in implementing government policies to assist the producer, particularly measures for minimum or fixed prices. Historically, throughout a large part of the rice-growing world the assembly of small lots for the market has been in the hands of private dealers, such as itinerant merchants, village brokers, and commission agents for rice mills. Growers sold their produce on the farm or in village markets if they did not have to deliver to a landlord or money-lender, and only the more substantial producers were able to take their produce to markets in larger towns where trading was more competitive. Thus, in certain paddy districts in the states of Madras and Andhra Pradesh in India, 90 percent or more of paddy sales have in recent years taken place on the farm site.[55]

Prices are usually the result of bargaining between buyer and grower. The risk to the buyer is increased by the absence of generally accepted grades and quality standards or uniform weights and measures at this stage of the marketing chain, by the long distance to the consuming center, and the need to wait until a sufficient cargo has been collected for economical transport. Compensation for such risks results in a wide spread between farm and wholesale prices in the main centers. Although data on prices actually received on the farm are generally lacking, a study made in an up-country district in Thailand revealed that the wholesale price in Bangkok was 40 percent above the farm price.[56]

Where regulated markets exist, the producer can sell at competitive auction prices through licensed agents, and marketing charges are controlled. In East Pakistan, where rice is the main crop, legislation has been passed to establish a network of regulated markets similar to those already set up in West Pakistan, and it is planned to increase the number of regulated markets in India. In several countries, as already noted, sales can only be made to the government. In Japan, for example, prices are announced prior to the harvest and advance payments made against offers of delivery after the harvest has been completed. The Government of Burma has taken over the control of rice marketing and has increased the number of buying stations in paddy areas for this purpose; fixed prices are announced prior to the harvest and advance payments made. In some African countries, such as Chad and Gabon, where rice production is now being developed, growers must sell their paddy to officially designated bodies, from whom they receive a fixed price. Voluntary sales at officially guaranteed prices set at an incentive level account for the major portion of marketed rice in Ceylon, where rural co-operatives purchase for the Government, and in Venezuela, where purchases are made by the Agricultural Bank. In some African countries only statutory regulations governing the marketing of rice are in force without official purchasing; in Tanzania, for example, purchasing agents must submit their buying prices for official approval.

Levels of producer price guarantees

Where an adequate administrative organization has been established, as in Japan and Ceylon, it has been possible to implement incentive prices which have had a salutary effect on production. However, such programs place a heavy burden on public finances in that they require a significant transfer of funds from the nonagricultural sector of the economy which most developing countries cannot afford. Moreover, the payment of incentive prices to producers may conflict with the aim of maintaining consumer prices at a low level. This has been the case in India, with the result that the expansion in production has been disappointing and the Government has had to increase imports. On the recommendation of the Food-grains Prices Committee, the Government therefore began in 1964/65 to support prices of paddy and established guaranteed prices at a level significantly higher than average prices received by producers in the postharvest period of the preceding three seasons.

Malaysia provides a further typical example of the dilemma of governments in this respect. As in many other countries, the aim of the government's rice policy is self-sufficiency without increasing the consumer price. A high guaranteed price is paid for paddy, but this price does not reach the producer

[55] Government of India, Ministry of Food and Agriculture. *Agricultural price policy in India*, Delhi, 1963. (Mimeographed) p. 125.
[56] FAO. *Implementing price stabilization policies in Asia and the Far East*, Rome, 1963, p. 30.

and its incentive effect is therefore blunted. At the same time, it is necessary to import cheaper Thai rice in order to keep consumer prices down.

The levels of officially established prices in some of the main rice-producing countries are set out in Table IV-13.[57] In 10 of the 19 countries for which it is possible to compare prices over a period of 5 years or so, official prices have been adjusted upward, in some cases rather significantly. Paddy prices in 1965/66 ranged from U.S.$3 per 100 kilograms in Burma to 5 times as much in Yugoslavia and 7 times as much in Japan. Both this wide range and the changes that have taken place suggest a diversity of aims in the policies pursued in the different countries with respect to prices and production incentives, as well as varying conditions of production, costs of inputs and purchasing power in each country.

In the third column of Table IV-13 the changes in official prices have been deflated by the cost of living in order to show how they compared with changes in the general price level. In 5 of the 10 countries where increases took place, the adjustments in the official prices exceeded the rise in the cost of living. In these cases the raising of the price level can be considered to have increased the incentive to producers to raise their output, though obviously many other factors must also be taken into account, including changes in production costs and in the prices of other commodities, and whether the official price reaches the producer.

TABLE IV-13. – SUPPORTED OR STABILIZED PRICES TO PRODUCERS FOR PADDY IN 1965/66

	1965/66 price in U.S.$ per 100 kg	1965/66 price in national currency in relation to 1961/62	
		At current prices	Deflated by cost-of-living index
		Indices, 1961-62 = 100	
Burma	3.09	103	...
Surinam	4.24	100	90
Viet-Nam, Rep. of	4.44	[1]115	89
Madagascar	4.46	100	...
United Arab Republic	4.87	118	100
Mali	5.06	...	...
Ecuador	[2]5.42	100	88
Kenya	5.56	104	96
Central African Republic	5.67	...	...
Philippines	6.54	141	111
Niger	6.68	...	...
Gabon	6.89	...	...
Pakistan, East	7.31	...	...
India	7.35	...	...
Guatemala	7.61	100	101
Malaysia	[2]8.65	107	105
Nicaragua	[2]8.99	100	95
Trinidad and Tobago	9.00	...	...
Korea, Rep. of	[2]9.33	170	102
United States	9.92	96	90
Chile	10.03	...	...
Portugal	[2]10.26	106	98
Spain	10.42	...	...
Italy	11.23	...	...
Greece	11.67	140	131
Ceylon	12.08	100	93
France	12.85	...	...
Panama	13.04	...	...
Jamaica	[2]13.27	100	95
Venezuela	13.33	100	97
Yugoslavia	15.46	...	...
Japan [3]	22.71	155	121

[1] 1962/63 = 100. – [2] 1964/65 price. – [3] Converted to paddy equivalent from original price of $30.32 quoted for husked (brown) rice.

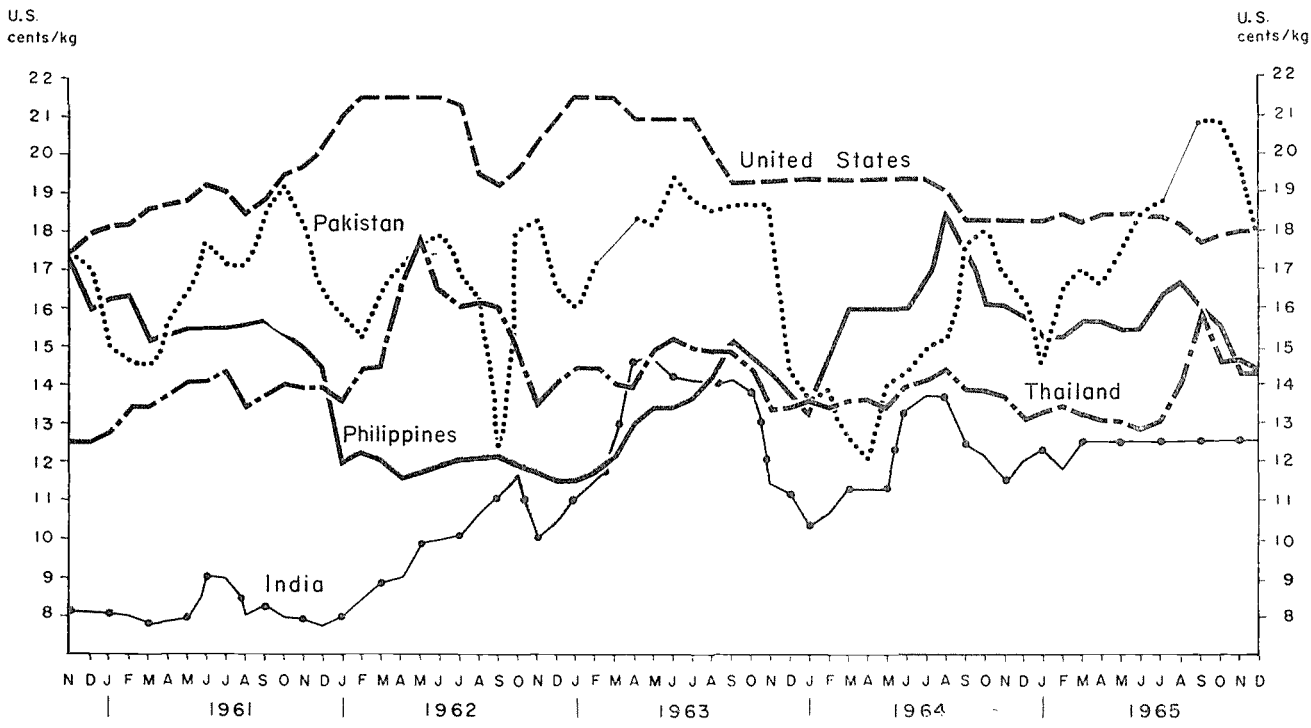
SEASONAL FLUCTUATIONS IN PRODUCER PRICES

The bulk of the marketed crop is generally sold immediately after harvest, a practice which initiates a period of low prices in the absence of official controls such as those described above. Small farmers usually lack the necessary storage space and must complete their sales shortly after the harvest in order to obtain cash for family needs or to repay debts. Larger farmers are more likely to have storage facilities and the financial ability to hold crops for later sale, and thereby benefit from higher prices. In the absence of farm price data, monthly average wholesale prices of paddy in some of the main marketing centers are set out in Figure IV-6 to illustrate the magnitude of the seasonal fluctuations. Data for the United States are included for comparison with the developing countries.

Vigorous steps have been taken in a number of countries to improve storage facilities in rural areas and in main consumption and export centers, often in combination with the expansion of credit facilities through co-operatives. In Ceylon, for example, increased storage facilities made possible a rapid rise in government purchases, which now take up most of the paddy that is marketed; continued emphasis is being placed on increasing storage space, as the lack of facilities still compels some farmers to sell to private traders at less than the guaranteed prices. In the Republic of Korea, the Government instituted a Rice Lien Program in 1957 to enable growers to deposit paddy immediately after the harvest in government warehouses and obtain a loan which they repay when the paddy is withdrawn for sale later in the season. A sample study was con-

[57] The prices in national currencies have been converted to U.S.$ per 100 kg at official exchange rates. It should be noted that these rates do not always reflect the comparative purchasing power of currencies in the various countries. Furthermore, some exchange rates have fluctuated rather sharply (e.g., Colombia, Ecuador), and in countries where inflationary forces are strong the conversion at official rates may give an upward bias to the price expressed in U.S.$.

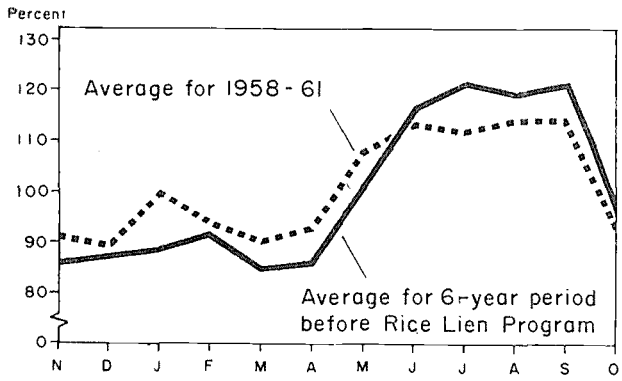
FIGURE IV-6. - SEASONAL FLUCTUATIONS IN WHOLESALE PRICES FOR RICE IN INDIA, PAKISTAN, PHILIPPINES, THAILAND AND THE UNITED STATES



INDIA. Coarse rice, wholesale price, Sambalpur (Orissa). - PAKISTAN. Rice, medium variety, wholesale price, Dacca (East Pakistan). - PHILIPPINES. Domestic, wholesale price, Manila. - THAILAND. White rice, 5-7 percent brokens, government standard, f.o.b. Bangkok. - UNITED STATES. NATO, wholesale price, New Orleans.

ducted in 1961 to appraise the working of this program.[58] It was found that growers who participated in the program had realized as much as 25 percent net gain in returns after paying storage and incidental expenses, and the seasonal fluctuation in paddy prices was down from 40 percent to 30 percent (Figure IV-7). However, the program targets have not been fulfilled, and the study brings out the difficulties of reaching more producers who might benefit from such a program. Many growers could not meet the minimum quantity requirements, or found the relatively heavy administrative and incidental expenses of the strict inspection a disadvantage over direct sales to merchants. There were not always sufficient funds to issue adequate loans. The price for paddy under lien is fixed prior to the harvest and tends to push up market prices at harvest time to a level at which they are attractive to growers in urgent need of cash.

FIGURE IV-7. - SEASONAL FLUCTUATIONS IN RICE PRICES IN THE REPUBLIC OF KOREA BEFORE AND AFTER ESTABLISHMENT OF THE RICE LIEN PROGRAM



SOURCE. Bank of Republic of Korea. *Report on a case study of the rice lien loan and government purchase program in Korea.* October 1962.

[58] FAO. *Implementing price stabilization policies in Asia and the Far East.* Rome. 1963. p. 114-118.

CONSUMER PRICE POLICIES

The improvement of marketing systems is especially important in those parts of the world where consumer incomes are low. Efficient marketing systems can reduce prices to consumers without affecting returns to producers.

As a result of variations in output and imperfections in the marketing system, the flow of supplies to consuming centers in the developing countries is liable to severe fluctuations. In many countries supplies are therefore regulated by the use of re-

serve stocks of domestic and imported grain for "injection" in the market when shortages threaten to develop, or for the purchase of grains to prevent a severe decline in prices. In some countries no further control is maintained over prices. In Thailand, where rice is abundant, the maintenance of large reserves is unnecessary and consumer supplies are regulated by the adjustment of export taxes. In China (Taiwan), also a rice surplus country, government rice collections, which amount to nearly a third of the marketed rice, are sold to low-income families at 20 to 30 percent of free market prices. A rice stock program is operated in Turkey to stabilize consumer prices in conjunction with import and export programs. In Australia, arrangements made between the Paddy Marketing Board and the millers keep consumer prices stable.

The large element of subsidy involved in the sale of rice to consumers in Ceylon, Jamaica and Japan is made good by the equalization of prices of domestic rice (guaranteed at a high level to producers) and imported rice and other cereals sold at higher than world market prices.

The various attempts in India to improve the distribution of rice to consumers eventually led to the establishment of the Food Corporation early in 1965 to undertake the purchasing and marketing of food grains and other foodstuffs, including the establishment of rice and flour mills. This body functions generally on an autonomous basis along commercial lines. Wholesale and retail prices of rice have been fixed, and in some areas during the recent shortages maximum producer prices for paddy have also been fixed (higher than support prices) to ensure that the statutory wholesale and retail prices do not become uneconomic.

Transport facilities

Inadequate transport is often responsible for high marketing margins and the persistence of subsistence rice cropping in remote areas.

The better storage life of paddy vis-à-vis rice and the relatively high conversion losses for milling have resulted in most countries in the location of storage and milling facilities in the main producing areas. In certain countries, however, such as Japan and the Republic of Korea, where consumers prefer freshly milled rice, paddy may be hulled on farms or in nearby villages, and subsequently stored as husked (brown) rice and milled in small milling units in the consumption centers.

The general concentration of storage and milling facilities in production areas has a far-reaching impact on the paddy-rice transport pattern and costs. The bulk of the paddy crop is thrown into the market within the space of a few months, while the demand for rice remains fairly constant throughout the year. Frequent short hauls of paddy daily between buying and storage centers during the harvest season permit the full and economic use of a limited transport fleet which may be more than sufficient to match the subsequent need for conveying rice to distant consumer centers and the demand for other hauling jobs. In addition, substantial savings are made in transport costs since the main movement is of milled rice, rather than the more bulky paddy.

The provision of basic means of transport — roads, railways and waterways — is a definite responsibility of government. The provision of feeder roads to open up new agricultural areas is of particular importance. Through the provision of new roads producers are drawn into the market economy. The density of a transport network in a paddy-producing area is of major importance for the economic marketing of the produce. The Malayan Rice Commission in 1956 suggested a maximum distance from producer to hard surface road of 3 miles (5 kilometers) wherever water transport was not possible. Although such an extensive network will be extremely costly, a maximum distance of about 16 miles (26 kilometers) from the nearest village market or feeder road accessible by cart traffic seems to be indicated. In some Latin American countries, 25 to 30 kilometers have been found to be the maximum distance over which farmers can arrange to transport their crop to the next market or collecting center.

Other government marketing services

Even where government intervention is confined to measures that assist private enterprise to maintain efficiency or improve their methods, there are certain types of government assistance that are essential.

In the first place, it is important to have a very clear and precise meaning attached to "quality" and "price," since without uniformity of description it is necessary for all transactions to be personally negotiated by a process of inspection and argument that will inevitably be costly, wasteful and inefficient. One of the primary duties of government in the marketing of rice should therefore be to lay down a definite system of classification and ensure that the

rice is marketed accordingly. The classes or grades should describe both the type and quality of paddy or rice, so that for the whole country a certain grade has a single definite meaning and transactions can be conducted over long distances, simply on description. This also gives precision to price differentials and can lead to the institution of a price-reporting service, whereby farmers are informed as to what is being offered in different parts of the country and, after some experience, can learn to calculate what would be a fair price in their own districts.

The grading of rice will also immensely simplify contractual disputes which frequently arise over differences concerning what constitutes fair average quality. A government may proceed further than this and draw up a standard form of contract which specifies precisely the conditions under which a sale takes place and provides for arbitration in case of dispute. Related to the question of grading are the quality standards that are often imposed by governments in respect of exported produce, so as to preserve the country's good name in foreign markets.

Agricultural credit

The need for sufficient farm credit is also related to marketing improvements and the ability of farmers to respond to programs undertaken for their benefit. This refers not only to credit needed for holding the crop while awaiting sale at a more favorable price later in the season, but also to sufficient credit for production purposes. The means by which credit is repaid determines the channels through which the farmer markets his crop, his ability to choose between different outlets and the possibility of bargaining over the price at which the produce is sold. Most of the available credit in rice-growing regions comes from noninstitutional sources, such as landlords, moneylenders, produce brokers and relatives. Interest charges are usually very high, ranging from 25 percent per year in India and Burma and 30 percent in Thailand to between 60 and 200 percent in Indonesia. Very often, loans are linked with marketing agreements, whereby the farmer is compelled to sell his paddy to the moneylender at prices far below the market price,[59] resulting in interest rates (in real terms) of between 200 and 400 percent per annum.

Most rice-growing countries have introduced programs to increase the volume and efficiency of institutional credit (as against noninstitutional credit), to lower interest rates, and to break the hold of the moneylender and landlord on credit and marketing.[60]

Land tenure

Land tenure conditions are one of the main factors responsible for the low productivity of rice lands in developing countries.

The average rice holding in Ceylon and Java in Indonesia is less than half a hectare, and in China (Taiwan) and Japan (even after the land reform) only one hectare. Thus some countries have aimed at a minimum size holding (West Pakistan) or an economic family size holding (the Philippines), and many others have legislated to prevent the subdivision of existing holdings below their present level or below a minimum floor level. The Agricultural Basic Law of Japan (1961) and the agrarian structural improvement program seek to increase the scale of operation. In China (Taiwan), a land consolidation program is now being implemented in the wake of the successful land reform. In some states in India, and also in Pakistan, land consolidation is being pursued.

Joint farming and various types of co-operative farming have been attempted in a number of countries as a means of increasing the scale of operation. Apart from co-operative or joint farming, there has been a steady increase in the rice-producing countries in service co-operatives in the fields of production, supply, credit and marketing. In the United Arab Republic, crop rotation is planned and carried out over the whole area of a co-operative; this system, which began in the land reform areas, is now being extended to the rest of the country. In Ceylon, the Paddy Lands Act of 1958 (with amendments of 1962) provides for the planning of cultivation on a tract-wide basis, and the introduction of improved methods of cultivation through cultivation committees which are elected by the farmers themselves. Such organization of smallholders for common activities has helped in surmounting some of the difficulties of planning production, and the provision of supplies and services on an economic basis for thousands of smallholders.

As much as half the rice lands of Ceylon, Java in Indonesia, the main rice-growing areas of Malaysia

[59] In some villages in Iran, for example, it has been observed that farmers who had to deliver grain against debts obtained only half to a third of the prevailing harvest prices.

[60] Some recent developments in such programs are described in FAO, *The state of food and agriculture 1965*, Rome, 1965, p. 177-181.

and the Philippines, and the central plains of Thailand are covered by some form of tenancy. Such tenancy in the developing rice-growing countries is usually an economically and socially exploitative form of tenure, inhibiting incentive and investment. Often the system is compounded by the existence of feudal intermediaries whose exactions add to the burden of the actual tiller of the soil (as in India and Pakistan before land reform). The high cost of land, high rents (usually a half of the crop), and insecurity of tenure combine to leave the tenant with neither the incentive nor the means for investment.

Most countries in the rice-producing areas have therefore introduced measures to abolish or reform such systems of tenancy. Their first effort has usually been — as in the case of Burma, Ceylon, Indonesia and the Philippines — to bypass the problem by programs of public land redistribution or land settlement, so as to siphon off the pressure of landless population and tenants into newly reclaimed areas. Experience in all these countries has shown, however, that because of the need for material and social infrastructure before people can be moved to new areas, these schemes have proved very slow and costly to implement, and have failed to make an appreciable impact on the problems of size of holdings, tenancy and landlessness. These countries have therefore faced up more squarely to the problems of land reform through the abolition of intermediaries (where they existed), programs of land redistribution, transfer of ownership to tillers; or to lesser programs of tenancy regulation, including the provision of security of tenure, and rent regulation.

Most of these measures do not specifically concern rice production, and are amply documented elsewhere in general accounts of land reform programs.[61] Mention may be made, however, of the regulation of sharecropping, which is a common feature of tenancy systems in the rice-producing regions. Rents in some parts of Nepal, Java and India are as much as 70 percent of the crop. A more common rent is a half share of the crop, as in parts of Ceylon, India, Malaysia, Pakistan, the Philippines, and the central plains of Thailand. Regulatory measures have aimed at limiting rents to 25 to 35 percent of the crop, while converting them into a fixed rent in terms of a fixed quantity of paddy. Thus, in China (Taiwan) rents have been fixed at 37.5 percent of the crop, in Ceylon and the Philippines at 25 percent, and at between 20 and 25 percent in most states of India. An associated reform is the attempt to convert the rent payment from kind to cash. It has not always been possible, however, to enforce the lower rent in practice.

THE OUTLOOK

The paramount role played by rice as a basic food is unlikely to diminish in the foreseeable future. Its role in world trade is more uncertain, even though demand for imported rice should be well sustained for some years to come. The central rice problem is one of production. Its solution will depend on greater success, not only in diagnosing the cause of inadequate growth, but equally in applying in the paddy field the already known results of scientific research. Farmers will be more ready to adopt new ideas, to raise the productivity of rice lands, and above all to increase sales, if they receive the necessary economic incentives in terms of income and the consumer goods they need.

Role of rice in future food supplies

World demand for rice during the next decade should show a considerably faster rate of growth than other cereals, partly because wheat will be losing ground rapidly in the developed countries The level of actual consumption of rice will depend, however, on the extent to which production can be stepped up and marketing facilities improved.

The outlook for the demand for rice is projected to 1975 and 1985 in Table IV-14. On the assumption of constant prices and rising incomes,[62] by 1985 world demand for rice will show a massive increase of some 100 million tons above the 1961-63 level. While most of the absolute increase would be in the traditional rice-eating areas of the Far East, the greatest relative growth is likely to be in Latin America (where total consumption may well double by 1985 owing to the rapid population growth) and in west Africa, where urbanization favors a shift in diets toward rice. Per caput consumption is expected

[61] See, for example, FAO, *The state of food and agriculture 1965*. Rome, 1965, p. 168-177.

[62] Methodology and assumptions are described in full in FAO: *Agricultural commodities - projections for 1975 and 1985* (provisional) Committee on Commodity Problems (CCP) 66/5, Rome, 1966. See also Table IV-15. The projections will be analyzed in more detail, and if necessary revised, for the Indicative World Plan for Agricultural Development now in preparation by FAO.

TABLE IV-14. – ROLE OF RICE IN WORLD FOOD CONSUMPTION [1]

	1961-63 average		1975		1985	
	Rice consumption	Share of total calorie intake	Projected rice demand	Share of total calorie intake	Projected rice demand	Share of total calorie intake
	Million tons	*Percent*	*Million tons*	*Percent*	*Million tons*	*Percent*
Developing countries	81	27	117–122	27–26	149–159	26–25
Developed countries	13	6	14	6	15–16	6
Centrally planned countries	54	23	74–75	24	85–93	22
WORLD	148	20	205–211	21	249–268	21

[1] Excludes nonfood utilization.

to be higher in most countries of the Far East, though the increase will be less in high consuming countries such as Burma and Malaysia as demand is already approaching saturation level. In Japan and China (Taiwan), per caput consumption of rice may well show a decline by 1985, reflecting levels of living which permit its replacement in diets by more expensive protein-rich foods.

If realized, these trends would help to lift calorie intake approximately to the levels called for in the nutritional targets of the FAO Third World Food Survey. They would not, however, contribute to the desired nutritional balance. This would require a *reduced* per caput consumption of cereals in most developing countries [63] so as to allow for additional consumption of protective foods. In contrast, as Table IV-14 shows, consumer tastes — and poverty — make it likely that the share of rice in the total calorie intake of the developing countries will remain at its present level of about 27 percent in 1975. By 1985 only a slight decline is indicated in the projections in percentage terms, while there is a further increase in absolute terms of calories per caput. For the world as a whole, rice is likely to continue to contribute about a fifth of the energy value of diets, and it would still provide a large part of their protein content too.

These prospects underline the importance of two nutritional improvement measures mentioned earlier; first, improving the nutritional value of rice consumed, either by encouraging better processing and cooking methods, or by artificial enrichment; and, second, orienting food and agricultural planning toward nutritional goals so as to diversify the rice-eater's diet and reduce his dependence on rice. The development of low-cost food products which are rich in proteins, minerals and vitamins is particularly important. A sustained effort of consumer education will be needed to conteract the natural conservatism of many habitual rice-eaters, and to be effective this must be supported by economic incentives.

Action to prevent avoidable wastage must also be taken as an immediate practical measure to increase food availability. Information on the magnitude of this wastage is scanty, but there is no doubt that it is enormous. Many of the losses which occur at all levels between the field and the consumer could be avoided by proper handling, marketing, processing and storage.

Role of trade

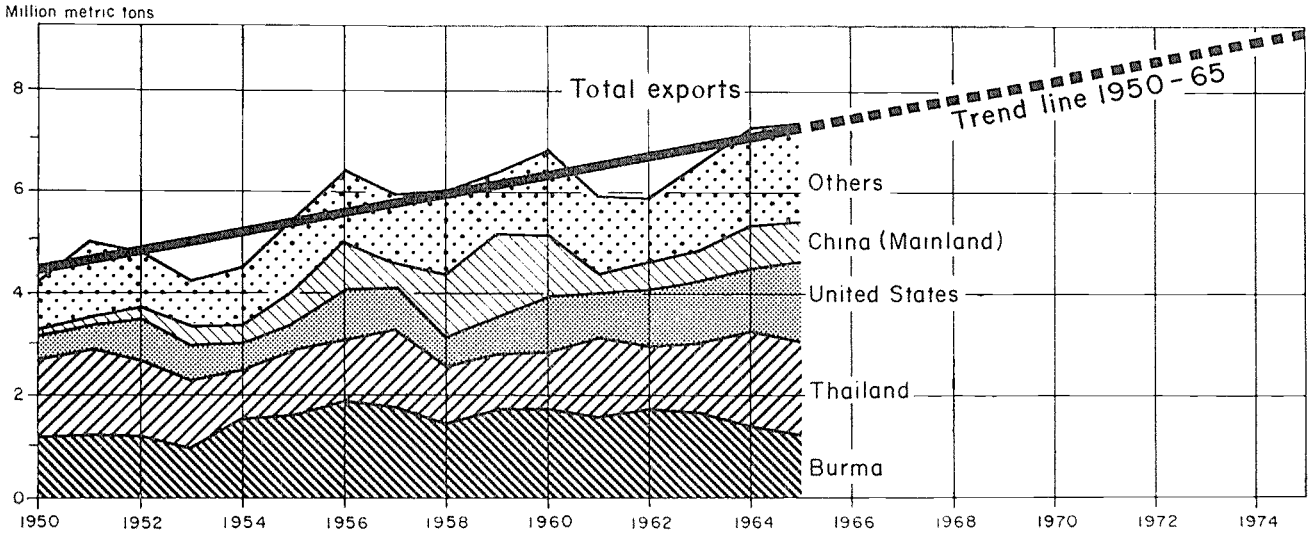
International trade plays only a marginal role in meeting the world's rice requirements, but a considerable group of countries will remain heavily dependent on rice exports as a source of foreign exchange to finance their development programs. The stability of international trade since 1955 has been largely due to the high degree of government control exercised on both sides of the market. Trade has been expanding in recent years, and a continuation of the past trend would thus lead to further growth (Figure IV-8).

Yet the longer range outlook is very uncertain. The upward trend in imports in past years has been largely a reflection of the failure of importing countries to meet their own production objectives.

The developing regions of the Far East, west Africa, Near East and Latin America, which contain five sixths of the world's rice importers, are trying to

[63] However, the biological value of some cereal proteins, particularly those of rice, is high and cereals provide a more concentrated form of energy than root crops. In some regions, such as central Africa, therefore, where consumption of starchy roots is excessively high, the nutritional targets call for additional cereals to replace part of the starchy roots. FAO, *Third world food survey*, FFHC Basic Study No. 11, Rome, 1963.

FIGURE IV-8. - TRENDS IN WORLD RICE EXPORTS,[1] 1950-65, AND PROJECTION TO 1975



[1] Milled rice equivalent, excluding re-exports.

reduce their purchases in order to save foreign exchange. Imports into Far Eastern countries are limited to the bare minimum needed to cover the annual deficit in domestic supplies; in west Africa and Latin America, where rice is not the main food, action has been taken to limit demand while local production is being built up. There is a slow and steady growth in imports into developed countries, and Japan's requirements have risen dramatically since 1960. This is unlikely, however, to offset the loss of outlets in the great traditional deficit areas which could occur if these countries succeed in their production objectives.

The dynamic upward trend in demand for rice in developing regions (which is not counterbalanced, as for wheat, by a declining trend in developed countries) suggests that there would be plentiful opportunities for trade if means could be devised to solve the problem of lack of purchasing power among the deficit countries. United States food aid has been a major supporting factor in world wheat markets for years, and some governments have now proposed that special financing arrangements should be extended to the export products of developing countries.[64] If this could be done, or alternatively if rice could form part of some type of regional co-operative scheme among the main producing areas, then the outlook for world trade in rice might be transformed. It should not be overlooked, however, that world trade is limited today by lack of rice available for export; any international arrangement to expand trade would be futile unless the developing exporting countries can solve their production problems. These issues are now being examined by the FAO Study Group on Rice.

[64] See the proposal for the modification of the United Nations/FAO World Food Program (WFP) presented by Argentina to the Intergovernmental Committee of WFP; Recommendation A.II.6 of the United Nations Conference on Trade and Development (UNCTAD); and United Nations General Assembly Resolution No. 2096 (XX) on Program of Studies on Multilateral Food Aid.

Production problems

Is the world rice economy capable of producing the rice needed over the next decades? Despite the substantial progress made in rice cultivation since 1950 in the Far East and its extension in other regions, doubts have been raised by the recent slowing down in the rate of growth. On a per caput basis, indeed, supplies available have shown little improvement for five years and recent seasons have been characterized by local scarcities, rising consumer prices and record imports into the rice deficit areas. Supplies have dwindled even in some traditional exporters, such as Burma and Madagascar. A continuation of present trends in production and consumption would, in fact, lead to a sharp increase in the net import deficit of developing countries, concentrated in the Far East but also affecting Latin America and Africa.

While some of the recent setbacks are due to short-term factors, it seems certain that the world will not be able to grow enough rice to satisfy its needs unless full use is made of available resources. The focussing of world attention on this crucial

need is the main object of the International Rice Year. First, there must be a careful assessment of the nature and causes of the national production problems. Second, the future expansion of output has to be rationally planned.

Production problems differ considerably from region to region. Land resources are now scarce in several major producing countries, including India, Pakistan and parts of Indonesia. Here a careful appraisal should be made of the scope for diverting land to rice from lower value crops like millet wherever sufficient water can be made available. In countries such as Burma and Thailand, where pressure of population on the land is much less intense, the room for maneuver is greater, but the common problem in the traditional growing areas is to raise productivity from its present abysmally low level; average rice yields per hectare in the Far East are probably only half what they could be if modern methods of technology were to be applied.

The critical element is usually the availability of water. Massive multipurpose schemes like the Mekong river project will take many years to complete. In the meantime, a combined operation is required to achieve better techniques of cultivation on existing rice lands, with all that this implies in terms of more efficient water use, greater fertilizer use, improved varieties, control of pests and diseases, better integration of draft animals and — dominating all these technical factors — economic incentives. Narrowing the wide gap between the levels achieved by more efficient farmers and those of the majority is the principal task of extension services. Fortunately, there are already signs of a gradual transformation of the countryside as regards the attitude to new techniques.

It may be necessary to effect an economic transformation — the conversion of the typical subsistence rice economies into commercial operations. Japanese experience has demonstrated the advances which can be secured in the productivity of rice lands within the traditional framework of small-scale farming, provided knowledge of technology is transmitted to farmers and farm operations are profitable. Until recently, in the Far East government action on incentive farm prices generally took second place to concern for low food prices for the growing urban population. The emphasis of policies is now changing, but attempts to introduce price incentives have so far proved disappointing.

This, at least in some cases, may be because the ability of farmers to respond to price incentives depends on progress in other fields, such as the provision of sufficient farm credit, marketing improvements, and better conditions of land tenure. Bottlenecks in the supply of farm requisites, particularly fertilizer, are often a serious obstacle. Generally, more careful evaluation of the cost/benefit ratio of new or improved inputs is needed to determine whether, at the prevailing level of farm prices, they will be remunerative to the efficient producer.

In much of Africa, in contrast, the greatest obstacles are the shortage of manpower (as is also the case in the southern European growing areas), the very low yields on upland (dry) rice lands, and the lack of a tradition of irrigated rice cultivation. There are believed to be great stretches suitable for rice in inland and coastal swamp lands, but their development needs to be preceded by exhaustive preinvestment studies into the type and costs of the water control measures and communication network required. Training programs for farmers will also often be necessary.

The low productivity of rice lands in Latin America is less serious insofar as it reflects semiextensive methods of cultivation. However, there are other, more disturbing factors. In recent years, progress has been slowed down by mounting costs of production, which are swollen by the heavy losses from plant diseases, internal transport difficulties, and other factors. Farmers have been protected from the competition of lower-cost imported rice, and in several cases the high domestic prices are limiting both internal and overseas demand. In future, therefore, a more selective encouragement of production in lower-cost areas may be necessary in Latin America.

Further inquiry into the economic and technical problems of dry-land rice cultivation (and particularly weed control, a major problem) would be useful both for Latin American and African rice growers, as would research into the economics of mechanized cultivation under conditions met in these areas. Generally, it must be stressed that the high capital-output ratio of irrigated rice compared with other cereals can only be justified economically if reasonable yields can be achieved in a short time.

The planning of an expansion in rice production therefore raises many questions. How large an increase is required? What land, labor, water and other resources are available? What are the costs of investment? What are the implications for milling, distribution, farm machinery, and other sectors of the economy? And so on. The Indicative World Plan for Agricultural Development, now in

TABLE IV-15. – WORLD RICE PRODUCTION REQUIREMENTS [1] IN 1985 COMPARED WITH 1961-63 AVERAGE UNDER ALTERNATIVE ASSUMPTIONS

Assumed annual increase in population	Assumed annual increase in Gross Domestic Product	
	3.5 percent	4.8 percent
Percent per annum	*Indices, rice production in 1961-63 = 100*	
1.8	169	173
2.0	176	181

[1] Constant prices are assumed.

preparation in FAO, should give some pointers to these questions, but complete answers can only be found within the individual country concerned.

The required output of rice will depend on the trend in demand. Projected world requirements for 1985 are given in Table IV-15 according to various combinations of assumptions concerning population growth and incomes. This shows that the additional needs might range from 69 to 81 percent above the 1961-63 level. To achieve such increases without any extension of the area planted would involve raising the *average* yield per hectare in the Far East to that already achieved in the United States. This would pose a tremendous challenge, bearing in mind the very slow progress in productivity over the past 50 years, and suggests that parallel efforts must be made to extend the rice area both by opening up new lands and by double-cropping the existing areas.

International collaboration on rice

Action is being taken to clarify all these issues and to find solutions not only at the national level but on the international plane too. It was the wartime disruption of production, and the critical rice shortages in the Far East that followed, which led FAO Member Nations to the establishment of the International Rice Commission (IRC) in 1949. The Commission helps to co-ordinate national rice improvement programs, and arranges co-operative research activities such as international hybridization projects, fertilizer response trials, etc. Since 1955, this work on the technical aspects of the problem has been complemented by that of the Study Group on Rice (formerly the FAO Consultative Subcommittee on the Economic Aspects of Rice), which meets regularly to review the current world rice position and outlook, and to provide an intergovernmental forum for discussions on international trade and economic problems.

A new departure came in 1960 with the establishment of the International Rice Research Institute in Los Baños by the Rockefeller and Ford Foundations in co-operation with the Government of the Philippines. The Institute conducts a comprehensive program of basic and applied research on rice and organizes training in research methods.

A recent expert group concluded that "the fundamental need was for a technological revolution in rice production such as has already occurred in the developed wheat-producing areas so as to bring about a substantial rise in productivity."[65] This study has underlined the immense and sustained efforts over a wide field which would be required to achieve this. While there is little sign yet of a breakthrough, there can be no doubt that the wide-ranging programs of national and international research have had an impact on rice problems, and research must continue unabated. More emphasis must be placed on quickening the process by which this technical know-how is transmitted to the farmer. And ways must be found to secure the farmers' own involvement and wholehearted participation in the development process. The strengthening of the link between the research scientist and the paddy farmer is an appropriate unifying theme for all the programs being arranged during the International Rice Year.

[65] FAO, *Report of Joint Session of the Consultative Subcommittee on the Economic Aspects of Rice and the FAO Group on Grains to the Committee on Commodity Problems*, Rome, 1964.

ANNEX TABLES

EXPLANATORY NOTE

FAO index numbers of agricultural, fishery, and forest production and trade

Production index numbers

The indices of agricultural production have been calculated by applying regional weights, based on 1952/53-1956/57 farm price relationships, to the production figures, which are adjusted to allow for quantities used for feed and seed. The indices for food products exclude coffee, tea, tobacco, inedible oilseeds, animal and vegetable fibers, and rubber.

For fishery production, quantities are weighted by the average unit values of fishermen's landings in 1957-59. For forest production, roundwood production is weighted by 1952-56 prices.

Under the split year notation, agricultural production statistics for the Northern Hemisphere pertain generally to the harvests of the spring, summer and autumn of the first year stated, but for the more southerly parts of this hemisphere they represent harvests continuing into the early months of the following year; for the Southern Hemisphere they relate to the crops generally harvested in the latter half of the first year stated and the first half of the following year. Statistics of fishery and forest production are on a calendar year basis.

For agricultural production, the prewar averages generally refer to 1934/35-1938/39 or 1935/36-1939/40. Prewar data of fishery production refer to 1938.

Trade index numbers

In calculating the indices of the volume of exports and imports of agricultural products, the volume figures for individual products were formerly weighted by average unit values in 1952-53. In the revised indices, 1957-59 unit values are applied to 1957 and subsequent years, and the two series linked at the 1957-58 average.

Average unit values in the revised indices for agricultural products are calculated on a regional basis, using quantity and value data covering a minimum of 75 percent of the region's total trade in each product. The unit values for individual products are weighted by the average volume of trade in 1957-59 (for 1957 and subsequent years) and 1952-53 (for earlier years).

As far as possible, the provisional indices for the trade in fishery and forest products are calculated in the same way as the revised indices for agricultural products.

Regional coverage

The coverage of most of the regional groupings is self-explanatory. It should be noted, however, that western Europe is defined as including Yugoslavia, and the Near East as extending from Cyprus and Turkey in the northwest to Afghanistan in the east and including from the African continent Libya, Sudan, and the United Arab Republic. For China (Mainland), no estimates are included until more complete data are available.

Indices of the trade of eastern Europe and the U.S.S.R. are so far available only for the period 1955 to 1964. Because of difficulties concerning exchange rates and the pricing of barter transaction, the trade of these countries has been priced at the world average export unit values.

ANNEX TABLE 1A. – TOTAL AGRICULTURAL PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
WESTERN EUROPE ...	94	101	101	101	102	106	108	112	117	117	123	127	129
Northwestern Europe	96	100	102	100	102	104	106	107	118	115	123	125	128
Austria	91	103	96	102	107	112	116	108	122	126	129	131	138
Belgium-Luxembourg ...	93	96	104	107	100	107	111	103	113	111	117	121	128
Denmark	100	101	101	97	101	111	110	110	116	121	123	115	122
Finland	98	105	100	97	100	107	110	112	127	125	119	135	131
France	93	101	106	99	100	99	102	107	121	116	126	129	131
Germany, Fed. Rep. of .	95	101	101	100	102	105	110	107	121	109	123	127	126
Ireland	95	97	105	99	104	113	104	196	108	122	119	121	123
Netherlands	100	99	100	104	98	105	115	117	118	118	124	122	137
Norway	97	99	99	97	108	101	101	98	102	104	100	106	101
Sweden	104	104	101	90	101	99	95	98	100	104	100	97	106
Switzerland	101	100	103	99	98	99	108	106	110	110	110	107	111
United Kingdom	97	98	100	99	106	105	101	110	118	123	131	132	137
Southern Europe	90	103	98	105	104	112	114	122	115	119	124	130	131
Greece	79	102	99	109	112	128	122	125	117	138	138	149	157
Italy	93	104	96	105	103	101	116	116	107	116	115	113	119
Portugal	87	106	104	102	102	105	99	101	102	102	113	117	112
Spain	100	95	102	99	104	109	110	117	119	121	129	146	133
Yugoslavia	70	114	92	120	104	147	119	161	143	126	140	152	163
EASTERN EUROPE AND U.S.S.R.	89	94	96	104	116	118	129	132	132	135	139	134	146
NORTH AMERICA	99	99	97	101	103	98	105	108	109	108	112	119	117
Canada	111	103	79	99	108	92	98	100	108	91	114	126	117
United States	98	98	99	101	103	99	106	109	110	110	112	118	117
OCEANIA	97	97	98	103	105	102	117	119	123	126	132	138	142
Australia	97	97	97	104	105	99	119	119	123	127	133	140	144
New Zealand	96	95	100	103	105	109	115	120	122	125	129	133	132
LATIN AMERICA	95	96	100	103	107	113	118	122	121	126	128	132	135
Central America	89	92	100	106	113	122	130	130	138	136	139	145	161
Cuba	99	97	94	99	111	114	114	116	130	105	92	100	120
Guatemala	93	97	100	102	109	115	119	130	133	141	163	171	173
Honduras	99	104	95	97	105	111	118	117	117	125	132	135	138
Mexico	83	88	103	111	115	128	140	138	145	151	160	165	181
Panama	91	99	99	107	104	113	119	123	118	126	128	136	139
South America	96	96	100	103	105	111	115	120	118	124	126	129	129
Argentina	100	96	100	97	107	109	112	105	100	109	108	121	123
Brazil	93	95	99	108	106	115	125	145	137	147	146	143	135
Chile	101	95	103	102	99	112	108	110	114	114	121	125	124
Colombia	98	101	98	100	102	109	111	117	116	117	121	125	133
Peru	97	98	103	103	99	100	107	113	116	122	125	128	127
Uruguay	97	108	101	97	96	99	86	76	91	93	99	94	102
Venezuela	93	99	98	106	103	109	112	115	131	133	143	160	172

ANNEX TABLE 1A. – TOTAL AGRICULTURAL PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES (*concluded*)

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
FAR EAST [1]	91	98	100	104	108	107	112	116	120	124	126	129	133
Burma	102	98	96	97	107	93	107	114	113	113	125	125	131
Ceylon	95	95	102	108	101	105	109	111	117	123	126	131	137
China (Taiwan)	88	94	101	104	112	119	125	123	130	132	138	137	156
India	89	100	101	103	107	106	111	115	120	123	122	126	130
Indonesia	92	101	105	101	102	104	107	109	109	108	113	103	112
Japan	97	86	95	113	110	113	118	117	119	120	129	127	132
Korea, Rep. of	71	98	112	114	106	117	121	122	121	132	119	120	151
Malaysia: Malaya	95	94	99	105	108	108	110	119	126	132	138	143	151
Pakistan	100	98	102	97	103	102	102	109	113	115	115	130	129
Philippines	93	98	99	101	109	113	114	115	122	125	129	134	133
Thailand	89	105	86	105	115	94	108	112	131	140	146	160	158
NEAR EAST	94	99	97	101	109	112	118	121	123	123	132	135	139
Iran	90	96	99	104	111	118	122	124	119	134	133	139	124
Iraq	84	104	118	89	105	122	106	97	101	109	120	99	105
Israel	81	93	97	107	121	131	148	168	165	189	219	225	255
Syria	87	98	115	80	120	137	98	101	100	117	161	152	161
Turkey	100	108	86	99	107	108	124	126	130	123	129	143	142
United Arab Republic	96	92	101	103	108	115	117	121	127	111	136	136	144
AFRICA	94	98	101	102	106	106	110	114	122	118	125	129	132
Northwest Africa	91	103	107	94	105	93	108	102	108	83	102	110	107
Algeria	91	100	106	96	106	98	93	100	102	84	95	99	91
Morocco	[2] 91	[2] 103	[2] 110	[2] 96	[2] 100	[2] 82	117	101	108	84	116	120	119
Tunisia	94	109	103	81	112	101	134	109	126	78	91	119	132
South of Sahara [3]	94	97	100	103	106	108	111	117	124	125	130	133	136
Ethiopia	94	99	100	102	105	105	105	118	122	130	132	133	135
South Africa	89	98	100	103	110	108	111	116	125	134	135	128	131
WORLD [1]	94	98	98	102	107	107	114	117	119	121	125	128	131

NOTE: Country indices are calculated by FAO on a uniform basis. They may differ from national indices produced by the countries themselves because of differences in concepts of production, coverage, weights, and methods of calculation. They are not yet available for 1965/66.

[1] Excluding China (Mainland). – [2] Former French zone only. – [3] Derived by subtraction of subtotal for northwest Africa from regional total.

ANNEX TABLE 1B. – PER CAPUT AGRICULTURAL PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
WESTERN EUROPE ...	95	102	101	101	101	104	105	108	112	110	115	117	118
Northwestern Europe	97	101	102	99	100	101	102	103	112	109	114	115	117
Austria	91	103	96	102	107	111	114	107	120	124	126	127	133
Belgium-Luxembourg ...	94	96	104	107	99	105	108	100	109	107	112	114	120
Denmark	101	102	101	96	100	109	108	106	112	115	117	108	114
Finland	100	106	100	96	98	104	106	107	120	118	110	124	120
France	95	102	106	99	98	96	98	102	114	107	115	116	116
Germany, Fed. Rep. of .	97	102	102	99	100	101	105	101	113	100	111	114	112
Ireland	94	97	105	99	105	115	106	99	112	127	123	125	126
Netherlands	102	100	100	102	95	101	109	109	109	108	112	109	120
Norway	99	100	99	96	106	98	98	94	97	98	94	99	93
Sweden	105	104	101	89	100	97	93	95	96	100	95	92	100
Switzerland	103	102	103	98	95	95	102	99	100	98	95	90	90
United Kingdom	97	99	100	99	105	104	100	107	114	118	125	125	129
Southern Europe	91	104	98	104	102	109	111	117	110	113	116	121	121
Greece	81	103	99	108	110	125	118	119	111	130	129	139	145
Italy	94	105	96	104	102	99	114	112	104	112	110	107	111
Portugal	87	106	104	101	101	104	98	98	99	98	108	111	106
Spain	101	96	102	98	102	106	107	112	113	114	121	136	122
Yugoslavia	72	116	92	118	102	143	114	153	134	118	129	138	146
EASTERN EUROPE AND U.S.S.R.	92	96	96	103	113	113	122	123	121	123	124	119	128
NORTH AMERICA	103	101	97	99	100	93	98	98	98	96	97	102	99
Canada	117	106	79	96	102	84	87	88	92	76	94	103	94
United States	102	100	99	100	99	94	99	100	99	98	98	102	99
OCEANIA	102	99	98	101	100	95	107	106	107	107	111	113	114
Australia	101	100	97	102	100	93	109	106	108	109	112	116	117
New Zealand	101	97	100	101	101	102	106	108	108	108	108	109	107
LATIN AMERICA	100	98	100	101	101	104	106	107	104	105	103	103	103
Central America	94	95	100	104	107	112	117	113	117	111	110	112	120
Cuba	103	99	94	97	106	107	105	105	115	91	78	84	98
Guatemala	99	100	100	99	103	105	106	113	112	115	128	130	127
Honduras	105	107	95	94	99	101	105	101	98	101	104	103	102
Mexico	89	92	103	108	108	117	125	119	121	123	126	125	134
Panama	96	102	99	104	99	105	107	108	99	102	100	104	104
South America	101	99	100	100	100	103	104	106	101	103	102	102	99
Argentina	104	98	100	96	103	103	104	96	90	96	94	104	104
Brazil	99	98	99	105	100	106	111	125	115	120	115	109	101
Chile	106	97	103	99	94	104	98	97	98	96	100	100	96
Colombia	103	103	98	98	98	102	101	105	101	100	101	102	106
Peru	103	101	103	100	93	92	95	98	97	100	99	98	95
Uruguay	103	111	101	95	91	91	77	67	78	77	80	73	77
Venezuela	101	103	98	102	96	97	96	96	105	104	108	116	122

ANNEX TABLE 1B. – PER CAPUT AGRICULTURAL PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES (*concluded*)

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
FAR EAST [1]	95	100	100	102	103	101	103	105	106	107	106	106	107
Burma	107	100	96	95	102	87	98	102	99	97	105	103	105
Ceylon	100	97	102	105	96	98	99	98	100	103	103	105	106
China (Taiwan)	95	98	101	101	105	108	110	104	106	104	105	101	112
India	93	102	101	102	103	100	103	104	106	106	103	103	104
Indonesia	96	103	105	99	98	98	98	98	96	93	95	84	90
Japan	99	87	95	112	107	110	113	111	112	113	119	116	120
Korea, Rep. of	76	101	112	111	101	108	109	107	103	109	96	93	114
Malaysia: Malaya	100	96	99	103	102	99	98	103	105	107	108	108	111
Pakistan	104	100	102	95	99	96	94	98	99	100	97	107	104
Philippines	99	101	99	98	103	104	101	99	102	101	101	102	97
Thailand	95	108	86	102	108	86	96	97	110	114	116	123	118
NEAR EAST	99	102	97	98	104	104	108	108	106	104	108	108	108
Iran	94	99	99	102	106	110	112	113	105	115	110	112	97
Iraq	86	106	118	87	102	117	101	90	93	100	109	88	91
Israel	87	97	99	105	112	116	127	140	134	148	164	162	176
Syria	94	102	115	77	112	123	85	84	79	88	117	107	110
Turkey	105	111	86	97	101	99	111	110	110	101	103	111	107
United Arab Republic	101	94	101	101	103	107	107	108	111	94	112	110	112
AFRICA	98	100	101	99	101	98	100	101	105	100	103	104	104
Northwest Africa	96	105	107	91	100	86	92	85	87	65	78	82	78
Algeria	96	103	106	94	101	90	84	87	86	69	77	77	69
Morocco	[2] 96	[2] 106	[2] 110	[2] 93	[2] 95	[2] 76	91	77	80	60	81	82	79
Tunisia	98	111	103	79	109	97	126	101	114	69	79	101	110
South of Sahara [3]	99	99	100	101	101	101	102	104	108	106	108	108	108
Ethiopia	97	101	100	101	101	100	99	109	111	116	115	114	114
South Africa	94	101	100	100	105	100	101	103	107	113	112	103	103
WORLD [1]	98	100	99	101	103	101	105	106	107	105	107	107	108

NOTE: See explanatory note to Annex Table 1A.

[1] Excluding China (Mainland). – [2] Former French zone only. – [3] Derived by subtraction of subtotal for northwest Africa from regional total.

ANNEX TABLE 2A. – TOTAL FOOD PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
WESTERN EUROPE ...	94	101	101	101	102	106	109	112	118	117	124	127	129
Northwestern Europe	96	101	102	99	102	106	106	108	118	114	124	126	128
Austria	91	102	96	103	108	112	116	109	123	127	130	131	139
Belgium-Luxembourg ...	94	96	104	107	100	108	112	105	114	112	118	121	128
Denmark	100	101	101	97	101	111	110	110	116	121	123	115	122
Finland	98	105	100	97	100	107	110	112	127	126	119	135	131
France	93	101	106	99	100	99	102	107	121	116	127	129	131
Germany, Fed. Rep. of .	95	101	101	100	102	105	110	107	121	110	123	127	126
Ireland	95	97	105	99	104	113	103	96	108	122	119	121	123
Netherlands	99	99	101	103	98	106	117	119	119	119	125	123	137
Norway	97	99	99	96	108	101	101	97	102	104	100	106	100
Sweden	104	104	101	90	101	99	95	98	100	104	100	98	106
Switzerland	101	100	103	99	97	99	108	106	110	110	110	107	111
United Kingdom	97	98	100	100	106	105	101	110	118	123	131	133	138
Southern Europe....	90	103	98	105	104	106	115	122	116	125	124	130	131
Greece	82	105	99	104	111	125	121	126	118	137	133	141	155
Italy	92	104	96	105	103	102	117	117	108	118	117	114	120
Portugal	87	106	104	102	102	105	99	101	102	102	113	117	112
Spain	100	96	102	98	103	109	110	117	118	119	127	146	133
Yugoslavia	70	115	91	119	105	147	120	164	146	129	143	154	164
EASTERN EUROPE AND U.S.S.R.	90	95	96	104	116	119	130	133	134	138	141	135	148
NORTH AMERICA	99	98	97	101	104	101	109	110	111	110	113	121	119
Canada	112	105	78	99	106	91	96	100	106	90	114	126	118
United States	98	97	99	102	104	102	111	111	112	113	113	120	119
OCEANIA	99	99	98	103	100	99	117	115	122	124	134	139	145
Australia	98	100	99	104	99	95	120	114	124	127	138	143	149
New Zealand	98	96	100	103	103	109	113	115	117	122	123	130	128
LATIN AMERICA	94	96	100	102	109	112	117	117	118	121	124	130	137
Central America	91	94	99	103	113	121	130	133	140	137	136	144	161
Cuba	100	97	94	98	111	113	115	116	131	105	91	101	120
Guatemala	97	98	100	99	106	107	110	114	117	123	129	132	133
Honduras	102	105	94	95	105	107	114	115	116	123	126	126	129
Mexico	85	91	103	106	115	128	142	146	149	159	163	172	190
Panama	91	98	98	108	106	114	119	123	117	125	127	136	140
South America	94	96	100	102	108	110	113	113	113	118	121	127	131
Argentina	99	95	100	99	107	108	113	104	99	108	107	122	123
Brazil	88	96	101	103	112	114	122	127	131	135	140	141	148
Chile	101	95	103	102	99	113	108	109	114	114	122	126	125
Colombia	98	98	97	104	103	103	105	108	108	108	114	119	129
Peru	99	100	103	102	97	100	106	113	112	118	118	120	120
Uruguay	94	109	101	99	97	100	82	75	90	91	100	91	103
Venezuela	92	96	99	108	105	110	111	117	133	136	148	167	182

ANNEX TABLE 2A. – TOTAL FOOD PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES (*concluded*)

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
FAR EAST [1]	91	98	100	104	108	106	112	118	122	124	126	130	134
Burma	102	98	96	97	107	93	109	115	114	115	127	127	133
Ceylon	98	90	102	112	97	101	105	113	117	126	128	136	147
China (Taiwan)	88	95	101	104	112	118	125	123	130	131	137	136	156
India	89	100	101	103	106	105	110	117	121	123	121	125	129
Indonesia	89	102	105	101	103	104	109	111	113	109	115	105	114
Japan	97	85	94	113	110	113	118	118	120	121	131	128	133
Korea, Rep. of	70	99	112	114	106	119	124	125	124	135	121	123	157
Malaysia: Malaya	90	90	101	103	116	112	110	127	143	154	167	169	180
Pakistan	98	101	103	95	103	102	102	109	114	115	114	131	131
Philippines	94	98	99	101	108	113	113	113	120	122	127	132	130
Thailand	89	107	84	105	115	91	105	108	125	132	143	156	152
NEAR EAST	93	100	97	100	109	113	118	120	121	122	130	133	134
Iran	91	96	98	104	111	119	122	124	115	130	131	135	120
Iraq	84	106	119	87	105	121	106	95	100	109	121	97	104
Israel	82	93	97	107	121	129	146	164	157	179	208	219	246
Syria	92	106	116	67	118	134	86	90	84	104	151	139	141
Turkey	100	110	85	99	107	109	126	126	131	123	130	144	136
United Arab Republic	85	93	103	106	113	115	114	119	125	116	138	140	144
AFRICA	94	98	101	101	106	104	109	112	119	116	122	125	127
Northwest Africa	91	102	107	93	107	93	109	102	109	84	104	111	108
Algeria	91	99	106	96	109	98	95	101	103	86	98	101	92
Morocco	[2] 90	[2] 103	[2] 110	[2] 95	[2] 101	[2] 82	118	101	109	84	117	122	120
Tunisia	95	109	103	79	113	101	135	109	127	78	91	120	133
South of Sahara [3]	95	97	100	102	105	107	108	114	121	123	127	128	132
Ethiopia	94	100	100	102	104	104	104	117	121	125	127	128	130
South Africa	88	99	100	103	111	108	111	118	129	138	141	131	136
WORLD [1]	94	98	99	102	107	108	114	117	120	121	125	128	132

NOTE: See explanatory note to Annex Table 1A.

[1] Excluding China (Mainland). – [2] Former French zone only. – [3] Derived by subtraction of subtotal for northwest Africa from regional total.

ANNEX TABLE 2B. – PER CAPUT FOOD PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
WESTERN EUROPE ...	95	102	101	100	101	104	105	108	112	110	115	117	118
Northwestern Europe	97	101	103	99	100	103	103	103	112	107	115	115	117
Austria	91	103	96	103	107	112	115	107	121	124	126	128	134
Belgium-Luxembourg ...	95	97	104	106	99	106	109	102	110	108	113	115	120
Denmark	101	102	101	96	100	109	108	106	112	115	117	108	114
Finland	100	106	100	96	98	104	106	107	120	118	111	125	120
France	95	102	106	98	98	96	98	102	114	108	116	116	116
Germany, Fed. Rep. of .	97	102	102	99	100	101	105	101	113	101	112	114	112
Ireland	94	97	105	99	105	116	106	99	112	127	123	124	126
Netherlands	102	101	101	102	95	102	111	111	110	109	113	109	120
Norway	99	100	99	96	106	98	98	93	97	98	93	98	92
Sweden	105	104	101	89	100	97	93	95	96	100	95	93	100
Switzerland	103	102	103	98	95	95	102	99	100	98	95	90	90
United Kingdom	97	99	100	99	105	104	100	107	115	118	125	126	129
Southern Europe	92	104	98	104	102	104	112	118	111	119	117	121	121
Greece	83	106	99	103	109	122	117	121	112	129	125	131	144
Italy	93	104	96	104	102	100	115	113	104	114	112	108	113
Portugal	87	106	104	101	101	104	98	98	99	98	108	111	106
Spain	102	97	102	97	102	106	107	112	112	112	119	135	122
Yugoslavia	72	117	91	118	102	143	115	156	138	120	131	140	147
EASTERN EUROPE AND U.S.S.R.	93	96	96	103	112	114	123	124	123	124	126	119	129
NORTH AMERICA	103	100	97	99	101	96	101	100	100	97	99	103	101
Canada	118	107	78	96	100	83	86	87	91	75	94	103	94
United States	101	99	100	100	100	97	103	102	101	100	99	104	101
OCEANIA	104	102	98	101	95	92	106	102	106	106	112	113	116
Australia	102	103	99	102	94	89	110	103	108	109	116	118	121
New Zealand	103	98	100	101	99	102	104	103	103	105	103	107	103
LATIN AMERICA	99	98	100	99	103	103	105	102	101	101	100	102	104
Central America	96	97	100	100	107	111	116	116	118	112	108	111	121
Cuba	104	100	94	96	107	107	106	105	115	91	77	84	98
Guatemala	103	101	100	96	100	98	98	98	98	100	101	100	97
Honduras	108	108	94	92	99	98	101	99	97	100	99	96	94
Mexico	90	94	103	103	109	117	126	126	124	129	128	131	140
Panama	96	100	98	105	101	106	107	107	99	101	100	104	104
South America	99	98	100	99	102	102	102	99	97	98	98	100	101
Argentina	102	97	100	97	104	102	105	95	89	96	93	105	104
Brazil	95	99	101	100	105	105	108	110	110	110	111	108	110
Chile	106	98	103	99	94	104	98	96	98	96	100	101	97
Colombia	102	100	97	101	99	96	96	97	95	93	96	98	103
Peru	104	103	103	99	91	91	94	98	94	97	94	92	90
Uruguay	100	112	101	96	91	93	74	66	77	76	80	71	77
Venezuela	100	100	99	103	97	98	95	97	108	107	112	122	128

ANNEX TABLE 2B. – PER CAPUT FOOD PRODUCTION: COUNTRY, SUBREGIONAL AND REGIONAL INDICES (*concluded*)

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (Preliminary)
	Indices, average 1952/53-1956/57 = 100												
FAR EAST [1]	94	100	100	102	104	100	103	106	108	107	106	107	108
Burma	106	100	96	95	103	87	100	103	100	99	107	104	107
Ceylon	103	93	102	109	92	93	95	99	101	105	105	108	114
China (Taiwan)	95	99	101	100	105	107	109	103	105	103	105	100	111
India	93	103	101	102	102	99	102	105	107	106	102	103	104
Indonesia	93	104	105	99	99	98	100	99	99	93	97	86	92
Japan	100	87	94	112	107	109	113	112	113	114	121	117	120
Korea, Rep. of	74	102	112	111	101	110	112	109	106	112	97	96	119
Malaysia: Malaya	96	92	102	101	110	103	98	109	120	124	131	129	134
Pakistan	102	103	103	93	99	96	94	98	101	99	96	108	106
Philippines	100	101	99	98	102	103	100	97	100	99	99	100	95
Thailand	95	110	84	102	108	83	94	93	105	107	113	120	114
NEAR EAST	97	103	97	98	104	105	107	107	105	103	107	107	104
Iran	95	99	98	102	106	111	112	113	102	112	109	109	94
Iraq	86	107	119	86	102	117	101	89	92	99	109	85	90
Israel	88	98	99	104	112	115	125	137	127	140	155	157	169
Syria	99	110	116	65	109	120	74	75	66	78	110	98	96
Turkey	106	113	85	96	101	100	112	110	111	101	103	111	103
United Arab Republic	90	95	103	104	108	108	104	106	108	98	114	113	113
AFRICA	99	101	101	98	101	97	99	99	103	98	101	101	100
Northwest Africa	96	105	107	91	101	86	93	85	88	66	80	83	79
Algeria	96	101	106	93	103	91	85	88	87	71	78	79	70
Morocco	[2] 95	[2] 107	[2] 110	[2] 93	[2] 95	[2] 75	92	77	80	60	81	83	80
Tunisia	99	111	102	78	110	97	128	101	115	69	79	102	111
South of Sahara [3]	99	100	100	100	101	100	99	102	106	105	105	104	105
Ethiopia	97	101	100	100	101	99	98	108	110	112	111	110	110
South Africa	93	102	100	100	105	100	101	104	111	117	116	106	107
WORLD [1]	98	100	99	100	103	102	106	107	107	106	107	108	109

NOTE: See explanatory note to Annex Table 1A.

[1] Excluding China (Mainland). – [2] Former French zone only. – [3] Derived by subtraction of subtotal for northwest Africa from regional total.

ANNEX TABLE 3A. – WORLD [1] PRODUCTION OF MAJOR AGRICULTURAL COMMODITIES

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Million metric tons											
Wheat	144.78	155.49	188.06	223.10	228.62	219.37	220.40	210.53	236.60	217.23	250.58	237.96
Barley	44.07	46.69	62.03	73.31	69.65	67.77	76.67	69.07	83.38	86.16	93.07	87.48
Oats	64.10	60.51	59.25	54.11	60.87	54.82	57.20	49.07	48.60	46.00	42.96	45.15
Maize	106.44	125.29	142.80	188.28	168.55	183.87	196.94	195.52	196.53	201.42	202.92	210.32
Rice (milled equivalent)[2]	65.68	71.79	83.83	100.16	92.34	97.89	103.01	103.64	103.94	111.30	112.90	105.32
Sugar (centrifugal)	24.90	31.90	39.96	50.18	48.79	48.54	53.68	50.60	49.29	53.43	64.11	60.21
Apples[3]	6.80	9.45	10.42	14.30	15.60	12.33	15.49	13.21	14.86	16.09	16.40	15.09
Citrus fruit	11.10	15.17	18.10	21.31	20.32	20.53	20.98	23.05	21.70	22.73	24.43	25.38
Bananas	8.10	14.02	15.76	19.22	17.44	18.68	19.55	19.97	20.45	22.22	23.86	24.46
Olive oil	0.94	1.00	1.12	1.25	1.12	1.24	1.41	1.47	0.99	1.94	0.98	1.30
Soybeans	2.32	8.69	12.11	18.52	17.68	16.50	17.17	20.75	20.53	21.22	21.32	24.63
Groundnuts	6.41	7.49	9.58	11.81	11.52	10.75	11.68	12.21	12.89	13.10	14.39	13.74
Cottonseed	11.38	12.33	14.69	16.22	14.73	15.57	16.37	16.63	17.83	18.61	18.87	18.76
Copra	2.27	2.64	3.17	3.10	2.93	2.73	3.35	3.38	3.10	3.32	3.35	3.38
Total vegetable oils and oilseeds (oil equivalent)	10.40	12.93	15.61	18.36	17.66	16.93	18.32	19.58	19.33	20.39	20.89	21.65
Coffee	2.41	2.14	2.53	4.10	3.46	4.62	3.94	4.35	4.11	3.92	3.17	4.66
Cocoa	0.74	0.76	0.82	1.08	0.90	1.04	1.16	1.13	1.17	1.22	1.53	1.26
Tea	0.47	0.58	0.71	0.84	0.79	0.81	0.83	0.89	0.90	0.92	0.96	0.98
Wine	20.26	18.95	21.55	24.75	23.94	24.57	24.41	22.40	28.45	25.49	28.10	28.09
Tobacco	2.29	2.73	3.15	3.26	3.12	3.28	3.24	3.15	3.49	3.84	4.06	3.73
Cotton (lint)	5.99	6.77	8.00	8.81	7.92	8.52	8.92	8.97	9.70	10.12	10.30	10.30
Jute[4]	2.15	2.14	2.09	2.60	2.59	2.25	2.14	3.26	2.77	2.93	2.80	2.76
Sisal	0.25	0.32	0.46	0.59	0.54	0.58	0.61	0.60	0.63	0.66	0.70	0.68
Wool (greasy)	1.61	1.79	2.11	2.45	2.34	2.47	2.46	2.50	2.49	2.56	2.54	2.49
Rubber	1.00	1.74	1.88	2.07	1.97	2.07	2.02	2.12	2.16	2.11	2.27	2.29
Milk (total)	221.00	261.43	301.62	344.37	331.51	338.04	346.04	351.15	355.11	354.74	358.80	371.86
Meat[5]	32.25	40.64	50.35	59.24	55.57	57.56	58.41	61.17	63.51	65.34	65.10	66.57
Eggs	6.32	8.70	10.57	12.52	11.68	12.15	12.47	13.03	13.26	13.29	13.76	14.24

[1] Excluding China (Mainland). – [2] Paddy converted at 65 percent. – [3] Excluding U.S.S.R. as well as China (Mainland). – [4] Including allied fibers. – [5] Beef and veal, mutton and lamb, pork, poultry meat.

ANNEX TABLE 3B. – REGIONAL PRODUCTION OF MAJOR AGRICULTURAL COMMODITIES

	Prewar Average	Average 1948-52	Average 1953-57	Average 1958-62	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Million metric tons											
WESTERN EUROPE												
Wheat	31.07	30.32	36.23	41.36	39.08	42.66	39.62	37.60	47.83	41.46	46.80	47.82
Barley	9.08	10.93	15.77	21.75	17.73	20.35	22.14	22.59	25.96	28.62	29.58	30.22
Oats	16.44	14.84	14.85	12.84	12.88	12.57	13.29	12.92	12.53	12.67	11.86	11.56
Rye	7.49	6.65	7.10	6.53	6.99	7.17	7.04	5.42	6.04	5.86	6.34	5.39
Maize	9.73	7.18	10.04	13.15	11.08	14.32	14.83	13.13	12.38	15.21	15.41	14.79
Sugar (centrifugal)	4.02	5.13	6.80	8.12	8.19	7.32	9.93	7.80	7.34	8.57	10.18	8.73
Potatoes	69.87	76.38	79.13	74.38	72.43	72.75	79.97	73.03	73.70	80.42	68.10	63.67
Apples	3.16	4.68	4.95	7.10	7.98	5.65	8.17	6.27	7.45	8.17	7.82	6.96
Citrus fruit	1.99	2.10	2.43	3.35	2.91	3.28	3.27	4.07	3.25	4.13	4.24	4.20
Olive oil	0.81	0.83	0.90	0.99	0.80	1.07	1.10	1.20	0.80	1.62	0.63	1.07
Rapeseed	0.07	0.46	0.33	0.41	0.46	0.45	0.27	0.37	0.52	0.40	0.64	0.76
Total vegetable oils and oilseeds (oil equivalent)	0.88	1.10	1.13	1.27	1.06	1.34	1.32	1.48	1.15	1.95	1.03	1.51
Wine	14.13	13.13	14.87	16.68	16.02	16.66	16.62	14.20	19.89	16.64	19.61	19.30
Tobacco	0.19	0.25	0.31	0.27	0.30	0.32	0.26	0.20	0.26	0.33	0.36	0.32
Cotton (lint)	0.02	0.04	0.09	0.16	0.11	0.14	0.14	0.20	0.21	0.20	0.15	0.16
Milk (total)	77.02	76.64	91.30	102.09	97.29	97.33	102.96	105.68	107.21	106.71	106.06	110.23
Meat [1]	9.32	8.13	11.29	13.73	12.39	12.89	13.69	14.45	15.25	15.45	15.57	16.01
Eggs	1.95	2.13	2.72	3.34	3.09	3.25	3.32	3.45	3.58	3.72	3.90	4.10
EASTERN EUROPE												
Wheat	11.6	[2]10.8	11.8	13.2	11.9	14.0	12.9	13.6	13.9	13.4	14.4	17.8
Rye	11.6	[2]11.1	10.5	11.1	11.2	11.9	11.4	11.3	9.7	10.0	10.2	11.1
Barley	5.3	[2]4.1	4.9	5.8	4.8	5.7	6.3	5.9	6.4	6.1	6.1	6.5
Oats	6.6	[2]5.1	5.2	5.3	5.3	5.2	5.5	5.4	5.1	4.8	4.0	4.3
Maize	7.6	[2]5.7	9.4	10.3	8.1	11.5	11.3	10.5	10.4	12.1	12.9	12.1
Sugar beet	14.3	[2]20.2	23.2	28.1	27.0	23.2	33.9	29.8	26.8	31.1	34.0	33.4
Potatoes	65.6	[2]53.6	61.2	61.5	58.5	60.2	63.9	63.9	61.0	69.4	73.4	64.9
Meat (total) [1,3]	2.9	2.8	[5]3.6	4.3	4.2	4.2	4.2	4.5	4.5	4.4	4.5	4.7
Milk (total)	27.4	19.7	23.4	28.1	27.1	27.9	28.4	28.8	28.1	28.3	28.4	28.1
Eggs [4]	...	[2]9.4	11.8	16.4	14.3	15.4	16.8	18.0	17.3	17.1	18.3	19.3
U.S.S.R.												
Wheat	[6]31.8	[2]30.9	51.3	69.4	76.6	69.1	64.3	66.5	70.8	49.7	74.4	59.6
Rye	[6]21.0	[2]17.8	15.0	16.5	15.7	16.9	16.4	16.7	17.0	11.9	13.6	16.1
Barley	[6]12.1	[2]6.5	9.5	14.4	13.0	10.2	16.0	13.3	19.5	19.8	28.6	20.2
Oats	[6]16.8	[2]13.0	11.7	10.7	13.4	13.5	12.0	8.9	5.7	4.0	5.5	6.0
Millet	[6]4.4	[2]1.7	3.0	2.6	2.9	1.3	3.2	2.9	2.8	1.8	3.5	2.1
Maize	[6]5.1	[2]5.8	8.3	19.0	16.7	12.0	18.7	24.3	23.5	14.3	19.7	12.0
Pulses	[6]2.5	[2]1.7	1.1	3.7	1.8	2.1	2.7	4.0	7.6	8.0	8.5	8.0
Cotton, raw	[6]2.2	[2]3.4	4.1	4.4	4.3	4.7	4.3	4.5	4.3	5.2	5.3	5.7
Flax-fiber	[6]0.4	[2]0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4
Sugar beet	[6]18.0	[2]20.6	29.3	50.9	54.4	43.9	57.7	50.9	47.4	44.1	81.2	71.5
Total oilseeds	[6]3.2	[2]2.4	[7]3.1	4.8	5.2	3.4	4.3	5.3	5.5	4.9	6.5	...
Sunflowerseed	[6]2.6	[2]1.9	3.0	4.2	4.6	3.0	4.0	4.8	4.8	4.3	6.1	5.4
Potatoes	[6]75.9	[2]76.9	80.6	82.3	86.5	86.6	84.4	84.3	69.7	71.8	93.6	88.0
Milk, total	[6]33.6	[2]35.5	44.3	61.7	58.7	61.7	61.7	62.6	63.9	61.3	63.3	72.4
Meat, total [1,3]	[6]4.7	[2]4.7	6.5	8.7	7.7	8.9	8.7	8.7	9.5	10.2	8.3	9.6
Wool (greasy)	[6]0.2	[2]0.2	0.2	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.4
Eggs [4]	[6]12.2	[2]12.1	18.7	27.1	23.0	25.6	27.5	29.3	30.1	28.5	26.7	29.0
NORTH AMERICA												
Wheat	26.65	44.51	40.86	46.13	50.50	42.63	51.05	41.32	45.16	50.77	51.47	54.56
Barley	6.26	10.09	13.16	13.45	15.57	13.89	13.60	11.07	13.12	13.64	12.41	13.64
Oats	18.99	25.19	24.74	22.13	25.68	20.58	22.91	19.06	22.42	21.20	18.28	20.32
Maize	53.20	74.70	74.76	93.99	86.01	97.93	99.93	92.83	93.22	104.85	92.38	107.48
Sorghum	1.24	3.90	6.94	13.95	14.76	14.10	15.75	12.19	12.95	14.93	12.49	16.92
Rice (milled equivalent) [8]	0.62	1.25	1.56	1.61	1.32	1.58	1.61	1.60	1.95	2.07	2.16	2.27
Sugar (centrifugal)	2.76	2.96	3.36	3.91	3.57	3.67	3.93	4.10	4.27	5.11	5.28	4.87

ANNEX TABLE 3B. – REGIONAL PRODUCTION OF MAJOR AGRICULTURAL COMMODITIES (*continued*)

	Prewar Average	Average 1948-52	Average 1953-57	Average 1958-62	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Million metric tons											
Potatoes	11.94	12.49	12.41	13.98	13.92	12.78	13.63	15.34	14.23	14.42	13.04	15.16
Apples	2.91	2.71	2.63	3.02	3.13	3.08	2.67	3.09	3.15	3.21	3.44	3.41
Citrus fruit	3.62	6.41	7.24	7.02	7.35	7.20	6.85	7.80	5.88	5.67	6.94	7.85
Soybeans	1.17	7.40	10.58	16.60	15.97	14.69	15.25	18.68	18.39	19.17	19.29	23.18
Cottonseed	4.93	5.28	5.17	5.22	4.35	5.44	5.34	5.42	5.57	5.62	5.65	5.55
Total vegetable oils and oilseeds (oil equivalent)	1.19	2.70	3.22	4.19	4.07	3.78	4.07	4.48	4.53	4.75	4.78	5.65
Tobacco	0.62	1.02	1.01	0.98	0.88	0.89	0.98	1.03	1.14	1.15	1.08	0.92
Cotton (lint)	2.81	3.11	3.01	3.03	2.51	3.17	3.11	3.12	3.24	3.34	3.31	3.26
Milk (total)	54.44	59.55	63.44	64.39	63.98	63.39	63.83	65.23	65.51	65.08	65.82	65.26
Meat [1]	9.34	13.22	15.99	17.95	16.61	17.63	17.97	18.74	18.80	19.74	20.95	20.77
Eggs	2.42	3.93	4.11	4.13	4.16	4.24	4.09	4.07	4.10	4.05	4.11	4.11
OCEANIA												
Wheat	4.38	5.30	4.42	6.98	6.02	5.64	7.70	6.94	8.60	9.20	10.28	7.06
Sugar (centrifugal)	0.94	1.04	1.44	1.69	1.64	1.60	1.55	1.55	2.13	2.06	2.30	2.35
Wool (greasy)	0.59	0.69	0.84	1.01	0.97	1.02	1.00	1.04	1.04	1.09	1.10	1.03
Milk (total)	10.17	10.24	11.22	11.79	11.37	11.83	11.94	11.66	12.16	12.35	12.71	13.08
Meat [1]	1.44	1.65	1.92	2.29	2.26	2.22	2.13	2.32	2.51	2.56	2.62	2.55
LATIN AMERICA												
Wheat	8.62	7.98	10.46	9.26	10.60	9.47	7.86	8.96	9.41	13.05	15.21	10.29
Maize	18.00	15.02	18.88	23.68	21.93	22.37	23.59	25.19	25.35	25.63	31.00	32.60
Rice (milled equivalent) [8]	1.33	3.06	3.81	5.06	4.19	4.84	5.28	5.41	5.56	5.94	5.46	5.64
Sugar (centrifugal)	6.89	12.52	13.78	16.67	16.73	17.15	18.05	16.11	15.29	16.44	18.82	19.62
Citrus fruit	3.28	3.76	4.26	5.20	4.76	4.77	5.22	5.24	6.05	5.78	5.71	5.70
Bananas	4.20	8.38	10.42	12.89	11.91	12.73	13.20	13.21	13.40	14.60	16.12	16.20
Groundnuts	0.16	0.37	0.59	1.00	0.78	0.81	1.05	1.27	1.11	1.01	1.32	1.43
Cottonseed	1.24	1.57	2.09	2.65	2.38	2.19	2.61	2.81	3.27	3.11	3.30	3.30
Sunflowerseed	0.16	0.93	0.69	0.74	0.49	0.93	0.68	0.97	0.62	0.57	0.82	0.89
Copra	0.06	0.09	0.17	0.24	0.23	0.23	0.24	0.25	0.25	0.28	0.28	0.29
Palm kernels	—	0.10	0.12	0.16	0.15	0.14	0.16	0.18	0.20	0.21	0.22	0.22
Total vegetable oils and oilseeds (oil equivalent)	1.03	1.11	1.25	1.73	1.45	1.63	1.66	1.96	1.93	1.88	2.17	2.12
Coffee	2.11	1.77	1.97	3.14	2.69	3.78	2.92	3.39	2.94	2.62	1.87	3.36
Cocoa	0.24	0.26	0.30	0.31	0.32	0.36	0.28	0.28	0.30	0.29	0.31	0.33
Tobacco	0.21	0.31	0.37	0.43	0.40	0.41	0.44	0.45	0.48	0.50	0.52	0.50
Cotton (lint)	0.59	0.86	1.16	1.46	1.30	1.21	1.45	1.55	1.78	1.73	1.83	1.83
Sisal	0.01	0.08	0.12	0.19	0.16	0.19	0.20	0.20	0.21	0.23	0.26	0.26
Wool (greasy)	0.27	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.33	0.36	0.36	0.35
Milk	12.22	14.48	18.41	21.86	20.54	21.61	22.53	22.16	22.45	23.04	23.90	24.12
Meat [1]	5.27	6.27	6.86	7.50	7.81	7.18	7.09	7.55	7.91	8.03	7.70	7.71
Eggs	0.48	0.58	0.78	0.96	0.93	0.90	0.95	1.03	0.98	0.98	1.04	1.06
FAR EAST [9]												
Wheat	12.13	11.50	13.64	16.27	13.32	15.86	16.46	17.18	18.52	16.41	16.04	18.70
Maize	6.11	6.56	8.37	11.60	10.13	10.59	11.06	12.45	13.77	12.83	14.71	15.45
Millet and sorghum	14.94	13.32	16.83	17.82	18.23	17.28	18.00	17.03	18.55	18.16	19.51	16.90
Rice (milled equivalent) [8]	60.61	63.47	73.77	88.37	82.13	86.37	90.95	91.84	90.58	97.19	99.11	94.02
Sugar (centrifugal)	4.18	3.16	4.90	6.28	5.74	6.25	6.79	6.48	6.14	6.84	7.92	8.30
Sugar (noncentrifugal)	3.67	4.03	4.72	5.83	5.92	5.57	5.95	5.58	6.15	7.53	8.13	8.13
Pulses [10]	6.78	7.11	8.76	10.31	8.69	11.41	10.06	10.87	10.50	10.18	8.89	10.35
Soybeans	1.12	1.02	1.22	1.28	1.27	1.30	1.31	1.30	1.22	1.15	1.14	1.14
Groundnuts	3.77	3.80	4.97	5.95	6.24	5.66	5.71	5.94	6.19	6.40	7.44	6.44
Copra	1.90	2.23	2.61	2.48	2.33	2.13	2.75	2.73	2.46	2.65	2.67	2.73
Total vegetable oils and oilseeds (oil equivalent)	3.96	4.06	5.00	5.35	5.31	4.88	5.47	5.55	5.56	5.53	6.08	5.83
Tea	0.46	0.53	0.65	0.74	0.71	0.72	0.72	0.78	0.77	0.78	0.82	0.83
Tobacco	0.79	0.60	0.78	0.85	0.77	0.87	0.84	0.84	0.95	0.99	1.02	1.00
Cotton (lint)	1.22	0.90	1.24	1.29	1.24	1.07	1.36	1.27	1.49	1.61	1.50	1.41
Jute [11]	1.94	2.02	1.97	2.49	2.48	2.14	2.03	3.14	2.65	2.81	2.67	2.63

ANNEX TABLE 3B. – REGIONAL PRODUCTION OF MAJOR AGRICULTURAL COMMODITIES (*concluded*)

	Prewar Average	Average 1948-52	Average 1953-57	Average 1958-62	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66 (Preliminary)
	Million metric tons											
Rubber (natural)	0.97	1.65	1.75	1.90	1.82	1.90	1.84	1.95	1.98	1.93	2.07	2.10
Milk (total)	23.23	25.23	27.61	29.93	28.64	29.73	30.04	30.45	30.79	32.99	33.29	33.29
Meat [1]	1.87	2.02	2.49	2.91	2.78	2.88	2.86	2.93	3.10	3.10	3.16	3.23
Eggs	0.44	0.42	0.73	1.01	0.83	0.88	0.95	1.14	1.25	1.30	1.45	1.55
NEAR EAST												
Wheat	9.50	10.95	15.30	16.63	16.69	16.27	16.40	15.72	18.06	18.69	17.38	17.71
Barley	4.24	4.77	6.34	6.37	6.47	6.01	6.13	6.02	7.23	7.71	6.37	6.78
Maize	2.40	2.58	3.13	3.47	3.44	3.32	3.58	3.41	3.59	3.47	3.75	3.75
Rice (milled) [6]	1.09	1.35	1.50	1.74	1.40	1.72	1.83	1.52	2.24	2.44	2.33	2.61
Sugar (centrifugal)	0.22	0.42	0.66	1.02	0.85	1.02	1.20	1.00	1.02	1.15	1.52	1.33
Pulses [10]	0.70	0.78	0.86	0.90	0.89	0.91	0.90	0.76	1.02	0.92	1.09	1.05
Citrus fruit	0.79	0.86	1.21	1.55	1.52	1.49	1.43	1.47	1.83	2.15	2.18	2.09
Dates	0.87	0.86	1.07	1.28	1.36	1.00	1.15	1.41	1.49	1.43	1.33	1.35
Olive oil	0.06	0.08	0.10	0.12	0.13	0.08	0.11	0.18	0.09	0.16	0.19	0.11
Cottonseed	1.09	1.22	1.44	1.93	1.77	1.82	1.91	1.99	2.16	2.13	2.40	2.40
Total vegetable oils and oilseeds (oil equivalent)	0.32	0.41	0.53	0.67	0.63	0.64	0.65	0.75	0.67	0.76	0.87	0.79
Tobacco	0.09	0.12	0.15	0.15	0.14	0.16	0.17	0.14	0.11	0.16	0.22	0.17
Cotton (lint)	0.56	0.66	0.76	1.03	0.95	0.99	1.02	1.05	1.16	1.12	1.34	1.40
Wool (greasy)	0.07	0.08	0.10	0.12	0.11	0.12	0.12	0.12	0.12	0.12	0.13	0.13
Milk (total)	2.70	10.52	10.96	12.57	12.38	12.81	12.67	12.49	12.52	12.59	12.70	12.72
Meat [1]	1.13	0.90	1.16	1.40	1.29	1.32	1.44	1.47	1.49	1.55	1.55	1.58
AFRICA												
Wheat	2.66	3.17	4.03	3.79	3.97	3.80	4.08	2.79	4.33	4.58	4.65	4.44
Barley	2.60	3.19	3.31	2.73	3.39	2.77	3.02	1.53	2.92	3.45	2.64	2.97
Maize	4.62	7.67	9.80	12.82	11.01	11.64	13.79	13.48	14.20	12.83	12.90	12.00
Millet and sorghum	2.31	2.51	3.23	3.90	3.63	3.62	4.05	3.83	4.34	4.62	5.04	4.95
Rice (milled equivalent) [8]	1.11	1.62	1.87	2.09	2.00	2.02	2.17	1.96	2.31	2.33	2.40	2.35
Sugar (centrifugal)	0.95	1.37	1.88	2.36	2.23	2.34	2.03	2.53	2.67	3.01	2.95	2.95
Pulses [10]	1.02	1.44	1.55	1.46	1.41	1.55	1.51	1.38	1.47	1.57	1.64	1.66
Citrus fruit	0.38	0.79	1.12	1.50	1.30	1.42	1.56	1.57	1.66	1.80	1.85	1.84
Bananas	0.30	0.66	0.89	0.95	0.91	0.95	0.95	0.94	1.01	1.06	1.10	1.10
Olive oil	0.07	0.08	0.11	0.12	0.18	0.08	0.19	0.08	0.09	0.15	0.15	0.11
Groundnuts	1.86	2.39	3.17	3.75	3.39	3.23	3.78	3.95	4.38	4.35	4.25	4.34
Total vegetable oils and oilseeds (oil equivalent)	1.73	2.14	2.55	2.77	2.77	2.59	2.86	2.76	2.85	2.98	2.94	2.90
Coffee	0.14	0.28	0.45	0.76	0.62	0.66	0.80	0.75	0.95	1.05	1.04	1.05
Cocoa	0.49	0.50	0.51	0.76	0.57	0.66	0.87	0.83	0.85	0.90	1.19	0.89
Wine	2.14	1.72	2.30	2.22	2.03	2.61	2.26	2.25	1.95	2.06	1.79	1.80
Tobacco	0.06	0.14	0.16	0.20	0.20	0.20	0.21	0.20	0.19	0.25	0.26	0.26
Cotton (lint)	0.14	0.22	0.28	0.30	0.31	0.32	0.33	0.23	0.31	0.33	0.34	0.36
Sisal	0.16	0.23	0.30	0.37	0.35	0.37	0.38	0.37	0.40	0.41	0.42	0.40
Rubber (natural)	0.01	0.06	0.10	0.14	0.13	0.14	0.15	0.14	0.15	0.15	0.16	0.15
Wool (greasy)	0.15	0.13	0.17	0.17	0.17	0.18	0.17	0.18	0.17	0.17	0.17	0.18
Milk (total)	6.82	9.98	11.01	11.96	11.54	11.68	12.02	12.17	12.37	12.48	12.64	12.64
Meat [1]	1.21	1.83	2.02	2.29	2.16	2.19	2.24	2.42	2.43	2.43	2.44	2.46
Eggs	0.14	0.22	0.24	0.28	0.26	0.27	0.28	0.29	0.29	0.29	0.29	0.29

[1] Beef and veal, mutton and lamb, pork, poultry meat. – [2] 1949-52. – [3] Slaughtered weight. – [4] Thousand million units. – [5] Average 1955-57. – [6] 1940. – [7] 1953. – [8] Paddy converted at 65 percent. – [9] Excluding China (Mainland). – [10] Dry beans, dry peas, broad beans, chick-peas, lentils. – [11] Including allied fibers.

ANNEX TABLE 4. – TOTAL CATCH (LIVEWEIGHT) OF FISH, CRUSTACEANS, AND MOLLUSKS IN SELECTED COUNTRIES [1]

	1938	1948	19.6	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	1963
	Thousand metric tons												%
WORLD TOTAL	20 900.0	19 500.0	30 400.0	31 400.0	32 800.0	36 300.0	39 500.0	42 900.0	46 300.0	47 400.0	51 600.0	52 900	100.0
A. *1963 catch: 1 000 000 tons and more*	*11 980.0*	*11 210.0*	*18 950.0*	*19 670.0*	*20 870.0*	*23 800.0*	*26 900.0*	*29 480.0*	*31 780.0*	*32 050.0*	*34 970.0*	*35 500*	*67.6*
Peru	23.4	84.1	322.3	511.0	961.2	2 186.6	3 569.1	5 284.3	6 956.9	6 900.3	9 130.7	...	14.6
Japan	3 677.7	2 518.5	4 772.8	5 407.3	5 504.7	5 884.1	6 192.7	6 710.5	6 866.9	6 694.7	6 334.7	...	14.1
China (Mainland)	...	...	2 648.0	3 120.0	4 060.0	5 020.0	5 800.0	...	...	...	...	...	...
U.S.S.R.	1 523.0	1 485.0	2 616.0	2 531.0	2 621.0	2 756.0	3 051.0	3 250.0	3 616.5	3 977.2	4 475.8	...	8.4
United States	2 260.1	2 416.6	2 989.4	2 759.8	2 708.6	2 890.8	2 814.7	2 931.9	2 972.8	2 776.6	2 647.1	2 701.1	5.9
Norway	1 127.8	1 422.2	2 187.3	1 745.8	1 442.3	1 575.2	1 543.0	1 523.0	1 331.7	1 387.9	1 608.1	2 280.1	2.9
Canada	836.8	1 052.9	1 105.5	997.1	1 007.6	1 094.4	934.5	1 019.6	1 123.5	1 197.4	1 211.1	1 258.7	2.5
South Africa and South West Africa	68.0	187.8	536.4	583.6	655.7	747.6	867.6	1 010.8	1 061.1	1 170.8	1 254.5	...	2.5
Spain	408.5	547.2	761.6	777.2	844.9	859.1	969.9	988.0	1 107.5	1 125.3	1 203.5	1 338.5	2.3
India	...	...	1 012.3	1 233.0	1 064.6	823.2	1 161.4	961.0	973.7	1 046.3	1 320.0	...	2.2
B. *1963 catch: 500 000 tons and more but less than 1 000 000 tons*	*3 940.0*	*3 970.0*	*5 370.0*	*5 370.0*	*5 450.0*	*5 770.0*	*5 650.0*	*6 040.0*	*6 690.0*	*6 920.0*	*7 700.0*	*8 000.0*	14.7
Denmark and Faeroe Islands	160.1	318.6	579.3	638.9	704.7	760.9	690.6	757.6	928.6	984.9	1.010.2	...	2.1
United Kingdom	1 198.1	1 206.1	1 050.4	1 014.7	999.0	988.9	923.8	892.6	944.3	960.9	974.3	1 046.8	2.0
Indonesia	472.0	...	713.9	728.0	687.0	754.1	956.7	906.8	943.0	936.2	...	..	2.0
Iceland	327.2	478.1	517.3	502.7	580.4	640.8	592.8	710.0	832.6	784.5	972.7	1 198.3	1.7
Chile	32.2	64.6	188.3	213.1	225.8	272.6	339.6	429.8	638.6	761.9	1 160.9	708.5	1.6
France	643.6	512.8	623.7	595.9	611.8	703.1	734.2	750.9	744.3	742.3	780.4	...	1.6
Germany, Fed. Rep. of	777.2	414.0	800.6	791.7	725.4	768.0	674.0	619.0	632.7	647.2	624.3	630.7	1.4
Philippines	80.9	195.1	416.0	407.5	447.3	457.6	465.8	476.1	505.3	565.6	623.5	685.7	1.2
Portugal	247.2	292.1	482.6	479.5	466.0	427.8	475.1	500.0	525.6	539.7	603.7	...	1.1
C. *1963 catch: 100 000 tons and more but less than 500 000 tons*	*4 080.0*	*3 230.0*	*4 470.0*	*4 570.0*	*4 560.0*	*4 720.0*	*4 880.0*	*5 290.0*	*5 550.0*	*6 150.0*	*6 820.0*	...	*13.0*
Korea, Rep. of	844.2	293.8	346.6	409.3	403.3	392.1	357.2	424.5	468.5	465.7	524.0	...	1.0
Thailand	161.0	161.0	217.9	234.5	196.3	204.7	220.9	305.6	339.7	418.7	577.0	...	0.9
Brazil	103.3	144.8	208.0	212.2	211.9	239.1	251.0	275.1	379.4	411.1	...	...	...
Viet-Nam, Rep. of	180.0	...	130.0	135.0	143.0	153.5	240.0	250.0	255.0	378.6	397.0	375.0	0.8
Netherlands	256.2	294.1	298.1	300.8	313.8	319.6	314.7	346.1	321.9	361.0	387.8	377.0	0.8
Burma	...	...	360.0	360.0	360.0	360.0	360.0	360.0	360.0	360.0	360.0	360.0	0.8
China (Taiwan)	89.5	83.5	193.2	208.0	229.7	246.3	259.1	312.2	327.0	350.7	376.7	381.7	0.7
Pakistan	...	...	277.0	282.8	283.7	290.1	304.5	319.1	330.5	345.0	360.6	379.0	0.7
Sweden	129.2	193.9	197.4	222.1	238.0	268.0	254.7	267.3	292.6	339.8	372.1	364.6	0.7
Korea, North	925.2	...	...	291.5	...	...	...	...	...	...	...	...	...
Mexico	17.1	68.4	144.8	117.5	163.9	192.4	197.9	225.4	218.6	244.3	258.4	...	0.5
Malaysia	...	144.9	139.1	138.9	139.9	146.5	169.4	181.2	201.0	230.8	241.1	253.4	0.5
Angola	26.2	113.2	420.5	395.5	278.2	267.4	252.0	241.5	269.3	239.7	355.8	256.6	0.5
Italy	181.2	...	...	...	...	...	...	279.0	256.0	271.0	295.5	317.3	0.5
Poland	32.5	47.1	139.3	138.8	145.1	162.2	183.9	185.5	179.6	226.7	264.3	297.5	0.5
Germany, Eastern	...	...	74.9	96.5	93.2	105.6	114.4	130.1	150.1	189.4	224.9	...	0.4
Morocco	43.7	68.6	112.4	151.5	172.7	151.5	162.9	178.4	171.4	184.1	199.6	214.9	0.4
Cambodia	...	...	150.0	...	...	...	...	148.3	145.8	157.5	164.6	165.8	0.3
Turkey	76.0	...	139.5	116.7	101.3	96.7	89.4	82.3	60.6	130.7	121.7	...	0.3
Argentina	55.3	71.2	76.6	82.5	84.2	89.9	104.6	101.9	101.4	130.3	168.2	205.2	0.3
Greece	25.0	33.6	65.0	75.0	80.0	82.0	87.0	110.0	110.0	115.0	117.0	124.0	0.2
Senegal	...	...	...	75.5	85.9	99.8	122.1	126.9	133.4	118.2	127.4	...	0.2
United Arab Republic	38.1	42.8	70.3	75.2	80.0	85.6	88.5	92.0	118.0	104.2	...	...	0.2

ANNEX TABLE 4. – TOTAL CATCH (LIVEWEIGHT) OF FISH, CRUSTACEANS, AND MOLLUSKS IN SELECTED COUNTRIES [1] *(concluded)*

	1938	1948	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)	1963
	Thousand metric tons												%
D. *1963 catch: less than 100 000 tons*	*900.0*	*1 090.0*	*1 610.0*	*1 790.0*	*1 920.0*	*2 010.0*	*2 070.0*	*2 090.0*	*2 280.0*	*2 280.0*	*2 110.0*	...	4.7
176 countries – 53 specified and 123 unspecified ..	950.0	1 090.0	1 610.0	1 790.0	1 920.0	2 010.0	2 070.0	2 090.0	2 280.0	2 280.0	2 110.0	...	4.7
D1. *1963 catch: 50 000 tons and more but less than 500 000 tons*													
Venezuela	21.7	92.3	61.3	83.7	78.3	83.3	84.7	84.9	94.9	97.3	110.6	...	0.2
Ceylon	...	24.0	40.3	38.5	40.7	48.3	57.8	74.0	83.9	92.6	101.6	94.3	0.2
Finland	44.4	46.1	60.2	64.1	61.4	65.9	64.4	73.3	68.5	83.6	63.1	73.5	0.2
Chad	...	...	...	...	...	...	65.0	...	80.0	80.0	...	100.0	0.2
Hong Kong	...	34.3	57.2	67.2	69.5	67.0	62.3	63.6	70.8	75.1	76.3	81.8	0.2
Tanzania	23.5	29.7	63.8	63.8	63.8	68.8	69.1	70.7	70.8	85.3	...	...	0.2
Australia	33.5	38.9	49.9	55.3	54.3	58.8	61.0	62.4	67.2	70.8	76.6	79.4	0.1
Uganda	...	11.0	45.7	51.3	53.4	55.6	62.6	61.2	64.5	69.6	70.6	72.7	0.1
Ghana	...	...	26.3	28.4	30.9	36.0	31.8	40.3	48.7	62.8	79.1	...	0.1
Belgium	42.5	70.8	69.1	62.9	64.0	57.5	63.7	61.6	59.9	61.9	59.4	59.8	0.1
Congo, Dem. Rep. of	0.9	17.5	96.2	122.4	136.6	153.4	...	68.0	70.0	60.0	...	...	0.1
Nigeria	...	...	...	...	...	...	58.5	48.5	59.0	59.0	59.0	...	0.1
Cameroon	18.0	22.0	43.5	53.6	57.8	...	48.8	53.7	55.3	56.6	57.0	58.5	0.1
South Arabia, Fed. of	...	20.0	21.8	22.6	21.5	24.4	22.3	47.4	53.8	55.3	52.0	52.0	0.1
D2. *1963 catch: 5 000 tons and more but less than 50 000*													
Ecuador	1.8	3.4	21.8	26.4	31.1	35.9	44.3	38.6	42.6	50.3	46.3	53.5	0.1
Colombia	10.0	15.0	21.2	30.1	25.0	21.1	29.7	47.5	51.7	47.4	53.3	...	0.1
Ivory Coast	...	...	24.0	30.0	40.0	40.0	44.0	41.5	43.0	45.0	53.0	...	0.1
New Zealand	27.0	35.7	38.4	39.0	39.3	41.5	44.3	43.1	41.3	40.8	44.2	...	0.1
Cuba	10.0	8.3	15.6	22.0	21.9	28.2	31.2	30.5	35.0	35.6	36.3	40.3	0.1
Yugoslavia	16.8	21.2	28.4	30.7	31.4	29.4	30.9	37.3	30.3	34.4	38.3	41·9	0.1
Greenland	4.7	21.0	25.8	30.8	32.0	33.2	34.6	41.8	43.3	33.3	38.3	40.6	0.1
Madagascar	...	...	...	...	25.5	27.0	28.0	29.0	30.5	35.9	44.9	...	...
Zambia	...	...	18.4	26.2	26.9	20.9	19.5	20.4	22.2	40.1	42.3	40.1	0.1
Ireland	12.6	25.3	30.5	36.6	36.5	38.6	42.8	32.1	29.0	27.6	31.9	35.7	0.1
Dahomey	...	...	23.0	23.0	23.0	28.0	28.0	28.0	30.0	25.0	26.0	20.0	0.1
Iran	...	...	...	...	...	...	...	...	...	...	...	...	...
Sierra Leone	...	...	...	...	14.7	16.2	17.4	18.8	21.0	21.4	21.5	21.6	—
Tunisia	9.6	12.2	11.9	14.0	15.2	14.8	16.3	22.4	19.0	21.3	...	...	—
Hungary	7.0	4.0	10.9	12.3	13.0	14.4	14.9	19.3	21.0	21.0	22.7	...	—
Kenya	...	...	32.6	25.5	22.0	22.6	12.6	13.5	18.4	20.1	20.7	23.4	—
Sudan	8.8	11.4	13.5	9.9	19.2	16.2	16.5	17.3	18.6	...	...	...	...
Mali	...	...	19.0	19.0	16.0	20.0	28.0	19.4	18.5	...	...	...	...
Israel	1.7	2.5	10.3	11.6	12.6	13.2	13.8	14.9	16.4	17.5	18.7	19.5	—
Ryukyu Islands	12.0	7.7	13.7	13.1	16.6	21.4	14.4	16.0	17.8	17.4	21.7	24.0	—
Somalia	...	...	17.1	...	...	...	...	...	...	...	...	...	...
Algeria	21.2	30.0	22.3	22.2	18.8	22.5	25.6	30.7	14.4	16.9	17.3	...	—
Jamaica	4.5	...	6.5	7.1	7.8	8.3	8.5	11.5	11.9	13.9	16.0	16.6	—
Malawi	...	...	...	...	...	...	...	6.3	11.5	13.7	13.2	18.9	—
Panama	0.7	0.7	4.5	6.5	6.8	14.8	10.9	11.4	14.4	13.4	25.7	39.3	—
American Samoa	...	...	6.1	7.6	13.3	12.7	12.6	...	...	...	...	...	...
Congo (Brazzaville)	...	...	...	...	...	...	...	8.6	11.6	11.5	12.6	...	—
Iraq	3.5	4.0	8.5	...	...	...	...	...	9.0	11.3	19.2	12.5	—
Burundi	...	2.3	5.4	9.7	11.5	11.0	9.2	5.3	7.2	10.6	9.7	13.3	—
Czechoslovakia	3.0	3.5	...	...	8.1	8.6	8.8	9.9	10.1	9.7	10.6	11.0	—
Guyana	...	...	3.4	3.1	3.5	3.0	5.7	7.4	7.9	9.2	10.4	12.0	—
Niger	...	...	...	...	...	...	3.4	4.2	6.0	9.0	6.3	...	—
Ethiopia	...	...	11.0	13.5	27.9	34.7	19.1	17.2	14.0	8.9	...	...	—
Macau	...	7.2	6.6	8.0	6.0	6.6	5.8	7.3	7.8	8.7	9.5	...	—
St. Pierre and Miquelon	1.9	2.2	9.3	7.9	8.3	9.4	10.3	13.6	8.1	8.2	8.6	10.0	—
Trinidad and Tobago	2.7	...	3.6	2.9	4.2	7.2	7.2	7.7	7.5	7.9	...	...	—
Bulgaria	5.6	6.4	5.7	5.1	6.1	6.1	8.7	8.1	9.6	7.5	13.2	19.8	—
El Salvador	...	...	...	...	2.5	2.7	5.2	5.7	6.0	6.3	6.9	8.5	—

[1] Countries arranged in order of 1963 catch.

ANNEX TABLE 5. – WORLD [1] AND REGIONAL PRODUCTION OF MAJOR FOREST PRODUCTS

	Unit	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
		Million units											
WORLD [1]													
Fuelwood	m³	779	779	776	791	784	790	772	779	784	793	801	810
Industrial roundwood	"	855	905	927	915	913	972	989	976	997	1 003	1 045	1 062
Sawn softwood	"	218.9	234.0	235.8	231.7	241.8	259.2	258.5	256.8	259.3	266.6	280.8	282.0
Sawn hardwood	"	57.3	61.3	64.1	59.5	62.0	65.1	67.1	68.2	69.6	72.5	75.4	76.3
Plywood	"	8.9	10.8	11.3	11.8	13.0	14.8	15.4	16.5	18.3	20.2	22.3	23.9
Fibreboard	t	2.8	3.2	3.3	3.4	3.7	4.1	4.3	4.6	4.9	5.3	5.7	5.9
Mechanical woodpulp	"	14.3	15.3	16.1	16.2	15.9	17.1	18.0	18.4	18.9	19.5	20.8	21.6
Chemical woodpulp	"	27.8	30.9	33.1	33.7	33.7	37.4	40.5	43.5	45.4	49.4	53.2	56.2
Newsprint	"	10.3	11.0	11.9	12.1	11.9	12.8	13.7	14.1	14.3	14.6	15.8	16.4
Other paper and paperboard	"	40.5	44.9	47.2	48.2	49.2	54.0	57.5	61.0	63.9	68.3	73.1	77.0
EUROPE													
Fuelwood	m³	102.9	101.4	101.5	109.5	105.1	105.3	101.9	101.1	97.3	95.9	94.8	91.0
Coniferous logs	"	87.5	93.4	87.3	83.5	87.7	83.6	93.0	94.4	93.4	88.5	94.5	94.0
Broadleaved logs	"	21.7	23.9	24.4	25.1	26.8	26.4	27.6	29.7	30.5	31.1	32.9	34.0
Other industrial roundwood	"	80.7	86.3	89.2	92.9	87.8	87.5	94.5	101.3	104.1	98.9	105.6	107.0
Sawn softwood	"	52.3	54.4	52.7	52.4	52.6	51.4	55.7	56.0	55.3	53.9	56.5	56.6
Sawn hardwood	"	10.1	10.9	11.2	11.8	12.1	12.2	13.0	13.9	14.1	14.4	15.1	15.3
Plywood	"	1.9	2.0	1.9	2.1	2.2	2.3	2.7	2.7	2.9	3.2	3.3	3.4
Fibreboard	t	1.07	1.21	1.29	1.41	1.48	1.55	1.79	1.90	2.05	2.20	2.45	2.53
Particle board	"	0.15	0.26	0.37	0.48	0.58	0.84	1.20	1.49	1.83	2.29	2.71	3.20
Mechanical woodpulp	"	4.43	4.71	4.99	5.13	5.12	5.47	6.02	6.25	6.27	6.46	6.84	7.10
Chemical woodpulp	"	7.72	8.37	8.67	9.20	9.11	9.83	11.06	11.85	12.08	13.15	14.51	15.00
Newsprint	"	2.86	3.11	3.43	3.52	3.52	3.81	4.22	4.36	4.32	4.38	4.73	4.95
Printing and writing paper	"	3.39	3.59	3.68	3.93	4.08	4.30	4.87	5.28	5.37	5.84	6.32	6.75
Other paper and paperboard	"	8.72	9.60	10.00	10.79	11.11	11.97	13.39	14.08	14.64	15.84	16.84	17.70
U.S.S.R.													
Fuelwood	m³	123.1	121.8	120.2	123.6	124.1	127.7	108.0	97.7	97.0	102.3	108.4	108.0
Industrial roundwood	"	205.8	212.1	222.1	237.8	250.9	270.1	261.5	253.3	255.7	267.3	276.9	275.0
Sawn softwood	"	58.7	64.3	65.1	69.4	79.6	88.4	89.8	88.7	88.8	90.4	94.3	94.0
Sawn hardwood	"	10.4	11.3	11.5	12.2	14.1	15.6	15.8	15.6	15.7	16.0	16.6	16.6
Plywood	"	1.0	1.0	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.5	1.7	1.9
Fibreboard	t	0.05	0.05	0.07	0.09	0.11	0.17	0.21	0.28	0.31	0.35	0.38	0.42
Particle board	"	...	...	...	...	0.02	0.05	0.10	0.17	0.22	0.28	0.39	0.50
Mechanical woodpulp	"	0.66	0.72	0.77	0.81	0.83	0.87	0.93	1.03	1.12	1.15	1.23	1.30
Chemical woodpulp	"	1.68	1.74	1.85	1.97	2.09	2.19	2.28	2.42	2.60	2.76	2.97	3.20
Newsprint	"	0.32	0.36	0.36	0.38	0.39	0.40	0.43	0.49	0.54	0.56	0.63	0.70
Other paper and paperboard	"	1.95	2.05	2.22	2.41	2.57	2.69	2.79	2.95	3.13	3.29	3.49	3.70
NORTH AMERICA													
Fuelwood	m³	62.6	61.9	59.8	58.3	55.8	54.0	49.4	48.3	39.4	36.9	34.5	34.0
Coniferous logs	"	178.8	190.0	185.8	169.6	166.0	193.8	188.5	176.6	193.5	193.4	204.7	210.0
Broadleaved logs	"	42.7	42.4	40.7	38.7	37.9	36.7	34.8	33.4	35.7	35.7	32.2	35.0
Other industrial roundwood	"	107.8	119.8	132.8	123.9	111.9	123.6	132.7	125.0	124.3	123.0	126.7	131.0
Sawn softwood	"	86.1	90.3	90.4	80.4	80.8	89.1	80.9	79.7	82.5	87.8	91.6	93.0
Sawn hardwood	"	17.8	18.8	19.9	14.8	15.1	16.7	15.8	15.1	15.8	17.0	15.1	15.4
Plywood	"	5.0	6.5	6.7	6.7	7.6	8.8	8.9	9.7	10.7	11.9	13.1	13.9
Fibreboard	t	1.50	1.67	1.72	1.63	1.71	1.97	1.81	1.87	1.97	2.16	2.25	2.30
Mechanical woodpulp	"	8.32	8.87	9.20	8.98	8.70	9.36	9.58	9.50	9.87	10.12	10.95	11.30
Chemical woodpulp	"	17.02	19.16	20.62	20.25	20.27	22.53	23.79	25.13	26.46	28.53	30.30	32.10
Newsprint	"	6.51	6.92	7.32	7.41	7.04	7.51	7.89	7.96	7.95	7.96	8.57	8.85
Printing and writing paper	"	4.66	5.16	5.64	5.35	5.38	6.03	6.24	6.39	6.70	7.14	7.65	8.15
Other paper and paperboard	"	18.65	20.88	21.55	21.00	21.15	23.14	23.44	24.34	25.76	26.78	28.22	29.70

ANNEX TABLE 5. – WORLD [1] AND REGIONAL PRODUCTION OF MAJOR FOREST PRODUCTS (*concluded*)

	Unit	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
		Million units											
OCEANIA													
Fuelwood	m^3	9.1	8.8	8.9	9.0	9.1	9.1	9.2	9.2	9.2	9.2	9.2	9.0
Coniferous logs	"	4.1	4.3	4.1	4.2	4.7	5.0	5.6	5.4	5.2	5.4	6.0	6.0
Broadleaved logs	"	7.2	7.6	7.5	7.3	7.1	7.3	7.6	7.7	7.1	7.5	8.4	9.0
Other industrial roundwood	"	1.8	2.2	2.7	2.4	2.7	2.5	2.7	2.9	2.9	3.3	3.4	4.0
Sawn softwood	"	2.0	2.0	2.1	2.1	2.1	2.3	2.3	2.2	2.1	2.2	2.4	2.5
Sawn hardwood	"	2.7	2.8	2.5	2.4	2.6	2.7	2.7	2.6	2.4	2.5	2.6	2.7
Mechanical woodpulp	t	0.16	0.19	0.24	0.26	0.28	0.30	0.29	0.30	0.31	0.38	0.42	0.45
Chemical woodpulp	"	0.14	0.17	0.26	0.26	0.26	0.30	0.30	0.31	0.33	0.38	0.41	0.45
Newsprint	"	0.07	0.09	0.13	0.15	0.16	0.17	0.18	0.18	0.21	0.26	0.28	0.30
Other paper and paperboard	"	0.28	0.29	0.35	0.37	0.41	0.44	0.52	0.54	0.55	0.64	0.69	0.75
LATIN AMERICA													
Sawn softwood	m^3	5.2	5.3	5.1	4.6	5.3	5.2	4.9	5.1	5.3	4.8	5.4	5.4
Sawn hardwood	"	7.2	7.2	7.0	6.7	6.6	6.2	6.3	6.3	6.6	6.4	6.7	6.8
Plywood	"	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
Mechanical woodpulp	t	0.14	0.15	0.16	0.16	0.20	0.22	0.24	0.28	0.27	0.33	0.37	0.40
Chemical woodpulp	"	0.14	0.13	0.19	0.22	0.23	0.28	0.35	0.48	0.50	0.60	0.71	0.80
All paper and paperboard	"	0.93	1.04	1.18	1.23	1.39	1.49	1.57	1.80	1.88	1.97	2.21	2.45
FAR EAST [1]													
Industrial roundwood	m^3	59.8	63.1	67.6	69.3	67.9	72.1	76.7	83.2	78.9	84.4	85.1	85.0
Sawn softwood	"	13.6	16.4	19.3	21.6	20.4	21.6	23.4	23.6	23.3	25.4	28.3	28.0
Sawn hardwood	"	7.6	8.7	9.9	10.0	9.8	9.8	11.6	12.6	13.0	14.3	17.0	17.2
Plywood	"	0.7	0.8	1.1	1.2	1.4	1.8	1.8	2.0	2.4	2.8	3.3	3.8
Mechanical woodpulp	t	0.61	0.68	0.74	0.80	0.75	0.90	0.97	1.00	0.99	0.98	1.01	1.00
Chemical woodpulp	"	1.04	1.25	1.49	1.70	1.65	2.15	2.63	3.20	3.29	3.69	4.12	4.25
Newsprint	"	0.45	0.48	0.55	0.59	0.61	0.75	0.82	0.90	1.05	1.14	1.27	1.27
Other paper and paperboard	"	1.78	2.08	2.43	2.84	2.90	3.70	4.46	5.39	5.61	6.35	7.23	7.40
NEAR EAST													
Industrial roundwood	m^3	7.4	7.4	7.6	8.0	7.9	7.8	8.1	7.9	8.3	9.1	8.7	9.0
Sawn softwood	"	0.5	0.8	0.6	0.7	0.6	0.7	0.8	0.8	1.1	1.2	1.4	1.4
Sawn hardwood	"	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.4	0.4	0.5	0.5
AFRICA													
Fuelwood	m^3	151.4	153.1	158.0	159.0	159.4	163.4	168.5	173.9	178.0	180.6	181.3	184.0
Industrial roundwood	"	16.3	17.0	17.5	18.6	19.5	20.7	21.6	22.2	23.3	24.5	24.9	25.0
Sawn softwood	"	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.9	0.8	0.9	0.9	1.0
Sawn hardwood	"	1.3	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.7	1.7	1.7	1.8
Plywood	"	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
All paper and paperboard	t	0.17	0.20	0.24	0.25	0.27	0.29	0.32	0.35	0.41	0.59	0.60	0.65

[1] Excluding China (Mainland).

ANNEX TABLE 6. – STOCKS OF MAJOR AGRICULTURAL AND FOREST PRODUCTS

	Date	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966 (Forecast)
		Million metric tons														
WHEAT																
United States	1 July	7.0	16.5	25.4	28.2	28.1	24.7	24.0	35.2	35.8	38.4	36.0	32.5	24.5	22.3	15.5
Canada	1 Aug.	5.9	10.4	16.8	14.6	15.8	19.9	17.6	16.0	16.3	16.5	10.6	13.3	12.5	14.0	14.0
Argentina	1 Dec.	0.1	2.0	1.6	2.4	1.2	1.6	1.3	1.4	1.2	0.8	0.2	0.5	2.2	3.1	0.9
Australia	1 Dec.	0.5	1.0	2.6	2.6	2.4	1.1	0.5	1.8	1.6	0.7	0.5	0.6	0.5	0.5	0.5
TOTAL 4 MAJOR EXPORTERS		13.5	29.9	46.4	47.8	47.5	47.3	43.4	54.4	54.9	56.4	47.3	46.9	39.7	39.9	30.9
RICE (milled equivalent)																
Asian exporters [1]	31 Dec.	0.7	1.4	1.6	0.8	0.7	0.6	0.5	0.5	0.3	0.2	0.4	0.5	0.5	...	...
United States	31 July	0.1	—	0.2	0.8	1.1	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	...
TOTAL OF ABOVE		0.8	1.4	1.8	1.6	1.8	1.2	1.1	1.0	0.7	0.5	0.6	0.7	0.7	...	...
COARSE GRAINS [2]																
United States	1 July [3]	18.5	24.7	29.4	37.3	39.3	44.4	53.8	61.6	68.0	77.2	65.3	58.2	62.9	50.7	51.4
Canada	1 Aug.	3.6	5.1	5.6	3.7	4.3	6.6	5.2	5.1	4.7	4.5	2.8	4.4	5.7	4.2	5.0
TOTAL 2 MAJOR EXPORTERS		22.1	29.8	35.0	41.0	43.6	51.0	59.0	66.7	72.7	81.7	68.1	62.6	68.6	54.9	56.4
BUTTER																
United States		0.03	0.13	0.17	0.07	0.01	0.04	0.03	0.01	0.03	0.10	0.14	0.09	0.03	0.02	...
Canada		0.02	0.03	0.04	0.05	0.04	0.03	0.04	0.05	0.05	0.06	0.06	0.06	0.04	0.03	...
European countries [4]		0.04	0.06	0.05	0.04	0.10	0.12	0.08	0.06	0.12	0.14	0.13	0.12	0.15	0.21	...
Australia and New Zealand		0.05	0.05	0.06	0.06	0.05	0.06	0.06	0.05	0.07	0.07	0.06	0.06	0.07	0.07	...
TOTAL OF ABOVE	31 Dec.	0.14	0.27	0.32	0.22	0.20	0.25	0.21	0.17	0.27	0.37	0.39	0.33	0.29	0.33	...
CHEESE																
United States	31 Dec.	0.11	0.20	0.25	0.24	0.20	0.19	0.13	0.14	0.15	0.21	0.19	0.15	0.15	0.14	...
CONDENSED AND EVAPORATED MILK																
United States [5]	31 Dec.	0.18	0.12	0.10	0.10	0.11	0.10	0.09	0.10	0.10	0.10	0.07	0.06	0.08	...	...
DRIED SKIM MILK																
United States [6]	31 Dec.	0.08	0.23	0.06	0.04	0.04	0.05	0.06	0.04	0.14	0.14	0.28	0.17	0.08	...	...
LINSEED AND OIL (oil equivalent)																
United States	1 July	0.41	0.38	0.29	0.17	0.10	0.22	0.13	0.18	0.07	0.09	0.08	0.14	0.18	0.19	...
Argentina	1 Dec.	0.30	0.23	0.08	0.03	0.06	0.06	0.06	0.05	0.10	0.03	0.01	...	...	...	...
TOTAL OF ABOVE		0.71	0.61	0.37	0.20	0.16	0.28	0.19	0.23	0.17	0.12	0.09	...	...	...	...

ANNEX TABLE 6. – STOCKS OF MAJOR AGRICULTURAL AND FOREST PRODUCTS (*concluded*)

	Date	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966 (Forecast)
		Million metric tons														
LIQUID EDIBLE VEGETABLE OILS AND OILSEEDS (oil equivalent)																
United States	1 Oct. [6]	...	0.69	0.56	0.41	0.38	0.39	0.45	0.69	0.53	0.57	0.88	0.95	0.85	0.44	...
SUGAR (raw value)																
Cuba	31 Dec.	2.2	1.5	1.9	1.6	0.6	0.7	0.5	1.2	1.1	1.0	0.3	0.2	0.2	...	...
WORLD TOTAL [7]	31 Aug.	10.0	9.4	10.8	10.5	9.1	8.7	8.5	11.8	12.5	13.2	10.8	8.5	8.8	15.0	...
COFFEE																
Brazil		0.18	0.20	0.20	0.20	0.63	0.44	0.87	1.44	2.64	3.10	3.42	3.71	3.41	3.30	...
TOTAL 5 COUNTRIES [8]	30 June	0.53	0.51	0.49	0.38	0.84	0.69	1.17	1.84	3.15	3.66	3.96	4.35	4.16	3.96	...
TOBACCO (farm weight)																
United States [9]	1 Oct.	1.56	1.66	1.69	1.83	1.89	2.00	1.89	1.81	1.74	1.70	1.83	2.00	2.21	2.32	...
COTTON (lint)																
United States		0.61	1.22	2.11	2.43	3.15	2.47	1.89	1.93	1.64	1.57	1.70	2.43	2.68	3.10	...
WORLD TOTAL [10]	31 July	3.41	4.05	4.59	4.84	5.33	5.12	4.81	4.61	4.42	4.39	4.30	5.06	5.63	6.06	...
NATURAL RUBBER																
WORLD TOTAL [11]	31 Dec.	0.73	0.72	0.73	0.76	0.74	0.76	0.75	0.70	0.76	0.76	0.77	0.71	0.82	0.83	...
NEWSPRINT																
North America [12]	31 Dec.	0.89	0.80	0.77	0.69	0.92	0.92	0.99	0.98	0.93	0.93	0.95	0.89	0.91	0.88	...
SAWN SOFTWOOD																
European importers [13]	31 Dec.	5.74	6.19	5.10	6.09	5.32	5.62	5.42	5.12	6.22	6.14	6.06	6.34	6.97	7.41	...
European exporters [14]	31 Dec.	...	1.55	1.42	1.53	1.50	1.71	1.78	1.57	1.48	1.75	2.13	1.90	1.83	1.65	...
North America	31 Dec.	14.01	15.68	14.23	14.18	16.23	15.88	14.96	15.18	17.47	15.03	14.48	13.14	14.67	14.40	...
SAWN HARDWOOD																
European importers [15]	31 Dec.	1.29	1.13	1.06	1.22	1.31	1.25	1.26	1.19	1.25	1.33	1.24	1.16	1.19	1.22	...
European exporters [16]	31 Dec.	...	0.42	0.41	0.50	0.59	0.62	0.57	0.55	0.54	0.73	0.68	0.62	0.52	0.56	...
North America	31 Dec.	5.11	5.41	4.62	4.17	4.77	4.73	4.77	4.79	5.06	4.11	4.36	4.85	3.80	3.05	...

NOTE: Quantities shown include normal carry-over stocks.

[1] Burma, Thailand, Republic of Viet-Nam. – [2] Barley, oats, maize, sorghum and rye. – [3] Maize and sorghum, 1 October. – [4] Austria, Belgium, Finland, Federal Republic of Germany, Ireland, Netherlands, Norway, Sweden, Switzerland, United Kingdom and (from 1957) France. – [5] Manufacturers' stocks and CCC uncommitted supplies. – [6] Cottonseed, 1 August and soybeans 1 September. – [7] Excluding the U.S.S.R. and China (Mainland). – [8] Brazil, Colombia, Ivory Coast, Uganda and United States. – [9] Flue-cured types, 1 July. – [10] Including estimates of cotton afloat. – [11] Including estimates of rubber afloat, but excluding strategic stockpiles. – [12] United States and Canadian mills and United States consumers. – [13] Belgium-Luxembourg, Denmark, Federal Republic of Germany, Netherlands, Switzerland, United Kingdom. – [14] Austria, Poland, Yugoslavia. – [15] Belgium-Luxembourg, Federal Republic of Fermany, United Kingdom. – [16] Austria, Bulgaria, Yugoslavia.

ANNEX TABLE 7. – INVESTMENT[1] OF UNITED STATES COMMODITY CREDIT CORPORATION AS OF 30 APRIL 1966

	1954	1955	1956	1957	1958	1959	1960	1961 [2]	1962	1963	1964	1965	1966
Quantity													
	Thousand metric tons												
Wheat	24 208	28 156	29 073	24 453	24 174	33 937	35 512	37 888	34 209	34 057	26 815	21 991	14 776
Rice	58	763	1 322	804	732	535	455	240	34	73	96	165	151
Barley	622	2 044	1 987	1 774	2 698	3 242	3 383	2 184	1 344	1 468	1 235	900	239
Oats	589	1 052	1 222	650	732	1 376	646	598	557	688	1 026	1 378	1 571
Maize	20 568	22 255	29 192	34 801	37 211	39 206	45 291	54 012	43 587	40 036	39 167	31 860	23 796
Grain sorghum	1 029	2 927	2 887	2 040	8 295	13 498	14 964	18 784	19 070	18 618	17 667	16 381	13 268
Butter	165	149	34	16	45	20	27	40	144	176	80	35	—
Cheese	164	176	130	87	74	5	4	—	38	30	10	3	—
Dried milk	298	101	81	65	70	59	108	117	217	311	147	127	20
Soybeans	101	876	270	1 228	1 746	3 255	1 598	89	2 565	1 567	1 588	368	830
Linseed	382	201	41	351	59	279	18	6	5	141	346	184	358
Linseed oil	31	37	26	—	—	—	14	—	—	—	—	36	36
Cottonseed oil	469	170	5	—	—	27	—	—	—	4	5	15	—
Cotton linters	279	318	141	20	—	—	—	—	—	—	—	—	—
Cotton, upland	1 674	1 817	2 839	2 056	973	1 628	1 179	565	1 203	2 214	2 579	2 903	3 435
Wool	55	70	54	24	—	—	—	—	—	—	—	—	—
Tobacco	281	366	402	451	427	414	317	280	211	285	432	535	479
Value													
	Million dollars												
Wheat	2 155	2 633	2 795	2 411	2 402	3 105	3 253	2 772	2 459	2 499	1 987	1 575	1 041
Rice	6	98	232	107	104	81	65	26	5	9	11	19	17
Barley	34	107	92	87	114	155	113	85	52	56	48	34	19
Oats	32	58	60	32	32	57	27	21	21	26	40	55	61
Maize	1 296	1 437	1 926	2 289	2 414	2 486	2 786	2 688	1 952	1 818	1 766	1 438	1 059
Grain sorghum	60	167	128	105	393	706	833	797	810	800	765	729	579
Butter	245	212	44	21	60	26	35	53	191	227	103	45	—
Cheese	146	156	111	73	62	4	3	—	32	25	8	3	—
Dried milk	109	38	30	24	26	20	34	35	80	102	48	41	6
Soybeans	10	70	20	95	131	247	114	6	214	129	130	30	68
Linseed	56	25	5	42	7	31	2	1	1	16	39	21	40
Linseed oil	13	14	9	—	—	—	4	—	—	—	—	9	9
Cottonseed oil	185	64	2	—	—	7	—	—	—	1	1	5	—
Cotton linters	58	67	31	5	—	—	—	—	—	—	—	—	—
Cotton, upland	1 268	1 439	2 268	1 580	642	1 260	947	410	894	1 600	1 842	1 995	2 268
Wool	81	103	82	35	—	—	—	—	—	—	—	—	—
Tobacco	270	406	535	609	590	594	441	393	321	461	679	843	786
Other commodites	165	167	263	301	274	154	176	141	152	191	160	110	156
TOTAL	6 189	7 261	8 633	7 816	7 251	8 933	8 833	7 428	7 184	7 960	7 627	6 952	6 109
	Percentage												
Change from previous year	+ 97	+ 17	+ 19	— 9	— 7	+ 23	— 1	— 1	— 3	+ 11	— 4	— 9	— 12

SOURCE: United States Department of Agriculture, Commodity Credit Corporation, *Report of financial conditions and operations, 30 April 1954–30 April 1966*.

[1] Stocks pledged for outstanding loans and stocks in price support inventory. – [2] As from 1961 the values are in accordance with the new accounting policy adopted by the CCC as of 30 June 1961. The 1961 total comparable with the previous years is $8,748 million and the percentage change 1960/61 refers to this amount.

ANNEX TABLE 8A. – PER CAPUT FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES

	Period	Cereals [1]	Potatoes and other starchy foods [2]	Sugar [3]	Pulses, nuts and seeds [4]	Vegetables [5]	Meat [6]	Eggs [7]	Fish [8]	Milk [9]		Fats and oils
										Fat	Protein	
		Kilograms per caput per year										
WESTERN EUROPE												
Austria	1934–38	131.6	96.3	24.1	3.8	57.8	48.8	6.7	1.0	7.0	7.4	17.3
	1948/49–1950/51	129.6	107.6	23.2	2.7	60.6	30.1	3.8	2.0	5.0	6.0	15.3
	1951/52–1953/54	116.2	100.8	25.6	2.0	61.4	41.3	6.0	2.3	6.4	7.1	16.2
	1954/55–1956/57	117.8	95.8	30.9	2.5	63.2	47.2	8.3	3.1	6.9	7.6	17.6
	1957/58–1959/60	114.1	91.5	34.2	3.2	65.1	52.2	10.5	3.2	6.9	7.6	18.2
	1960/61–1962/63	103.9	84.1	36.4	3.8	61.9	59.8	11.9	3.6	6.9	7.4	18.0
	1963/64	100.0	82.0	34.9	3.8	69.4	62.3	13.3	3.5	6.8	7.3	18.8
	1964/65	99.2	80.1	35.7	4.0	66.7	63.2	14.2	3.9	6.8	7.4	19.5
Belgium-Luxembourg	1936–38	114.4	156.1	26.0	5.9	49.3	47.2	11.8	5.8	2.8	4.2	19.1
	1948/49–1950/51	106.0	148.0	28.5	3.9	60.4	47.0	12.1	5.9	4.2	5.1	21.0
	1951/52–1953/54	104.3	147.3	28.5	3.8	65.6	49.0	12.7	6.8	4.4	5.9	21.8
	1954/55–1956/57	100.0	149.5	28.5	3.9	65.1	53.0	14.4	6.9	4.5	6.2	22.1
	1957/58–1959/60	92.3	144.4	32.3	4.0	68.9	58.1	15.2	5.9	4.7	6.8	21.3
	+ 1960/61–1962/63	89.7	118.2	31.7	3.8	76.3	60.4	13.3	5.3	5.3	6.4	29.5
	+ 1963/64	84.1	145.6	29.7	4.6	83.9	65.9	13.3	6.0	6.2	7.2	28.9
Denmark	1934–38	93.9	120.5	50.5	4.6	58.0	74.6	7.5	10.3	7.7	7.7	26.6
	1948/49–1950/51	104.4	141.4	36.1	6.8	72.3	61.6	8.9	17.9	8.3	9.9	18.1
	1951/52–1953/54	95.1	137.5	40.8	5.3	63.7	56.8	7.8	12.6	8.3	9.4	25.3
	1954/55–1956/57	89.6	131.1	48.0	4.7	61.9	58.8	7.5	13.8	8.1	7.9	26.3
	1957/58–1959/60	81.6	128.7	45.5	4.0	65.7	64.8	9.4	15.1	8.8	8.4	28.2
	1960/61–1962/63	77.9	119.0	49.4	6.3	66.4	66.3	11.1	16.1	9.0	8.9	26.9
	1963/64	77.3	107.4	47.4	8.1	68.0	63.2	12.5	17.0	9.1	9.0	28.3
	1964/65	75.1	102.5	47.9	7.7	63.3	62.9	12.4	16.9	9.0	9.1	28.7
Finland	1934–38	128.0	180.8	28.2	3.3	30.0	32.6	3.0	6.0	10.6	9.9	13.1
	1949/50–1950/51	122.5	118.6	31.2	1.8	17.8	29.0	5.1	12.3	12.0	12.0	15.2
	1951/52–1953/54	120.5	115.4	34.2	2.0	18.5	29.3	7.2	10.4	12.6	12.5	17.0
	1954/55–1956/57	118.5	108.7	37.8	2.1	19.1	32.5	7.5	11.2	12.8	12.7	18.5
	1957/58–1959/60	114.4	98.5	40.5	2.1	20.6	31.7	6.3	11.0	12.0	12.0	18.5
	1960/61–1962/63	106.9	111.2	40.0	1.6	15.3	34.3	8.0	10.5	12.3	12.2	19.5
	1963/64	99.2	110.5	39.0	1.6	15.0	37.6	9.1	12.7	12.5	12.4	19.6
France	1934–38	123.8	143.2	24.2	6.6	143.2	55.2	9.0	5.9	4.4	5.0	15.6
	1948/49–1950/51	121.5	132.6	23.1	5.1	140.0	55.6	10.5	5.8	4.4	5.0	14.4
	1951/52–1953/54	116.4	122.0	26.3	4.7	138.7	60.5	10.8	5.9	4.5	5.2	15.8
	1954/55–1956/57	111.2	130.3	25.6	5.5	132.3	68.7	10.3	5.7	4.8	5.6	17.1
	1957/58–1959/60	106.3	106.7	30.3	5.8	127.2	74.3	10.7	5.8	5.7	6.7	17.2
	+ 1960/61–1962/63	98.2	99.8	30.0	4.8	149.0	76.7	11.4	7.3	6.0	7.3	22.4
	+ 1963/64	92.7	101.6	31.6	5.7	141.2	82.1	11.4	7.4	6.0	7.3	22.8
Germany, Fed. Rep. of [10]	1935–38	113.0	185.1	26.0	3.3	51.9	52.8	7.4	6.8	5.7	6.6	21.1
	1948/49–1950/51	114.4	209.5	23.6	4.1	51.5	29.2	5.1	8.0	4.1	5.8	15.8
	1951/52–1953/54	99.0	172.5	24.9	3.0	45.5	41.5	8.1	7.0	5.4	6.7	22.8
	1954/55–1956/57	95.7	157.3	27.5	3.5	45.1	48.1	10.4	7.1	5.7	6.8	25.2
	1957/58–1959/60	87.8	143.2	28.1	3.3	46.3	53.6	12.4	6.8	5.7	7.0	25.2
	1960/61–1962/63	79.2	130.9	30.3	3.7	49.5	60.5	13.1	6.7	5.7	7.0	25.5
	1963/64	75.2	124.5	32.0	3.6	53.2	64.0	13.4	6.2	5.6	7.1	25.5
	1964/65	74.1	122.0	30.1	3.7	50.7	65.8	13.6	6.3	5.6	7.0	25.7
Greece	1935–38	162.9	13.6	10.5	14.8	27.0	19.6	4.2	5.5	3.9	4.1	14.7
	1948/49–1950/51	154.2	34.0	9.4	13.0	66.3	11.4	3.2	5.9	2.6	2.9	14.9
	1952/53	149.1	42.2	9.8	14.4	100.0	13.6	3.2	6.4	3.3	3.3	16.6
	1954-56	164.6	41.0	11.6	15.9	110.8	17.7	4.5	6.9	4.3	4.5	18.2
	1957–59	168.4	43.7	11.8	14.6	118.2	21.8	5.7	7.8	4.6	4.8	18.6
	1960–62	157.1	39.4	13.5	14.2	134.8	26.3	6.8	9.2	5.1	5.3	18.4
	1963	145.2	50.1	15.1	13.4	158.6	32.6	8.8	10.2	5.6	5.7	18.8
Hungary	1960–62	134.9	95.6	27.6	3.1	80.3	48.6	8.9	0.8	4.0	4.3	21.2
	1962	133.8	94.1	28.5	3.3	76.8	49.9	8.9	0.8	3.8	4.0	21.2
Ireland	1934–38	131.4	195.4	38.1	1.5	53.2	54.9	15.8	3.0	5.5	8.9	13.5
	1948–50	133.5	190.3	35.3	2.2	58.8	53.1	12.5	2.6	6.6	8.8	18.4
	1951–53	132.2	174.8	40.0	1.6	58.6	52.9	14.6	3.0	7.1	8.8	19.7
	1954–56	127.7	155.1	42.2	1.7	60.8	55.3	17.6	4.0	8.6	7.6	19.7
	1957–59	116.6	142.3	44.8	2.4	62.7	58.2	17.6	4.0	7.9	8.8	19.3
	1960–62	109.4	141.2	47.7	2.8	65.4	63.4	16.5	4.2	8.6	9.3	19.5
	1963	104.7	138.4	48.5	3.5	65.4	68.3	16.0	3.5	8.7	9.3	19.1

ANNEX TABLE 8A. – PER CAPUT FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (*continued*)

	Period	Cereals [1]	Potatoes and other starchy foods [2]	Sugar [3]	Pulses, nuts and seeds [4]	Vegetables [5]	Meat [6]	Eggs [7]	Fish [8]	Milk [9]		Fats and oils
										Fat	Protein	
		Kilograms per caput per year										
Italy	1934–38	160.4	36.6	7.8	18.9	55.8	20.1	7.3	3.4	2.6	2.8	11.7
	1948/49–1950/51	149.5	38.1	11.7	9.8	81.3	15.3	6.0	4.0	3.2	2.9	9.9
	1951/52–1953/54	146.2	40.4	14.3	11.2	92.5	17.6	6.9	4.5	3.2	3.5	12.1
	1954/55–1956/57	139.6	48.1	16.4	9.2	95.9	20.7	7.8	4.2	3.5	3.8	12.4
	1957/58–1959/60	134.8	49.2	18.9	10.6	127.7	25.7	8.5	4.6	3.8	4.1	14.1
	1960/61–1962/63	134.2	52.3	22.9	7.6	138.6	30.7	9.3	5.1	4.0	4.3	16.8
	1963/64	131.2	58.5	25.2	9.6	141.4	35.1	9.8	5.2	3.9	4.5	18.5
	1964/65	130.6	51.0	25.4	9.0	146.0	35.0	9.8	5.3	4.0	4.7	18.8
Netherlands	1936–38	106.9	115.8	29.4	5.1	67.0	37.6	9.1	6.1	6.8	7.3	20.6
	1948/49–1950/51	98.3	158.4	35.8	3.7	67.8	27.7	4.9	6.2	7.2	8.7	22.9
	1951/52–1953/54	94.5	115.7	35.6	3.5	63.6	34.6	6.6	5.1	7.4	8.6	25.0
	1954/55–1956/57	89.6	96.2	38.9	4.5	66.2	43.1	10.5	4.7	7.4	8.5	23.8
	1957/58–1959/60	85.2	91.3	39.8	4.0	66.1	44.2	11.7	4.2	7.6	8.5	25.0
	+ 1960/61–1962/63	80.4	98.7	42.9	4.2	69.9	45.9	12.0	5.6	8.1	8.5	28.8
	1963/64	75.5	98.6	45.4	4.4	73.7	51.1	13.7	6.4	8.4	8.6	28.6
	1964/65	74.0	95.7	40.6	4.5	74.1	54.1	12.9	6.3	8.2	8.4	29.1
Norway	1934–38	119.0	130.2	30.3	3.1	19.3	37.9	6.9	21.0	8.2	8.4	24.9
	1948/49–1950/51	116.4	127.8	24.5	3.4	28.4	33.0	7.1	24.6	11.0	10.0	23.1
	1951/52–1953/54	103.5	107.4	32.0	2.7	31.2	34.1	6.7	20.2	11.5	9.7	25.7
	1954/55–1956/57	94.7	104.9	36.9	4.1	34.5	37.4	7.7	19.7	11.7	9.1	26.5
	1957/58–1959/60	83.5	104.2	38.1	3.3	35.8	37.9	7.9	17.9	11.8	9.0	25.1
	1960/61–1962/63	78.2	99.3	40.2	3.7	33.4	39.6	8.8	20.2	11.4	8.3	23.0
	1963/64	74.9	101.9	40.3	3.6	38.4	40.8	8.8	20.4	11.7	8.6	24.8
	1964/65	74.6	100.1	38.6	3.6	32.8	39.3	8.8	20.2	11.7	8.7	24.3
Poland	1961–63	146.4	220.9	31.2	1.8	92.1	54.3	7.7	4.1	7.2	6.9	9.5
Portugal	1937–38	104.6	76.2	10.0	8.6	109.7	15.0	3.2	16.7	0.5	0.5	14.6
	1948–50	120.4	108.1	12.1	12.3	107.3	16.0	2.6	16.2	0.8	0.7	13.8
	1951–53	123.2	118.6	13.7	7.8	107.6	16.9	3.1	17.2	1.2	1.1	15.1
	1954–56	124.8	115.3	15.5	9.5	109.5	20.2	3.3	18.3	1.4	1.3	15.4
	1957–59	122.0	104.4	17.0	8.8	111.7	18.0	3.5	19.6	1.5	1.4	14.9
	1960–62	126.1	99.3	19.0	9.1	117.2	19.7	3.6	20.8	1.6	1.5	15.5
	1963	133.5	102.3	19.1	9.8	132.6	19.8	3.7	19.8	1.7	1.6	16.2
	1964	126.0	111.8	20.0	10.1	132.4	19.0	3.8	23.0	1.7	1.6	16.6
Romania	1961–63	196.3	66.1	13.1	9.3	61.5	34.8	5.2	2.0	5.2	5.0	4.5
Spain	1952/53–1953/54	122.8	104.4	10.6	14.8	102.0	14.1	4.7	9.9	2.1	2.4	15.5
	1954/55–1956/57	116.9	112.8	13.5	15.6	102.1	14.2	5.2	10.5	2.5	2.7	16.1
	1957/58–1959/60	112.5	114.7	15.4	15.4	114.5	16.0	5.3	11.2	2.4	2.7	18.0
	1960/61–1962/63	115.8	115.2	18.7	14.7	130.0	20.9	7.3	13.2	2.4	2.8	20.4
	1963/64	104.9	128.6	19.2	11.8	135.8	26.3	11.2	13.9	2.7	3.2	23.5
Sweden	1934–38	95.5	122.2	43.7	2.9	21.1	49.0	8.3	17.5	11.4	10.3	17.8
	1948/49–1950/51	88.2	119.6	44.4	3.3	25.0	48.7	10.6	15.7	11.0	9.5	20.1
	1951/52–1953/54	83.0	111.0	41.3	2.6	25.0	49.2	11.3	17.6	10.7	9.7	20.3
	1954/55–1956/57	76.2	102.0	42.0	3.0	25.1	50.2	11.4	18.3	10.3	9.3	21.0
	1957/58–1995/60	73.7	92.5	41.0	3.0	25.4	50.0	11.6	17.9	10.5	8.9	21.2
	1960/61–1962/63	71.9	90.8	41.3	3.4	29.9	51.2	12.0	19.6	9.9	9.3	23.0
	1963/64	70.6	97.9	38.9	3.2	31.5	51.9	11.8	20.5	9.6	9.4	22.1
	1964/65	68.8	96.4	39.0	3.3	34.6	52.5	11.8	21.3	9.7	9.4	22.0
Switzerland	1934–38	109.5	90.5	38.1	4.5	61.9	53.2	8.8	1.4	11.2	11.3	15.4
	1948/49–1950/51	116.6	88.6	37.6	5.8	72.9	44.1	8.6	2.0	11.3	11.2	14.7
	1951/52–1953/54	108.6	78.0	38.4	7.0	72.5	47.8	8.9	2.3	10.8	10.6	15.5
	1954/55–1956/57	101.2	74.3	40.4	7.0	75.1	51.4	9.7	2.8	10.5	10.4	17.3
	1957/58–1959/60	97.2	72.8	39.3	7.7	76.2	54.6	9.9	3.0	10.4	9.7	18.6
	1960/61–1962/63	96.0	68.5	42.8	7.8	75.2	59.9	9.9	3.7	10.1	9.0	19.9
	1963/64	91.2	67.3	38.1	8.7	79.3	64.4	10.0	4.0	9.9	8.6	20.6
United Kingdom	1934–38	95.2	82.5	42.3	4.6	54.5	53.0	12.8	11.9	5.3	5.1	21.2
	1948/49–1950/51	106.1	114.6	38.8	5.0	60.9	49.8	13.1	11.5	7.2	7.2	21.4
	1951/52–1953/54	96.6	104.0	40.5	5.2	56.2	55.0	12.5	9.8	7.2	7.2	21.0
	1954/55–1956/57	88.3	98.5	46.6	6.3	58.5	67.6	13.4	9.9	7.3	7.2	22.1
	1957/58–1959/60	84.3	94.7	48.8	5.7	59.6	70.5	14.6	10.1	7.3	7.3	22.2
	1960/61–1962/63	81.4	98.2	49.1	5.8	58.3	74.1	15.2	9.6	7.6	7.6	23.0
	1963/64	79.8	101.2	45.9	6.3	60.5	74.0	15.5	9.3	7.7	7.7	24.0
	1964/65	79.0	102.8	48.2	5.8	59.2	74.0	16.5	10.2	7.8	7.6	24.0

ANNEX TABLE 8A. – PER CAPUT FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (*continued*)

	Period	Cereals [1]	Potatoes and other starchy foods [2]	Sugar [3]	Pulses, nuts and seeds [4]	Vegetables [5]	Meat [6]	Eggs [7]	Fish [8]	Milk [9]		Fats and oils
										Fat	Protein	
		Kilograms per caput per year										
Yugoslavia	1952/53	190.2	64.0	8.1	6.8	31.6	20.0	2.2	1.4	2.7	3.4	7.7
	1954–56	185.8	60.3	10.4	9.3	39.0	23.2	2.4	1.3	3.1	3.8	9.3
	1957–59	186.6	66.8	13.5	9.3	49.6	24.5	3.4	1.8	4.0	4.9	9.9
	1960–62	189.3	67.3	16.3	9.9	55.1	28.4	3.2	1.2	3.5	4.4	11.6
	1963	193.8	66.1	18.2	9.6	64.0	24.8	3.4	1.3	3.3	4.2	12.6
NORTH AMERICA												
Canada	1935–39	92.6	60.4	42.7	5.7	56.2	61.9	13.8	5.4	7.6	6.8	18.8
	1948/49–1950/51	74.8	75.3	46.6	6.6	70.2	70.5	15.4	6.0	8.4	8.9	20.2
	1951/52–1953/54	74.3	67.3	43.3	4.9	70.7	69.3	14.7	6.0	7.9	8.5	19.0
	1954/55–1956/57	71.9	68.0	44.3	5.3	71.4	75.0	16.2	6.0	8.2	8.9	18.9
	1957/58–1959/60	68.0	63.2	44.2	5.0	74.1	77.2	16.4	6.0	7.8	8.7	19.1
	1960/61–1962/63	66.3	64.4	44.9	5.4	76.7	77.6	15.4	5.6	7.3	8.5	19.3
	1963/64	69.1	70.9	42.7	5.1	69.4	86.4	14.5	6.6	7.1	8.2	19.9
	1964/65	67.4	71.6	45.7	5.7	73.5	85.7	14.5	6.8	7.1	8.2	19.3
United States	1935–39	92.4	66.6	44.0	8.7	105.4	71.6	16.2	4.9	7.6	7.2	20.6
	1948–50	76.6	52.1	42.4	7.3	102.6	81.8	21.7	5.0	8.9	8.2	19.8
	1951–53	73.3	50.1	42.2	7.0	97.4	84.3	22.1	5.1	8.7	8.4	18.8
	1954–56	69.1	49.0	42.0	6.7	95.1	92.1	22.5	4.9	8.7	9.0	20.6
	1957–59	67.2	47.7	41.7	6.6	93.7	92.0	20.5	4.8	8.7	8.8	20.6
	1960–62	66.0	47.6	40.8	7.9	98.6	95.5	18.8	4.8	8.2	8.6	20.6
	1963	65.4	50.0	40.1	8.1	98.0	99.6	18.2	4.8	8.1	8.6	20.8
	1964	65.6	47.1	39.8	8.0	96.4	102.6	18.1	4.8	8.1	8.6	21.6
LATIN AMERICA												
Argentina	1935–39	106.1	65.8	26.9	2.5	24.5	106.9	7.1	2.2	5.4	5.3	15.3
	1948	125.8	88.1	35.0	2.1	39.6	116.3	7.4	2.0	5.5	5.1	15.8
	1951–53	104.9	79.0	31.8	4.0	44.7	102.8	8.6	2.3	5.1	5.1	18.2
	1954–56	104.7	83.5	33.8	3.2	49.3	108.0	6.6	2.0	5.0	4.6	17.8
	1957–59	115.5	69.9	33.5	2.1	44.1	109.3	7.2	1.9	4.2	3.9	16.4
	1960–62	91.3	87.9	35.3	2.6	47.7	99.8	8.1	2.1	3.6	3.4	15.7
	1962	75.7	68.7	36.9	2.2	47.2	101.3	7.0	2.0	3.6	3.5	16.2
Bolivia	1961–63	95.8	[11]166.9	18.0	2.4	32.6	18.4	1.0	0.2	1.3	1.3	4.1
Brazil	1935–39	78.3	91.1	24.7	22.0	20.0	49.8	2.6	0.9	2.7	2.6	5.1
	1948–50	85.0	147.7	30.9	24.9	4.2	28.4	2.2	1.9	1.2	1.2	5.7
	1951–53	89.3	139.2	33.4	25.2	5.3	28.3	2.5	1.9	1.6	1.6	6.1
	1954–56	98.8	149.8	37.1	26.4	6.4	28.6	3.1	2.2	1.5	1.5	7.4
	1957–59	95.9	142.1	38.2	25.8	7.5	29.6	3.3	2.1	1.6	1.5	7.8
	1960–62	108.9	149.3	40.1	29.6	8.1	27.5	3.4	2.6	1.9	1.8	7.7
	1962	113.1	156.4	38.6	29.7	8.8	27.6	3.5	2.9	1.9	1.8	8.1
Chile	1935–39	123.8	73.3	25.4	10.3	50.0	38.4	1.7	3.2	1.6	1.5	4.7
	1948	133.9	79.5	25.0	6.0	54.0	37.9	2.0	...	3.2	3.0	5.6
	1951/52	128.6	61.3	26.9	9.1	56.1	29.9	4.7	5.5	3.6	3.5	7.9
	1954–56	137.0	75.5	27.0	7.6	66.8	31.3	4.1	8.3	3.9	3.9	6.9
	1957–59	122.1	75.7	22.5	7.1	69.1	32.0	2.6	7.6	3.3	4.1	9.6
	+ 1960–62	119.8	70.3	31.2	9.8	80.5	33.3	4.2	6.2	2.6	3.5	7.4
	1962	120.0	66.5	23.2	10.0	78.3	35.0	5.4	6.8	2.7	3.7	8.1
Colombia	1957–59	66.2	[11]113.9	48.4	5.8	14.6	33.9	2.7	0.8	2.2	2.2	5.1
	+ 1960–62	64.6	[11]205.6	49.8	5.3	12.3	35.9	3.4	1.2	2.2	2.2	3.7
	1963	59.3	[11]198.3	51.6	5.2	11.8	36.6	5.6	1.2	2.4	2.4	3.4
Costa Rica	1963	87.1	[11]42.3	60.0	9.7	8.9	19.9	6.3	1.2	3.6	3.6	6.8
Dominican Republic	1959	56.5	[11]124.0	20.6	16.6	22.5	18.5	3.6	3.5	2.8	3.0	4.2
Ecuador	1954–56	82.5	[11]137.2	22.8	9.4	19.2	11.1	3.5	2.2	2.6	2.6	4.6
	1957–59	69.8	[11]120.8	19.7	9.0	25.4	13.5	4.2	3.0	2.8	2.8	5.4
	+ 1960/61	69.1	[11]133.1	34.3	10.8	46.1	20.8	2.2	4.5	2.4	2.4	2.9
	1961	74.6	[11]133.1	26.5	9.4	31.4	14.1	4.3	5.0	2.8	2.8	4.6

ANNEX TABLE 8A. – PER CAPUT FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (*continued*)

	Period	Cereals [1]	Potatoes and other starchy foods [2]	Sugar [3]	Pulses, nuts and seeds [4]	Vegetables [5]	Meat [6]	Eggs [7]	Fish [8]	Milk [9]		Fats and oils
										Fat	Protein	
		Kilograms per caput per year										
El Salvador	1960–62	129.1	2.9	22.9	11.6	4.8	12.8	4.7	1.2	3.0	3.0	5.5
	1962	133.2	2.9	24.3	12.3	4.8	12.5	4.8	1.2	3.0	3.0	6.7
Guatemala	1960–62	141.2	[11]7.8	25.9	8.5	38.7	12.4	1.9	0.2	1.1	1.1	2.9
	1962	153.4	[11]8.1	25.5	8.9	38.6	11.3	1.7	0.2	1.2	1.4	2.9
Honduras	1960–62	106.8	44.4	21.8	11.0	5.2	10.8	4.1	0.7	0.8	2.5	3.5
	1962	106.6	44.3	21.4	10.6	4.9	10.2	4.1	0.6	0.8	2.5	3.8
Jamaica	1958	81.3	[11]63.6	35.8	10.8	17.3	17.1	4.2	11.4	1.3	2.0	7.0
Mexico	1954–56	126.3	[11]16.5	32.3	19.3	...	19.7	4.2	2.2	2.4	2.4	9.5
	1957–59	122.2	[11]14.3	32.0	21.1	...	22.2	6.4	2.3	3.1	3.0	9.3
	1960–62	127.5	[11]17.2	33.3	22.7	12.5	22.7	5.4	2.5	4.3	4.2	11.0
	1962	126.9	[11]18.2	34.3	23.8	11.8	23.7	5.0	2.4	4.6	4.5	10.6
Panama	1960–62	102.7	68.6	22.4	15.8	12.4	34.4	4.4	4.8	1.9	1.8	7.4
	1962	100.7	65.8	22.2	15.5	12.3	37.6	3.8	5.2	1.8	1.8	7.4
Paraguay	1957–59	76.5	271.2	15.8	15.6	36.3	...	0.6	0.1	2.6	2.6	4.3
	1960–62	75.4	262.1	16.1	14.5	16.2	44.9	0.6	0.3	2.4	2.4	4.8
	1962	80.8	256.2	14.4	14.9	16.5	43.6	0.6	0.3	2.3	2.3	4.8
Peru	1952	122.1	184.8	24.3	9.6	54.8	22.4	3.0	2.3	1.2	1.2	6.4
	1957–59	93.5	152.4	26.1	9.7	89.2	18.6	0.8	5.7	1.2	0.9	8.4
	+ 1960–62	95.7	126.7	25.5	9.8	76.3	26.3	3.7	6.7	1.4	1.4	5.0
	1963	91.1	153.3	27.8	10.7	98.2	16.6	0.9	8.2	1.2	1.6	6.9
Surinam	1958–59	142.0	[11]28.8	28.0	9.2	11.4	8.0	2.4	9.1	1.2	1.4	9.3
	1960–62	119.8	[11]27.2	27.5	8.3	11.3	9.1	2.6	9.6	1.4	1.5	10.2
	1963	99.8	[11]26.7	27.4	8.4	13.2	9.3	2.4	8.7	1.4	1.6	11.7
	1964	147.7	[11]30.2	26.9	9.4	15.9	11.0	2.4	9.4	1.3	1.4	12.8
Uruguay	1948–50	99.4	51.0	33.2	2.8	22.4	115.0	7.4	1.1	5.6	5.4	14.2
	1952–53	96.2	58.7	32.2	2.3	26.6	122.8	6.6	1.1	5.9	5.6	15.9
	1954–56	98.8	61.5	32.7	2.0	36.5	108.9	6.6	1.1	6.3	6.1	16.6
	1957–59	91.7	64.7	32.1	2.2	47.5	111.4	6.9	1.1	6.3	6.1	21.2
	1961	89.7	70.0	33.1	4.0	39.3	101.0	6.6	1.5	7.4	7.3	17.2
Venezuela	1952–53	82.4	[11]87.0	32.9	14.2	9.8	18.6	4.2	6.2	2.6	2.4	6.1
	1954–56	78.3	[11]74.3	30.0	12.6	9.9	18.7	4.4	5.6	2.7	2.6	6.6
	1957–59	78.4	[11]82.0	30.9	14.5	11.9	22.8	4.0	7.7	3.1	2.9	7.8
	1960–62	87.5	[11]100.0	33.9	16.7	13.5	25.3	3.3	6.7	3.2	3.0	9.5
	1962	89.3	[11]110.9	34.0	13.8	12.5	26.2	2.8	6.5	3.3	3.1	10.3
FAR EAST												
Ceylon	1952–53	118.0	34.8	16.2	32.4	41.8	2.8	1.6	5.4	0.5	0.5	3.9
	1954–56	124.8	33.8	16.5	34.0	41.8	2.8	1.2	5.1	0.6	0.5	3.7
	1957–59	125.7	22.0	18.3	29.9	43.3	2.8	1.0	6.1	0.6	0.5	3.6
	1960–62	127.3	34.7	18.6	29.6	42.1	2.1	1.1	6.0	0.7	0.5	3.6
	1963	138.8	30.0	...	28.2	39.6	2.0	1.8	6.1	0.7	0.6	3.6
	1964	131.3	35.1	21.4	30.6	39.6	2.0	1.9	6.9	0.7	0.8	3.6
China (Taiwan)	1935–39	98.5	120.8	11.0	5.4	61.9	18.5	2.3	12.9	—	—	3.0
	1948–50	137.5	76.2	9.4	[12]5.6	62.2	11.0	1.5	5.9	—	—	2.2
	1951–53	145.4	65.6	9.4	[12]8.0	61.8	16.8	1.6	8.3	—	—	3.5
	1954–56	148.3	70.3	9.4	[12]9.2	58.4	16.8	1.7	9.6	—	—	3.8
	1957–59	155.6	72.2	9.4	[12]10.1	59.7	18.1	1.7	10.4	—	—	4.0
	1960–62	160.5	63.8	9.4	[12]10.1	58.1	16.0	1.6	12.2	—	—	4.6
	1963	156.8	50.1	9.2	[12]10.3	60.3	17.9	1.9	13.7	—	—	4.8
	1964	150.8	60.5	9.6	[12]11.9	56.6	18.4	2.1	14.2	—	—	6.4
India	[13]1934–38	139.1	7.7	13.0	21.8	25.0	3.0	0.4	0.8	[14]3.5	[14]2.4	[15]3.0
	1949/50–1950/51	118.2	8.8	11.8	20.6	...	1.4	0.1	0.9	[14]2.5	[14]1.7	[15]3.0
	1951/52–1953/54	121.4	11.1	11.2	21.9	...	1.4	0.2	0.9	[14]2.6	[14]1.8	[15]3.0
	1954/55–1956/57	126.4	10.7	13.1	24.2	...	1.5	0.2	1.1	[14]2.7	[14]1.8	[15]3.6
	1957/58–1959/60	131.2	10.6	13.8	23.5	...	1.5	0.2	1.0	[14]2.7	[14]1.8	[15]3.9
	1960/61–1962/63	139.5	10.6	18.0	22.9	2.8	1.5	0.2	1.0	[14]2.7	[14]1.8	[15]3.8
	1963/64	142.0	10.9	17.4	18.9	2.7	1.5	0.2	1.2	[14]2.7	[14]1.8	[15]3.4

ANNEX TABLE 8A. – PER CAPUT FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (*continued*)

	Period	Cereals [1]	Potatoes and other starchy foods [2]	Sugar [3]	Pulses, nuts and seeds [4]	Vegetables [5]	Meat [6]	Eggs [7]	Fish [8]	Milk [9]		Fats and oils
										Fat	Protein	
		Kilograms per caput per year										
Japan [10]	1934–38	157.7	46.4	14.1	[17]16.7	70.6	2.8	2.3	9.6	—	—	0.9
	1948–50	157.0	62.5	4.0	[17]7.1	61.1	1.8	0.6	13.3	—	—	0.7
	1951–53	146.8	56.7	9.8	[17]13.4	69.3	2.8	2.5	19.5	—	—	1.6
	1954–56	150.8	62.4	12.1	[17]15.6	67.6	3.9	3.4	22.1	—	—	2.6
	1957–59	153.5	66.6	13.4	[17]16.5	75.0	5.5	3.9	24.7	0.6	0.5	3.5
	1960–62	149.2	68.9	15.6	[17]16.4	89.6	7.7	6.0	26.6	0.9	0.8	4.8
	1963	148.3	65.8	16.4	[17]15.5	103.8	9.6	7.4	27.8	1.2	1.0	6.1
	1964	147.4	67.4	17.2	[17]15.1	101.8	10.4	8.6	24.8	1.1	1.1	6.8
Pakistan	1934–38 [13]	139.1	7.7	13.0	21.8	25.0	3.0	0.4	0.8	[14]3.5	[14]2.4	[15]2.5
	1949/50–1950/51	160.0	...	12.0	8.0	18.3	4.4	0.4	0.6	[14]2.5	[14]1.8	[15]3.0
	1951/52–1953/54	152.9	...	13.0	6.9	17.8	4.5	0.4	1.0	[14]2.6	[14]2.0	[15]3.6
	1954/55–1956/57	149.6	...	14.2	7.9	17.8	4.5	0.4	1.6	[14]2.6	[14]2.0	[15]3.5
	1957/58–1959/60	153.3	3.7	15.0	6.8	18.5	4.1	0.3	1.5	[14]1.8	[14]2.2	[15]3.4
	1960/61–1962/63	154.7	4.6	14.3	5.3	18.5	3.5	0.3	1.6	[14]3.5	[14]2.7	[15]5.5
	1963/64	165.3	8.1	14.8	6.4	12.6	3.5	0.4	1.6	[14]3.4	[14]2.7	[15]5.7
Philippines [18]	1953	112.3	44.0	13.7	4.1	32.0	14.6	2.8	8.6	—	—	1.8
	1954–56	114.1	43.7	12.6	3.8	31.8	15.8	3.2	9.7	—	—	1.9
	1957–59	114.7	43.2	12.1	4.3	31.0	16.3	3.3	10.5	—	—	2.5
	1960–62	118.3	42.8	12.7	6.5	28.6	14.9	3.3	10.8	—	—	2.4
	1963	126.7	42.3	18.0	7.5	31.0	14.3	2.5	11.0	—	—	2.6
	1964	124.4	46.2	18.0	6.3	28.5	13.3	2.5	14.9	—	—	2.6
NEAR EAST												
Afghanistan	1961/62	173.8	0.2	3.0	0.3	23.3	13.4	0.7	...	4.2	3.8	0.8
Iran	1960	143.8	3.5	19.1	3.9	7.9	15.9	1.7	0.8	1.6	2.4	6.6
Iraq	1960–62	129.6	5.4	29.5	5.7	56.8	20.1	1.1	0.8	3.9	3.4	3.8
Israel	1950/51	133.1	45.4	18.9	9.5	103.1	15.2	18.9	16.0	3.6	5.3	15.3
	1951/52–1953/54	150.1	39.6	20.6	7.4	115.7	11.8	13.1	11.7	4.1	5.1	15.0
	1954/55–1956/57	140.1	46.8	24.9	10.1	116.2	20.9	15.3	8.1	4.6	5.3	15.9
	1957/58–1959/60	122.9	41.2	28.7	8.5	117.3	29.7	18.9	7.2	4.3	5.0	16.4
	1960/61–1962/63	116.1	37.6	32.2	9.5	111.9	39.7	20.2	6.7	4.2	4.7	17.5
	1963/64	110.2	38.4	33.6	10.2	110.2	47.3	22.0	6.5	4.2	4.8	16.9
Jordan	1957–59	129.1	12.6	22.0	12.3	90.2	7.5	1.1	0.8	2.4	2.2	6.9
	1960–62	135.9	10.4	23.2	9.9	117.8	12.2	1.8	0.8	1.4	1.6	9.8
	1963	104.2	12.5	22.2	7.3	158.2	6.1	2.8	0.8	1.2	1.5	12.3
	1964	114.2	11.1	16.3	10.4	155.3	5.7	3.1	0.7	1.0	1.5	19.4
Lebanon	1960–62	121.6	15.6	21.0	11.8	103.2	31.5	2.7	1.9	2.0	2.5	12.0
	1963	116.7	19.1	13.3	7.9	98.5	40.1	3.0	2.1	2.5	3.6	16.3
	1964	85.9	22.4	23.2	12.5	129.7	32.2	4.3	3.1	2.8	4.1	10.0
Libya	1959	114.7	17.0	28.2	6.6	57.1	10.0	1.8	1.2	1.8	2.0	7.5
Sudan	1961–63	113.3	17.1	10.2	17.6	29.7	25.1	1.9	0.7	3.2	4.2	7.0
Syria	1960–62	157.6	8.9	15.5	11.5	33.4	13.8	0.4	0.1	2.3	2.4	9.3
Turkey	1934–38	193.3	5.9	4.5	9.9	31.8	14.8	2.2	0.4	2.4	3.9	2.9
	1948/49–1950/51	186.4	18.2	6.4	9.6	55.6	14.2	1.2	0.8	2.3	3.1	6.8
	1951/52–1953/54	198.8	28.3	8.3	10.9	68.0	14.6	1.3	1.5	2.8	2.8	7.9
	1954/55–1956/57	200.8	29.4	9.6	12.5	76.2	13.6	1.7	1.5	2.3	3.0	7.8
	1957/58–1959/60	199.6	39.6	9.4	14.0	78.5	13.3	1.6	1.6	3.3	2.7	7.5
	1960–61	223.0	38.5	17.0	13.2	105.0	13.5	1.8	2.5	3.6	3.5	7.9
United Arab Republic	1948/49–1950/51	172.9	10.6	13.1	11.5	45.6	10.3	0.8	3.3	[14]3.7	[14]2.3	[15]3.6
	1951/52–1953/54	171.6	8.8	14.0	10.1	49.9	11.1	0.9	2.6	[14]2.8	[14]1.7	[15]3.5
	1954/55–1956/57	180.0	9.0	12.9	10.2	63.1	12.5	1.1	4.6	[14]2.8	[14]1.8	[15]3.7
	1957/58–1959/60	184.0	9.4	12.3	10.5	78.1	12.8	1.1	4.5	[14]2.6	[14]1.7	[15]4.8
	1960/61–1962/63	198.6	10.7	10.6	14.5	88.9	12.1	1.1	4.8	[14]2.7	[14]1.7	[15]5.4
	1963/64	213.8	14.5	13.8	10.6	102.7	13.0	1.3	5.0	[14]2.7	[14]1.7	[15]7.3

ANNEX TABLE 8A. – PER CAPUT FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (*concluded*)

	Period	Cereals [1]	Potatoes and other starchy foods [2]	Sugar [3]	Pulses, nuts and seeds [4]	Vegetables [5]	Meat [6]	Eggs [7]	Fish [8]	Milk [9]		Fats and oils
										Fat	Protein	
		Kilograms per caput per year										
AFRICA												
Ethiopia	1961	148.5	19.1	2.0	19.4	12.6	26.8	2.2	0.2	2.6	2.8	4.9
Madagascar	1962	160.4	[11]123.3	7.1	4.8	28.1	15.3	0.2	3.8	0.3	0.2	1.1
Mauritius	1955/56	131.1	16.7	39.3	11.5	28.4	5.5	0.1	6.3	1.4	1.5	9.4
	1957–59	131.2	16.3	37.1	10.6	28.6	5.3	1.3	5.6	1.4	1.6	10.1
	1960–62	130.2	13.0	38.7	11.3	31.9	5.8	1.5	5.5	1.8	2.0	12.5
	1963	131.5	12.9	37.6	10.1	41.8	6.6	1.6	4.9	1.2	2.4	13.7
	1964	133.4	13.0	38.2	11.6	29.6	6.7	1.7	5.9	1.3	2.6	12.5
Southern Rhodesia	1951–53	184.4	11.9	12.9	14.0	25.9	30.3	0.6	1.5	1.1	1.2	1.9
	1953	201.0	10.4	11.7	16.0	26.2	29.3	0.7	1.5	1.1	1.2	2.0
South Africa [10]	1935–39	155.7	15.7	21.2	2.1	25.5	37.8	1.8	3.3	2.9	2.6	3.3
	1948–50	155.8	15.9	42.0	3.3	34.3	42.0	2.6	5.5	2.8	2.8	4.9
	1951–53	161.4	12.9	38.8	3.2	34.6	39.6	2.9	7.6	2.7	2.7	5.6
	1954–56	149.3	14.0	39.4	3.9	38.0	43.3	3.2	8.4	2.9	2.9	5.5
	1957–59	154.8	15.7	42.5	4.2	36.3	44.5	3.2	8.2	3.0	2.9	5.7
	1960/61	166.4	14.4	41.0	4.1	36.3	44.5	3.2	8.8	2.9	2.9	5.4
Uganda	1961	61.1	[11]475.7	12.6	27.1	23.1	10.0	1.0	4.4	2.0	1.4	2.2
OCEANIA												
Australia	1936/37–1938/39	101.4	48.7	53.3	2.5	65.0	120.4	12.0	5.1	5.9	5.0	16.1
	1948/49–1950/51	96.9	49.6	53.4	5.4	66.0	109.5	11.8	4.5	6.5	6.4	14.7
	1951/52–1953/54	93.7	50.7	51.2	4.5	60.3	107.8	10.4	4.3	6.6	6.1	16.3
	1954/55–1956/57	92.6	45.9	51.8	4.1	61.3	112.1	10.3	4.4	7.1	6.3	16.1
	1957/58–1959/60	85.9	53.0	50.6	3.8	62.9	115.2	10.7	4.7	7.3	6.6	15.5
	1960/61–1962/63	83.6	47.1	49.5	4.4	63.5	108.7	11.9	5.2	7.4	6.9	14.6
	1963/64	85.2	46.8	49.4	4.1	63.9	110.7	12.1	5.4	7.5	7.2	14.5
New Zealand	1935–39	86.7	49.8	48.2	2.9	65.0	109.3	13.4	6.4	8.5	8.3	17.3
	1948–50	89.7	52.5	50.5	3.3	79.2	102.7	12.7	7.3	10.9	8.8	16.4
	1951–53	86.3	43.7	43.0	3.6	86.2	105.8	12.1	6.4	10.9	9.4	19.6
	1954–56	86.4	52.1	42.9	3.4	72.8	105.3	13.6	6.9	10.6	9.7	19.4
	1957–59	86.1	57.3	41.9	3.3	68.6	105.6	15.1	7.0	10.8	10.1	20.4
	1960–62	86.6	59.3	41.4	3.8	79.4	110.2	15.9	6.6	11.1	10.7	20.2
	1963	85.8	61.7	39.1	3.4	94.4	115.7	16.3	6.4	11.2	10.8	20.7
	1964	86.4	62.9	33.2	3.6	98.5	113.7	16.7	6.6	10.6	10.3	19.8

NOTE: A number of marked breaks in the series could not be avoided because of the large number of revisions currently made in connection with work on FAO's Indicative World Plan and with work on standardization going on simultaneously, particularly regarding the EEC member countries. All such breaks are indicated by the symbol +. These revisions are at present under consideration with the governments concerned, and it is hoped that, in the future, series consistent over time can again be published for all countries.

[1] In terms of flour and milled rice. – [2] Including sweet potatoes, cassava, and other starchy foods. – [3] In terms of refined sugar; crude sugar included on the basis of its calorie content; excluding syrups and honey. – [4] Shelled equivalent for nuts; including cocoa beans. – [5] In terms of fresh equivalent, but including also minor quantities of processed vegetables in terms of product weight. – [6] Including offal, poultry, and game; expressed in terms of carcass weight, excluding slaughter fats. – [7] Fresh egg equivalent. – [8] Estimated edible weight. – [9] Milk and milk products excluding butter, expressed in terms of fat and protein. – [10] From 1960 onward including the Saar. – [11] Including plantains. – [12] Including soybean curd in terms of soybean. – [13] India and Pakistan. – [14] Including milk for making butter. – [15] Excluding butter. – [16] Refers to fiscal year, April-March. – [17] Including "miso" and "shoyu" (soybean preparations) in terms of soybean. – [18] Series subject to revision. – [19] Split year starting July 1959.

ANNEX TABLE 8B. – ESTIMATED CALORIE AND FAT CONTENT OF NATIONAL AVERAGE FOOD SUPPLIES PER CAPUT

	Calories								Fats							
	Prewar	1948/-1950/	1951/-1953/	1954/-1956/	1957/-1959/	1960/-1962/	1963/64	1964/65	Prewar	1948/-1950/	1951/-1953/	1954/-1956/	1957/-1959/	1960/-1962/	1963/64	1964/65
	Number per day								*Grams per day*							
WESTERN EUROPE																
Austria	2 930	2 670	2 700	2 900	2 980	2 970	2 960	2 980	101.3	80.0	91.7	102.2	107.8	111.9	114.2	118.8
Belgium-Luxembourg	2 820	2 880	2 960	2 970	2 930	+ 3 040	+ 3 150	...	95.7	107.6	113.6	117.2	117.5	+ 138.6	+ 140.9	...
Denmark	3 450	3 240	3 330	3 340	3 360	3 370	3 360	3 330	150.7	125.2	141.6	145.7	158.7	155.8	157.4	157.8
Finland	3 000	[12] 980	3 070	3 160	3 110	3 110	3 070	...	87.9	[7] 98.6	105.7	112.6	109.6	114.4	116.5	...
France	2 880	2 800	2 840	2 890	2 940	+ 3 050	+ 3 070	...	91.6	89.5	95.3	103.1	108.6	+ 125.6	+ 129.7	...
Germany, Federal Republic of [2]	3 040	2 730	2 880	3 000	2 940	2 960	2 940	2 920	110.8	78.8	109.3	120.6	124.0	128.1	128.8	131.0
Greece [3]	2 600	2 490	2 600	2 880	2 990	2 940	2 960	...	68.8	65.4	70.4	82.2	85.9	88.1	93.5	...
Hungary [3]	...	...	...	...	...	3 020	[13] 020	...	...	...	...	...	...	99.4	[13] 99.6	...
Ireland [3]	3 400	3 430	3 460	3 460	3 420	3 490	3 480	...	106.6	116.7	121.0	125.1	126.6	131.6	133.3	...
Italy	2 510	2 350	2 480	2 470	2 570	2 730	2 810	2 810	58.9	51.6	60.1	62.0	70.1	79.9	85.7	86.8
Netherlands	2 960	2 890	2 900	2 940	2 950	+ 3 080	3 100	3 080	112.3	102.1	113.8	120.6	125.1	+ 128.6	139.1	143.1
Norway	3 210	3 110	3 100	3 160	3 010	2 930	2 970	2 920	120.3	122.0	129.6	135.7	131.8	128.0	135.0	132.3
Poland [3]	...	...	...	...	...	[5] 3 350	...	...	...	...	...	...	...	[5] 97.2	...	...
Portugal [3]	2 040	2 320	2 350	2 480	2 470	2 550	2 680	2 670	63.0	62.6	63.9	64.2	63.0	66.6	69.3	70.3
Romania [3]	...	...	...	...	...	[5] 3 040	...	...	...	...	...	...	...	[5] 60.8	...	...
Spain	...	...	[6] 2 490	2 520	2 590	2 810	2 850	...	...	...	[6] 72.2	74.0	78.2	89.3	98.5	...
Sweden	3 120	3 110	3 020	2 980	2 930	2 990	2 980	2 950	121.2	128.1	127.6	129.8	128.3	135.2	133.1	132.9
Switzerland	3 140	3 170	3 110	3 130	3 120	3 220	3 150	...	112.3	108.7	112.4	118.2	124.2	130.7	134.7	...
United Kingdom	3 110	3 130	3 110	3 260	3 280	3 280	3 280	3 300	129.8	124.1	127.3	139.4	141.3	143.4	146.8	147.4
Yugoslavia [3]	...	...	[7] 2 690	2 780	2 920	3 030	3 110	...	...	...	[7] 60.4	69.3	72.9	79.5	78.8	...
NORTH AMERICA																
Canada	3 020	3 110	3 040	3 080	3 040	3 020	3 060	3 090	119.2	130.2	134.2	135.8	136.9	136.6	139.0	140.3
United States [3]	3 280	3 180	3 130	3 140	3 100	3 100	3 110	3 140	130.2	138.6	136.2	143.6	142.0	142.7	144.7	147.9
FAR EAST																
Ceylon [3]	...	...	[7] 1 990	2 070	2 030	2 080	2 100	2 180	...	...	[7] 49.7	49.2	45.0	43.6	44.1	44.7
China (Taiwan) [3]	1 870	1 980	2 140	2 210	2 330	2 350	2 300	2 340	35.6	25.1	35.4	37.0	39.9	40.1	42.0	48.5
India	[4] 1 950	[4] 1 700	1 750	1 850	1 910	2 020	1 990	...	[8] 25.8	[12] 23.6	24.4	26.5	27.3	26.6	26.7	...
Japan [9]	2 020	1 910	1 930	2 070	2 170	2 230	2 280	2 320	18.8	10.6	21.4	25.8	30.2	36.3	41.7	44.0
Pakistan	[4] 1 950	[12] 2 020	2 000	1 990	1 980	2 090	2 220	...	[8] 25.8	[12] 22.2	24.3	24.0	22.0	31.5	32.0	...
Philippines [3]	...	...	[10] 1 690	1 730	1 760	1 840	1 990	1 990	...	...	[10] 19.0	22.5	25.7	30.0	27.6	27.0
NEAR EAST																
Afghanistan	...	...	...	...	...	[11] 2 050	...	...	...	...	...	...	...	[11] 29.7	...	...
Iran	...	...	...	...	...	[12] 2 050	...	...	...	...	...	...	...	[12] 37.8	...	...
Iraq	...	...	...	...	...	2 140	...	...	...	...	...	...	...	35.5	...	...

Israel	...	[18]2 680	2 780	2 860	2 780	2 820	2 830	...	...	[18]74.4	71.9	84.6	84.8	90.9	93.3	...
Jordan [3]	...	...	...	...	2 200	+ 2 230	2 050	2 280	...	...	...	...	39.1	+ 45.6	48.1	65.4
Lebanon [3]	...	...	...	...	...	+ 2 440	2 510	2 170	...	...	...	...	...	+ 63.3	78.8	58.3
Libya [8]	...	...	...	...	[5,14]2 100	...	...	...	...	...	...	...	[14]38.5	...	...	...
Sudan [3]	...	...	...	...	...	[5,15]2 030	...	...	...	...	...	...	...	[5 15]52.3	...	...
Syria [3]	...	...	...	...	...	2 340	...	...	...	...	...	...	...	48.2	...	...
Turkey	2 550	2 510	2 730	2 780	2 820	[16]3 110	...	...	48.4	43.2	48.7	47.7	49.5	[15]53.8	...	...
United Arab Republic	...	2 360	2 340	2 470	2 530	2 690	2 930	...	...	38.5	36.0	37.0	39.5	42.1	49.1	...
AFRICA																
Ethiopia [3]	...	...	...	...	...	[17]2 110	...	...	...	...	...	...	...	[17]43.2	...	...
Madagascar [3]	...	...	...	...	...	[4]2 210	...	...	...	...	...	...	...	[4]16.8	...	...
Mauritius [3]	...	...	...	[18]2 250	2 230	2 330	2 370	2 380	...	...	...	[18]38.7	40.9	49.6	52.0	49.7
Southern Rhodesia [9]	...	...	2 450	...	...	...	...	...	...	...	52.4	...	...	...	...	...
South Africa [3]	2 340	2 640	2 680	2 610	2 730	[16]2 820	...	...	53.9	63.3	64.8	64.4	67.0	[16]68.0	...	...
Uganda [3]	...	...	...	...	...	[17]2 240	...	...	...	...	...	...	...	[17]39.0	...	...
OCEANIA																
Australia	3 300	3 240	3 170	3 230	3 210	3 140	3 160	...	128.7	121.2	124.8	133.2	135.4	132.7	132.1	...
New Zealand [3]	3 260	3 360	3 350	3 400	3 430	3 490	3 520	3 410	135.3	140.8	149.1	149.8	153.0	157.2	161.3	156.5
LATIN AMERICA [3]																
Argentina	2 780	3 240	2 980	3 070	3 090	2 820	2 660	...	100.8	109.4	111.7	122.0	117.3	109.1	109.8	...
Bolivia	...	...	...	...	...	[4]1 810	...	...	...	...	...	...	...	[4]28.2	...	...
Brazil	2 190	[14]2 280	2 380	2 600	2 590	2 780	2 850	...	54.9	[19]45.9	48.5	51.9	56.0	60.1	62.3	...
Chile	2 250	2 420	[20]2 450	2 550	2 380	+ 2 410	2 370	...	41.0	46.5	[20]53.2	52.6	60.1	+ 52.1	56.4	...
Colombia	...	...	...	...	1 990	+ 2 170	2 130	...	...	...	...	...	45.3	+ 42.5	42.9	...
Costa Rica	...	...	...	...	...	...	[21]2 460	...	...	...	...	...	...	...	[21]49.7	...
Dominican Republic	...	...	...	...	[14]2 040	...	...	...	...	...	...	...	[14]45.9	...	...	...
Ecuador	...	...	...	2 050	1 780	+ [22]1 890	...	...	...	...	...	35.9	39.3	+ [22]32.6	...	...
El Salvador	...	...	...	...	...	2 030	2 120	...	...	...	...	...	...	41.9	48.0	...
Guatemala	...	...	...	...	...	2 040	2 160	...	...	...	...	...	...	34.2	35.4	...
Honduras	...	...	...	...	...	2 080	2 070	...	...	...	...	...	...	31.7	32.0	...
Jamaica	...	...	...	...	[23]2 250	...	...	...	...	...	...	...	[23]49.8	...	...	...
Mexico	...	...	...	2 360	2 410	2 610	2 640	...	...	...	...	59.4	62.0	71.2	72.7	...
Panama	...	...	...	...	...	2 310	2 270	...	...	...	...	...	...	57.7	54.9	...
Paraguay	...	...	...	...	2 580	2 560	2 580	...	...	...	...	...	48.2	50.7	50.9	...
Peru	...	...	[24]2 270	...	2 180	+ 2 230	[21]2 240	...	...	...	[21]42.9	...	44.1	+ 34.6	[21]40.8	...
Surinam	...	...	...	...	[25]2 000	1 980	[21]1 930	2 310	...	...	...	...	[24]43.0	46.1	[21]50.5	56.4
Uruguay	...	[18]2 900	[7]2 950	2 960	3 020	[17]2 970	...	...	...	[10]115.9	[7]120.0	119.6	135.7	[17]124.5	...	...
Venezuela	...	...	[7]2 020	1 940	2 070	2 310	2 360	...	...	...	[7]38.8	40.4	47.0	57.6	59.6	...

+ = marked break in the series; see note at the end of Annex table 8A.

[1] 1949/50-1950/51. – [2] From 1959/60 onward, including the Saar. – [3] Calendar years instead of split years. – [4] 1962. – [5] 1961-63. – [6] 1952/53-1953/54. – [7] 1952 53. – [8] India and Pakistan. – [9] Refers to fiscal year, April-March. – [10] 1953. – [11] 1961/62. – [12] 1960. – [13] 1950/51. – [14] 1959. – [15] Including adjustment for food gathering and unreported food imports. – [16] 1960/61. – [17] 1961. – [18] 1955/56. – [19] 1948-50. – [20] 1951/52. – [21] 1963. – [22] 1960/61. – [23] 1958. – [24] 1952. – [25] 1958/59.

ANNEX TABLE 8C. – ESTIMATED PROTEIN CONTENT OF NATIONAL AVERAGE FOOD SUPPLIES PER CAPUT

	Total protein								Animal protein							
	Prewar	1948/-1950/	1951/-1953/	1954/-1956/	1957/-1959/	1960/-1962/	1963/64	1964/65	Prewar	1948/-1950/	1951/-1953/	1954/-1956/	1957/-1959/	1960/-1962/	1963/64	1964/65
	Grams per day															
WESTERN EUROPE																
Austria	88.3	77.3	80.3	85.3	87.3	86.8	86.5	86.7	40.9	30.3	37.8	42.2	44.9	47.5	48.3	49.0
Belgium-Luxembourg	83.7	83.4	86.4	87.7	87.7	+ 85.3	+ 91.1	...	35.3	37.8	40.9	43.7	46.7	+ 45.8	+ 51.0	...
Denmark	93.2	104.8	94.6	89.0	90.5	93.5	94.5	93.1	56.8	60.0	53.5	50.3	54.7	58.0	58.6	58.5
Finland	95.2	[1]96.2	96.4	97.6	94.0	93.9	95.1	...	43.8	[1]51.6	52.9	55.0	52.7	54.6	58.0	...
France	94.9	92.4	92.8	95.3	97.5	+ 99.4	+ 100.3	...	40.9	40.3	43.0	47.2	52.0	+ 55.8	+ 58.0	...
Germany, Federal Republic of [2]	84.8	79.5	77.4	79.1	79.3	80.3	80.3	80.4	42.5	32.1	39.0	43.5	46.1	49.2	50.3	51.1
Greece [3]	83.6	76.3	78.4	90.7	95.8	96.3	98.0	...	23.0	16.6	18.3	24.1	27.4	31.3	35.9	...
Hungary [3]	..	...	...	...	...	91.2	[4]90.9	...	...	...	...	...	...	37.0	[4]37.1	...
Ireland [2]	98.5	100.6	95.0	94.6	90.6	92.0	91.6	...	47.4	47.6	48.0	49.8	51.1	54.9	55.5	...
Italy	76.6	69.7	71.9	72.7	76.4	79.6	81.8	81.5	20.3	19.3	21.3	23.6	26.6	29.8	31.9	32.3
Netherlands	82.3	80.6	80.4	80.5	79.2	+ 80.4	84.6	84.6	40.1	39.7	40.9	43.4	44.2	+ 45.8	51.2	51.7
Norway	89.7	101.8	93.2	88.4	83.8	81.3	82.2	81.6	49.1	55.4	52.6	50.1	49.1	48.8	50.7	50.4
Poland [2]	...	...	...	...	...	[5]92.9	...	...	...	...	...	...	...	[5]40.4	...	...
Portugal [3]	59.4	66.6	68.5	70.0	69.7	72.6	75.9	76.6	20.4	20.9	22.7	24.4	25.4	27.2	27.0	28.7
Romania [2]	...	...	...	..	...	[5]92.2	...	...	...	...	...	...	...	[5]27.7	...	...
Spain	...	...	[6]69.8	70.2	71.1	77.1	78.6	...	...	...	[6]17.8	19.3	20.1	23.4	28.0	...
Sweden	91.9	86.7	86.5	83.5	81.2	82.7	83.5	83.1	55.4	52.3	54.1	53.3	52.4	54.3	55.5	55.6
Switzerland	95.7	95.9	93.5	93.0	90.3	90.3	89.3	...	53.9	50.8	51.0	52.1	51.0	51.3	52.3	...
United Kingdom	80.2	90.3	84.7	85.6	86.3	89.0	89.9	89.8	43.9	45.1	44.9	49.6	51.0	53.4	53.7	54.0
Yugoslavia [3]	...	...	[7]86.5	89.1	95.6	96.5	97.2	...	...	...	[7]19.2	21.6	25.9	25.5	24.2	...
NORTH AMERICA																
Canada	84.6	93.4	90.6	93.8	92.3	91.3	92.9	94.8	47.9	57.2	57.4	61.2	61.3	60.4	61.2	63.2
United States [3]	86.3	89.2	89.8	92.2	91.9	91.2	92.2	93.4	51.7	59.6	61.1	64.8	64.9	64.2	65.5	66.6
FAR EAST																
Ceylon [3]	...	...	[7]43.4	44.4	44.6	44.4	45.9	38.1	...	...	[7]8.3	7.8	8.7	8.0	8.1	8.9
China (Taiwan) [3]	45.1	43.3	50.0	53.0	56.9	58.5	58.7	59.5	15.5	8.3	11.7	13.2	14.4	15.3	16.8	17.5
India	[8]52.2	[1]45.4	47.1	49.8	50.9	51.5	50.1	...	[8]8.2	[1]5.4	5.8	6.1	6.4	6.0	6.4	...
Japan [9]	59.7	49.4	60.0	65.5	67.9	69.3	72.4	73.6	7.7	8.6	10.9	13.3	13.9	16.9	20.4	21.8
Pakistan	[8]52.2	[1]44.4	46.2	46.6	46.0	45.5	50.6	...	[8]8.2	[1]7.6	7.9	8.1	7.3	7.7	9.7	...
Philippines [3]	...	...	[10]41.3	43.0	43.8	44.4	46.1	47.9	...	...	[10]13.3	14.5	15.1	14.4	13.7	16.1
NEAR EAST																
Afghanistan	...	...	...	...	...	[11]68.4	...	...	...	...	...	...	...	[11]15.8	...	...
Iran	...	...	...	...	...	[12]59.6	...	...	...	...	...	...	...	[12]13.4	...	...
Iraq	...	...	...	...	...	61.9	...	...	...	...	...	...	...	17.6	...	...

Israel	...	[13]87.6	85.0	87.9	84.5	84.4	87.5	...	...	[12]33.1	26.4	30.6	33.6	36.3	39.8	...
Jordan [2]	...	...	...	...	62.0	+ 62.4	51.6	56.3	...	...	...	...	10.4	+ 10.8	8.1	7.8
Lebanon [3]	...	...	...	...	...	+ 68.3	73.1	66.3	...	...	...	...	...	+ 19.1	28.4	26.5
Libya [2]	...	...	...	...	[14]52.8	...	...	...	...	...	...	...	[14]10.4	...	...	...
Sudan [5]	...	...	...	...	...	[6, 15]69.3	...	...	...	...	...	...	...	[5, 15]23.9	...	...
Syria [3]	...	...	...	...	...	68.1	...	...	...	...	...	...	...	12.2	...	...
Turkey	83.4	80.9	88.4	88.1	90.5	[16]97.5	...	...	17.3	15.3	16.8	14.6	15.3	[16]15.9	...	...
United Arab Republic	...	69.4	67.8	71.7	73.5	79.0	84.1	...	...	12.5	10.7	12.2	11.9	12.2	12.6	...
AFRICA																
Ethiopia [3]	...	...	...	...	...	[17]71.1	...	...	...	...	...	...	...	[17]19.5	...	.
Madagascar [3]	...	...	...	...	...	[4]48.2	...	...	...	...	...	...	...	[4]8.0	...	..
Mauritius [3]	...	...	...	[18]46.1	45.9	47.0	49.1	50.6	...	...	...	[18]10.5	10.7	12.3	13.4	14.4
Southern Rhodesia [3]	...	...	75.2	...	...	...	...	...	...	...	16.2	...	...	...	...	...
South Africa [3]	67.8	72.8	74.0	73.7	77.1	[16]80.4	...	...	23.4	27.2	27.4	30.1	31.3	[16]31.6	...	...
Uganda [3]	...	...	...	...	...	[17]54.4	...	...	...	...	...	...	...	[17]10.4	...	...
OCEANIA																
Australia	103.3	97.4	92.3	91.1	91.4	89.8	91.7	...	66.6	66.0	61.5	59.1	60.9	59.7	61.5	...
New Zealand [3]	100.7	99.8	102.5	103.8	105.5	109.4	112.0	110.1	67.8	66.5	69.4	70.4	71.8	74.8	77.2	75.2
LATIN AMERICA [3]																
Argentina	96.5	110.4	97.1	96.9	97.8	81.6	77.2	...	59.6	66.1	59.4	58.2	56.9	52.4	52.9	...
Bolivia	...	...	...	...	...	[5]47.3	...	...	...	...	...	...	...	[5]11.5	...	...
Brazil	63.8	[19]54.6	57.7	61.3	60.2	66.3	68.6	...	27.9	[19]15.6	17.1	17.0	17.6	18.0	18.9	...
Chile	69.6	74.8	[20]75.1	80.1	77.4	+ 77.2	79.4	...	21.4	25.5	[20]26.0	29.0	28.8	+ 27.3	29.0	...
Colombia	...	...	...	...	45.7	+ 49.3	48.6	...	...	...	...	...	20.5	+ 22.8	23.6	...
Costa Rica	...	...	...	...	...	...	[21]53.8	..	...	...	...	...	...	...	[21]20.3	...
Dominican Republic	...	...	...	...	[14]49.7	...	...	...	...	...	...	...	[14]19.2	...	...	...
Ecuador	...	...	...	49.6	45.2	+ [22]48.5	...	...	...	...	...	13.0	15.0	+ [22]17.0	...	...
El Salvador	...	...	...	...	...	56.7	58.0	...	...	...	...	...	...	15.1	14.9	...
Guatemala	...	...	...	...	...	54.3	58.0	...	...	...	...	...	...	8.7	8.7	...
Honduras	...	...	...	...	...	53.6	53.0	...	...	...	...	...	...	12.7	12.3	...
Jamaica	...	...	...	...	[23]57.9	...	...	...	...	...	...	...	[23]22.5	...	...	...
Mexico	...	...	...	63.3	66.6	72.0	73.4	...	...	...	...	16.6	19.7	23.4	23.8	...
Panama	...	...	...	...	...	58.1	59.3	...	...	...	...	...	...	23.5	25.1	...
Paraguay	...	...	...	...	64.6	64.0	66.0	...	...	...	...	...	24.6	24.6	23.7	...
Peru	...	...	[24]59.7	...	54.9	+ 57.6	[21]57.1	...	...	...	[25]13.7	...	13.4	+ 18.0	[21]15.3	...
Surinam	...	...	...	...	[25]44.2	44.5	[21]42.9	51.2	...	...	...	...	[25]14.0	15.1	[21]14.6	15.3
Uruguay	...	[19]95.4	[7]99.2	95.9	94.6	[17]94.5	...	...	...	[19]61.3	[7]66.4	61.5	62.1	[17]61.9	...	...
Venezuela	...	...	[7]53.4	51.3	57.4	58.7	58.2	...	...	...	[7]19.2	16.7	22.8	22.9	23.3	...

+ = marked break in the series; see note at the end of Annex table 8A.

[1] 1949/50-1950/51. – [2] From 1959/60 onward, including the Saar. – [3] Calendar years instead of split years. – [4] 1962. – [5] 1961-63. – [6] 1952/53-1953/54. – [7] 1952/53. – [8] India and Pakistan. – [9] Refers to fiscal year, April-March. – [10] 1953. – [11] 1961/62. – [12] 1960. – [13] 1950/51. – [14] 1959. – [15] Including adjustment for food gathering and unreported food imports. – [16] 1960/61. – [17] 1961. – [18] 1955/56. – [19] 1948-50. – [20] 1951/52. – [21] 1963. – [22] 1960/61. – [23] 1958. – [24] 1952. – [25] 1958/59.

ANNEX TABLE 9A. – VOLUME OF WORLD [1] EXPORTS OF MAJOR AGRICULTURAL COMMODITIES

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons											
Wheat and wheat flour (wheat equivalent)	15.30	24.92	26.68	33.60	27.66	29.35	33.25	40.79	36.95	45.27	54.26	52.20
Barley	1.76	3.23	5.92	5.89	6.50	6.18	4.93	6.19	5.67	5.04	7.14	6.06
Maize	9.22	4.35	5.60	11.98	8.80	9.99	11.11	12.47	17.52	19.18	19.86	22.33
Oats	0.72	1.23	1.42	1.34	1.46	1.40	1.29	1.22	1.34	1.21	1.42	1.70
Millet and sorghums	0.28	1.45	1.23	3.03	2.57	3.28	3.04	2.38	3.86	3.93	3.84	6.05
Rice (milled equivalent) [2]	9.67	4.40	4.85	5.28	4.95	4.76	5.50	5.69	5.47	6.23	6.25	6.20
Sugar (raw equivalent) [3]	9.63	10.75	13.02	15.30	14.35	13.34	16.10	17.16	15.55	15.07	15.54	16.70
Potatoes	1.19	2.00	2.10	2.48	2.62	2.38	2.38	2.35	2.66	2.41	2.40	2.87
Apples	0.69	0.57	0.89	1.26	0.85	1.29	1.24	1.39	1.51	1.23	1.39	1.53
Bananas	2.48	2.34	3.04	3.80	3.53	3.68	3.89	3.99	3.90	4.05	4.22	4.90
Citrus fruit [4]	1.86	1.88	2.63	3.21	2.78	3.09	3.34	3.23	3.59	3.28	4.14	3.64
Vegetable oils and oilseeds (oil equivalent) [5]	3.65	3.14	3.99	4.71	4.31	4.49	4.86	4.76	5.14	5.18	5.37	5.41
Oilseed cake and meal	2.32	1.84	3.00	4.76	3.84	4.54	4.32	4.97	6.12	6.66	7.12	7.91
Cattle [6]	1.91	1.69	2.09	3.17	3.14	2.63	2.82	3.67	3.58	3.65	3.25	3.56
Meat [7]	1.14	0.94	1.20	1.64	1.48	1.57	1.56	1.61	1.99	2.30	2.26	2.14
Milk (condensed, evaporated and powdered)	0.30	0.61	0.73	0.92	0.80	0.91	0.90	0.97	1.04	1.21	1.39	1.37
Eggs (in the shell)	0.25	0.24	0.34	0.39	0.39	0.43	0.42	0.39	0.34	0.29	0.23	0.19
Coffee (green)	1.64	1.93	2.10	2.57	2.19	2.55	2.61	2.67	2.80	3.03	2.73	2.75
Cocoa beans	0.68	0.67	0.73	0.86	0.64	0.75	0.90	1.00	1.03	1.03	1.03	1.18
Tea	0.36	0.41	0.47	0.51	0.52	0.49	0.49	0.51	0.54	0.54	0.53	0.53
Wine	1.93	1.61	2.39	2.61	2.75	2.38	2.62	2.60	2.69	2.21	2.41	2.21
Tobacco (unmanufactured)	0.48	0.54	0.63	0.70	0.66	0.64	0.68	0.76	0.78	0.77	0.83	0.83
Wool (actual weight)	0.96	1.05	1.14	1.34	1.15	1.37	1.31	1.42	1.43	1.41	1.31	1.36
Cotton (lint)	2.88	2.37	2.67	3.04	2.65	2.79	3.50	3.28	2.97	3.38	3.46	3.17
Jute	0.79	0.85	0.91	0.80	0.95	0.89	0.77	0.61	0.77	0.78	0.85	0.79
Rubber (natural) [8]	0.98	1.67	1.89	2.15	1.97	2.27	2.01	2.21	2.30	2.13	2.23	2.23

[1] Including exports from the rest of the world to the U.S.S.R., eastern Europe and China (Mainland), but excluding exports from these countries. – [2] Including paddy converted at 65 percent. – [3] Including refined sugar converted at 108.7 percent. – [4] Oranges, mandarines and lemons. – [5] Excluding re-exports of copra from Malaysia, but including unrecorded shipments of copra from Indonesia and the Philippines to Malaysia. – [6] Million head. – [7] Beef and veal, mutton and lamb, pork. – [8] Excluding imports into Malaysia for re-export and exports from Hong Kong, but including unrecorded shipments from Indonesia to Malaysia.

ANNEX TABLE 9B. – VOLUME OF REGIONAL EXPORTS OF MAJOR AGRICULTURAL COMMODITIES

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons											
WESTERN EUROPE												
Wheat and wheat flour (wheat equivalent)	1.39	0.75	2.43	3.57	3.88	3.76	3.35	3.16	3.68	4.92	5.09	6.93
Barley	0.15	0.24	0.80	1.33	0.77	0.64	1.05	2.51	1.69	2.31	3.16	2.60
Maize	0.50	0.38	0.13	0.64	0.61	0.37	0.81	1.08	0.34	0.94	1.35	1.86
Sugar (raw equivalent) [1]	0.85	1.37	1.71	1.40	1.37	1.34	1.57	1.47	1.26	1.59	1.45	1.47
Potatoes	0.86	1.34	1.52	1.78	2.03	1.70	1.58	1.75	1.83	1.64	1.68	2.18
Apples	0.19	0.31	0.56	0.72	0.38	0.79	0.71	0.84	0.88	0.54	0.71	0.86
Citrus fruit [2]	0.97	0.91	1.18	1.45	1.20	1.35	1.48	1.49	1.73	1.21	2.01	1.39
Vegetable oils and oilseeds (oil equivalent) [3]	0.50	0.18	0.29	0.34	0.27	0.29	0.42	0.36	0.38	0.35	0.36	0.30
Oilseed cake and meal	0.45	0.19	0.61	0.80	0.61	0.77	0.77	0.91	0.92	0.89	1.07	1.11
Cattle [4]	0.90	0.73	1.16	1.43	1.34	1.26	1.38	1.80	1.37	1.85	1.85	1.76
Meat (fresh, chilled and frozen) [5]	0.05	0.09	0.22	0.40	0.25	0.31	0.40	0.45	0.59	0.65	0.58	0.65
Bacon, ham and salted pork	0.26	0.14	0.28	0.34	0.30	0.31	0.37	0.36	0.37	0.35	0.35	0.36
Milk (condensed, evaporated and powdered)	0.24	0.26	0.40	0.58	0.46	0.51	0.58	0.64	0.69	0.72	0.75	0.90
Butter	0.27	0.20	0.22	0.24	0.25	0.21	0.25	0.26	0.23	0.24	0.23	0.27
Cheese	0.14	0.16	0.24	0.33	0.29	0.32	0.33	0.34	0.36	0.38	0.39	0.42
Eggs (in the shell)	0.20	0.17	0.27	0.31	0.31	0.34	0.32	0.30	0.28	0.24	0.19	0.15
Wine	0.50	0.46	0.73	0.91	1.13	0.72	0.84	0.96	0.90	1.14	1.12	1.00
Wool (actual weight)	0.11	0.05	0.08	0.10	0.08	0.11	0.11	0.12	0.12	0.13	0.10	0.11
EASTERN EUROPE AND U.S.S.R.												
Wheat and wheat flour (wheat equivalent)	...	...	[7]3.34	5.36	4.11	6.34	5.86	5.29	5.19	4.60	2.51	...
Barley	...	...	[7]0.95	0.56	0.38	0.19	0.43	1.18	0.61	0.69	0.76	...
Maize	...	...	[7]0.70	0.94	0.73	0.27	0.60	1.19	1.94	1.48	0.96	...
Rye [6]	...	...	[7]0.55	0.82	0.46	0.55	0.68	1.09	1.30	0.82	0.15	...
Sugar (raw equivalent) [1]	...	...	[7]0.77	2.03	1.10	1.36	1.33	3.21	3.17	2.19	1.70	...
Potatoes	...	...	[7]0.10	0.36	0.17	0.31	0.25	0.40	0.66	0.46	1.18	...
Sunflowerseed [6]	...	...	[7]0.05	0.07	0.05	0.06	0.07	0.08	0.11	0.10	0.11	...
Oilseed cake and meal	...	...	[7]0.19	0.46	0.38	0.60	0.53	0.42	0.37	0.25	0.08	...
Meat (fresh, chilled and frozen) [5]	...	...	[7]0.07	0.15	0.07	0.21	0.10	0.15	0.22	0.22	0.18	...
Butter	...	...	[7]0.03	0.09	0.06	0.11	0.08	0.09	0.11	0.10	0.06	...
Eggs	...	...	[7]0.05	0.09	0.06	0.07	0.10	0.13	0.11	0.08	0.08	...
Cotton	...	...	[7]0.33	0.36	0.32	0.35	0.39	0.39	0.35	0.32	0.39	...
Flax	...	...	[7]0.03	0.07	0.05	0.09	0.07	0.07	0.07	0.05	0.03	...
NORTH AMERICA												
Wheat and wheat flour (wheat equivalent)	6.08	18.39	17.18	23.38	19.18	19.64	23.29	29.84	24.98	31.11	37.45	31.63
Barley	0.50	1.44	2.80	3.21	4.25	3.83	3.01	2.40	2.58	1.62	2.48	2.11
Maize	0.80	2.31	3.13	6.79	4.57	5.59	5.61	7.35	10.81	11.12	12.14	15.21
Millet and sorghums	—	1.14	0.86	2.27	1.88	2.59	2.46	1.64	2.79	2.94	2.55	5.32
Rice (milled equivalent) [8]	0.07	0.54	0.67	0.79	0.57	0.68	0.87	0.80	1.05	1.20	1.33	1.31
Citrus fruit [2]	0.17	0.24	0.40	0.29	0.27	0.33	0.29	0.30	0.27	0.26	0.30	0.33
Soybeans and soybean oil (oil equivalent)	0.01	0.22	0.43	1.01	0.79	0.96	1.14	0.88	1.29	1.29	1.47	1.57
Linseed and linseed oil (oil equivalent)	—	0.08	0.23	0.17	0.17	0.19	0.19	0.18	0.14	0.14	0.21	0.20
Oilseed cake and meal	0.29	0.20	0.56	0.87	0.44	0.93	0.83	0.79	1.37	1.69	1.95	2.46
Milk (condensed, evaporated and powdered)	0.03	0.25	0.21	0.23	0.22	0.25	0.21	0.23	0.23	0.35	0.47	0.31
Tobacco (unmanufactured)	0.20	0.22	0.24	0.24	0.23	0.23	0.24	0.24	0.23	0.25	0.26	0.23
Cotton (lint)	1.29	1.04	0.95	1.19	1.04	0.83	1.73	1.45	0.87	0.99	1.19	0.86

ANNEX TABLE 9B. – VOLUME OF REGIONAL EXPORTS OF MAJOR AGRICULTURAL COMMODITIES (*continued*)

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons											
OCEANIA												
Wheat and wheat flour (wheat equivalent)	2.80	3.09	2.68	3.78	1.42	2.68	3.60	6.41	4.79	6.69	6.83	7.25
Barley	0.07	0.26	0.57	0.59	0.32	0.88	0.38	0.95	0.40	0.28	0.39	0.38
Oats	—	0.19	0.15	0.28	0.07	0.38	0.22	0.47	0.27	0.31	0.37	0.31
Sugar (raw equivalent) [1]	0.56	0.47	0.87	1.03	0.89	0.84	1.04	0.99	1.38	1.44	1.61	1.47
Copra and coconut oil (oil equivalent)	0.13	0.13	0.16	0.17	0.16	0.17	0.18	0.18	0.18	0.18	0.19	0.17
Beef and veal	0.15	0.13	0.23	0.30	0.28	0.32	0.25	0.26	0.37	0.40	0.43	0.40
Mutton and lamb	0.27	0.30	0.32	0.39	0.34	0.39	0.42	0.41	0.41	0.43	0.48	0.44
Butter	0.24	0.21	0.22	0.25	0.24	0.28	0.22	0.25	0.24	0.27	0.28	0.27
Cheese	0.10	0.12	0.11	0.11	0.10	0.10	0.10	0.11	0.12	0.12	0.12	0.11
Wool (actual weight)	0.49	0.66	0.70	0.85	0.73	0.87	0.85	0.89	0.92	0.92	0.90	0.93
LATIN AMERICA												
Wheat and wheat flour (wheat equivalent	3.44	2.00	3.22	2.28	2.45	2.48	2.50	1.10	2.87	1.97	4.31	5.82
Maize	6.61	1.20	1.18	2.47	1.74	2.74	3.11	1.79	3.00	3.36	3.47	2.95
Millet and sorghums	0.04	0.08	0.09	0.38	0.34	0.33	0.20	0.39	0.67	0.64	0.89	0.30
Rice (milled equivalent) [8]	0.10	0.25	0.17	0.21	0.17	0.12	0.13	0.34	0.31	0.18	0.15	0.40
Sugar (raw equivalent) [1,9]	4.05	7.06	7.86	9.37	8.84	8.17	10.01	10.92	8.93	7.68	8.05	9.43
Bananas	2.04	1.92	2.37	2.99	2.79	2.94	3.11	3.10	3.02	3.13	3.17	3.73
Linseed and linseed oil (oil equivalent)	0.55	0.19	0.18	0.24	0.18	0.24	0.21	0.27	0.29	0.26	0.22	0.26
Oilseed cakes and meal	0.42	0.94	0.76	1.19	1.35	0.97	0.94	1.27	1.42	1.40	1.25	1.60
Cattle [4]	0.42	0.30	0.36	0.79	0.71	0.61	0.66	0.85	1.13	0.96	0.62	0.73
Beef and veal	0.51	0.27	0.27	0.42	0.46	0.42	0.37	0.37	0.49	0.65	0.60	0.48
Coffee (green)	1.40	1.61	1.58	1.81	1.56	1.87	1.85	1.83	1.91	2.06	1.81	1.82
Cocoa beans	0.21	0.18	0.21	0.19	0.19	0.17	0.23	0.19	0.15	0.18	0.17	0.17
Tobacco (unmanufactured)	0.06	0.07	0.07	0.10	0.08	0.08	0.09	0.11	0.12	0.13	0.14	0.15
Wool (actual weight)	0.19	0.18	0.18	0.20	0.18	0.20	0.19	0.23	0.22	0.19	0.15	0.16
Cotton (lint)	0.34	0.39	0.65	0.74	0.59	0.73	0.61	0.76	1.01	0.98	0.89	0.95
FAR EAST, excluding China (Mainland)												
Maize	0.63	0.07	0.19	0.57	0.32	0.45	0.72	0.72	0.64	0.89	1.32	0.71
Rice (milled equivalent) [8]	8.96	3.05	3.38	3.62	3.32	3.55	3.83	3.86	3.55	4.16	4.00	3.83
Sugar (raw equivalent) [1]	3.31	1.01	1.92	2.09	1.98	1.81	2.19	2.19	2.27	2.58	2.56	2.53
Vegetable oils and oilseeds (oil equivalent) [3,10]	1.52	1.23	1.36	1.27	1.22	1.12	1.30	1.40	1.32	1.44	1.43	1.37
Oilseed cakes and meal	0.88	0.19	0.44	0.97	0.60	1.00	0.90	1.01	1.37	1.55	1.59	1.39
Coffee (green)	0.10	0.02	0.07	0.11	0.08	0.08	0.09	0.16	0.13	0.17	0.10	0.10
Tea	0.36	0.39	0.45	0.46	0.49	0.45	0.45	0.46	0.48	0.48	0.47	0.45
Cotton (lint)	0.65	0.27	0.25	0.14	0.18	0.13	0.14	0.11	0.15	0.23	0.24	0.25
Jute	0.79	0.84	0.91	0.79	0.94	0.89	0.77	0.61	0.77	0.77	0.84	0.78
Rubber (natural) [11]	0.95	1.61	1.78	2.00	1.83	2.12	1.85	2.06	2.14	1.97	2.06	2.07
NEAR EAST												
Wheat and wheat flour (wheat equivalent)	0.24	0.27	0.66	0.23	0.27	0.45	0.08	0.06	0.30	0.23	0.26	0.22
Barley	0.38	0.46	0.73	0.35	0.58	0.26	0.02	0.16	0.76	0.54	0.29	0.39
Rice (milled equivalent) [8]	0.15	0.27	0.21	0.23	0.41	0.05	0.31	0.23	0.14	0.38	0.53	0.34
Potatoes	0.02	0.06	0.10	0.19	0.11	0.19	0.24	0.15	0.26	0.21	0.20	0.20
Citrus fruit [2]	0.30	0.20	0.28	0.45	0.39	0.46	0.51	0.40	0.49	0.62	0.56	0.63
Oilseed cake and meal	0.26	0.12	0.24	0.34	0.31	0.31	0.29	0.35	0.43	0.51	0.54	0.60
Cotton (lint)	0.47	0.47	0.56	0.67	0.54	0.76	0.72	0.66	0.68	0.85	0.81	0.77

ANNEX TABLE 9B. – VOLUME OF REGIONAL EXPORTS OF MAJOR AGRICULTURAL COMMODITIES (*concluded*)

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons											
AFRICA												
Wheat and wheat flour (wheat equivalent)[12]	0.57	0.31	0.43	0.25	0.36	0.26	0.34	0.12	0.18	0.19	0.16	0.16
Barley	0.21	0.55	0.44	0.15	0.25	0.25	0.16	0.04	0.07	0.25	0.28	0.27
Maize	0.66	0.36	0.95	1.50	1.56	0.83	0.87	1.54	2.73	2.85	1.57	1.60
Sugar (raw equivalent)[1]	0.68	0.71	1.02	1.19	1.18	1.12	0.99	1.20	1.46	1.66	1.66	1.65
Bananas	0.14	0.22	0.36	0.40	0.39	0.37	0.38	0.43	0.43	0.46	0.45	0.45
Citrus fruit[2]	0.15	0.40	0.61	0.82	0.71	0.75	0.88	0.83	0.92	0.92	1.04	1.04
Groundnuts and groundnut oil (oil equivalent)	0.24	0.25	0.40	0.51	0.52	0.50	0.44	0.54	0.55	0.57	0.58	0.58
Palm kernels and palm kernel oil (oil equivalent)	0.30	0.34	0.36	0.36	0.39	0.38	0.36	0.35	0.32	0.32	0.33	0.33
Palm oil	0.24	0.33	0.37	0.36	0.37	0.40	0.39	0.36	0.30	0.30	0.30	0.26
Oilseed cake and meal	0.02	0.19	0.37	0.57	0.50	0.55	0.56	0.62	0.59	0.59	0.68	0.73
Cattle[4]	0.18	0.23	0.24	0.24	0.21	0.18	0.25	0.25	0.29	0.25	0.22	0.22
Coffee (green)	0.13	0.28	0.43	0.64	0.54	0.59	0.66	0.67	0.74	0.77	0.81	0.81
Cocoa beans	0.46	0.48	0.51	0.66	0.44	0.56	0.65	0.80	0.85	0.82	0.84	0.99
Wine	1.40	1.13	1.63	1.66	1.52	1.63	1.76	1.62	1.76	1.02	1.26	1.17
Tobacco (unmanufactured)	0.03	0.06	0.08	0.10	0.08	0.09	0.11	0.11	0.12	0.12	0.13	0.14
Cotton (lint)	0.13	0.19	0.24	0.26	0.27	0.29	0.27	0.27	0.20	0.27	0.28	0.29
Sisal	0.16	0.22	0.29	0.37	0.34	0.36	0.37	0.36	0.40	0.40	0.39	0.39
Rubber (natural)	0.01	0.06	0.10	0.14	0.13	0.14	0.15	0.14	0.15	0.15	0.16	0.15

[1] Including refined sugar converted at 108.7 percent. – [2] Oranges, mandarines and lemons. – [3] Groundnuts, copra, palm kernels, soybeans, olive oil, groundnut oil, coconut oil, palm kernel oil, soybean oil. – [4] Million head. – [5] Beef and veal, mutton and lamb, pork. – [6] U.S.S.R. only. – [7] Average 1955-57. – [8] Including paddy converted at 65 percent. – [9] Excluding trade between the United States and its territories. – [10] Excluding re-export of copra from Malaysia, but including unrecorded shipments of copra from Indonesia and the Philippines to Malaysia. – [11] Excluding imports into Malaysia for re-export and exports from Hong Kong, but including unrecorded shipments from Indonesia to Malaysia. – [12] Including coarse ground flour.

ANNEX TABLE 9C. – VOLUME OF REGIONAL IMPORTS OF MAJOR AGRICULTURAL COMMODITIES

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons											
WESTERN EUROPE												
Wheat and wheat flour (wheat equivalent)	11.98	14.46	13.87	12.97	12.34	12.87	11.16	15.13	13.32	12.05	10.56	12.10
Barley	2.41	2.53	4.19	4.53	4.69	4.77	4.27	4.19	4.72	3.63	4.51	5.03
Maize	8.46	4.03	4.57	9.05	6.32	7.65	8.93	9.43	12.91	13.87	13.63	16.67
Oats	0.73	0.78	0.87	1.23	1.32	1.41	1.24	0.86	1.31	1.07	0.95	1.32
Rye	0.81	0.90	0.83	0.74	0.56	0.59	0.76	0.75	1.02	0.74	0.50	0.40
Millet and sorghums	0.20	0.82	0.93	2.35	1.88	2.72	2.51	1.77	2.88	2.03	2.04	2.55
Rice (milled equivalent) [1]	1.17	0.33	0.46	0.57	0.51	0.61	0.64	0.54	0.58	0.57	0.60	0.57
Sugar (raw equivalent) [2]	3.47	4.26	4.58	4.48	4.87	4.61	4.62	4.10	4.22	5.32	4.97	4.47
Potatoes	0.75	1.09	1.23	1.71	1.81	1.86	1.40	1.48	1.97	1.72	1.53	2.13
Apples	0.60	0.39	0.65	0.99	0.68	0.99	0.95	1.11	1.23	0.96	1.13	1.32
Bananas	0.74	0.62	1.19	1.75	1.59	1.63	1.74	1.86	1.93	1.92	1.96	2.36
Citrus fruit [3]	1.48	1.49	2.14	2.67	2.35	2.54	2.76	2.71	2.98	2.71	3.30	3.23
Vegetable oils and oil seeds (oil equivalent) [4]	2.57	2.22	2.77	3.05	2.90	2.96	3.22	3.09	3.09	3.12	3.02	3.04
Oilseed cake and meal	2.36	1.65	2.76	4.57	3.68	4.42	4.44	4.60	5.69	5.90	5.55	6.89
Cattle [5]	1.11	0.77	1.18	1.51	1.41	1.32	1.49	1.83	1.49	2.02	1.94	2.03
Meat (fresh, chilled and frozen) [6]	1.12	0.81	0.97	1.12	1.11	1.07	1.18	1.04	1.18	1.50	1.54	1.50
Butter	0.57	0.39	0.39	0.47	0.46	0.47	0.48	0.47	0.49	0.51	0.56	0.53
Cheese	0.23	0.27	0.29	0.35	0.33	0.34	0.34	0.36	0.39	0.42	0.43	0.46
Coffee (green)	0.67	0.48	0.67	0.92	0.79	0.87	0.93	0.99	1.04	1.12	1.18	1.17
Cocoa beans	0.35	0.33	0.40	0.46	0.38	0.42	0.46	0.52	0.53	0.53	0.51	0.56
Tea	0.23	0.22	0.26	0.27	0.29	0.25	0.26	0.28	0.28	0.28	0.27	0.28
Wine	1.68	1.39	2.13	2.47	2.67	2.23	2.51	2.39	2.55	1.95	2.10	1.85
Tobacco (unmanufactured)	0.37	0.33	0.39	0.45	0.41	0.39	0.46	0.48	0.51	0.52	0.53	0.51
Wool (actual weight)	0.74	0.66	0.79	0.82	0.74	0.86	0.80	0.84	0.86	0.85	0.79	0.78
Cotton (lint)	1.67	1.40	1.52	1.51	1.42	1.43	1.69	1.57	1.44	1.45	1.52	1.35
Sisal	0.17	0.16	0.24	0.33	0.31	0.32	0.34	0.34	0.36	0.37	0.34	0.35
Rubber (natural)	0.30	0.52	0.66	0.61	0.59	0.60	0.61	0.61	0.62	0.64	0.66	0.64
EASTERN EUROPE AND U.S.S.R.												
Wheat and wheat flour (wheat equivalent)	...	...	[7]3.81	4.57	3.66	4.59	5.10	5.34	4.18	8.17	14.67	...
Barley	...	...	[7]0.89	0.58	0.61	0.48	0.43	0.69	0.67	0.89	1.17	...
Maize	...	...	[7]0.47	0.73	0.69	0.39	0.63	0.59	1.34	0.94	1.18	...
Rye	...	...	[7]0.68	0.61	0.49	0.40	0.54	0.76	0.87	0.78	0.55	...
Rice (milled equivalent) [1]	...	...	0.69	0.72	0.76	1.10	0.93	0.25	0.55	0.50	0.63	...
Sugar (raw equivalent) [2]	...	...	[7]0.80	2.12	0.49	0.46	2.03	4.22	3.42	1.91	2.51	...
Citrus fruit [3]	...	...	[7]0.17	0.25	0.25	0.26	0.23	0.24	0.26	0.27	0.35	...
Vegetable oils and oilseeds (oil equivalent) [4]	...	...	[7]0.27	0.22	0.23	0.28	0.21	0.19	0.17	0.16	0.25	...
Meat (fresh, chilled and frozen) [6]	...	...	[7]0.22	0.21	0.20	0.25	0.21	0.16	0.25	0.21	0.20	...
Coffee (green)	...	...	[7]0.02	0.06	0.03	0.06	0.06	0.08	0.07	0.09	0.10	...
Cocoa beans	...	...	[7]0.05	0.07	0.04	0.08	0.10	0.07	0.10	0.11	0.13	...
Wine	...	...	[7]0.09	0.16	0.13	0.12	0.18	0.19	0.18	0.26	0.28	...
Tobacco (unmanufactured)	...	...	[7]0.13	0.14	0.14	0.16	0.13	0.12	0.13	0.16	0.20	...
Cotton (lint)	...	...	[7]0.42	0.63	0.54	0.62	0.67	0.66	0.66	0.71	0.68	...
Rubber (natural)	...	...	[7]0.17	0.36	0.34	0.30	0.29	0.45	0.43	0.39	0.35	...
NORTH AMERICA												
Maize	1.14	0.22	0.19	0.53	0.38	0.33	0.41	0.61	0.92	0.61	0.55	0.40
Sugar (raw equivalent) [2,8]	3.22	3.89	4.24	4.50	5.01	4.86	4.93	4.55	4.98	4.84	4.06	3.63
Bananas	1.35	1.48	1.65	1.87	1.76	1.91	2.02	1.94	1.72	1.73	1.71	1.75
Citrus fruit [3]	0.11	0.19	0.22	0.21	0.20	0.24	0.22	0.20	0.20	0.22	0.25	0.26
Vegetable oils and oilseeds (oil equivalent) [4]	0.78	0.45	0.44	0.51	0.47	0.49	0.50	0.51	0.55	0.51	0.55	0.56
Cattle [5]	0.36	0.35	0.30	0.97	1.16	0.74	0.67	1.05	1.25	0.86	0.58	1.14
Meat (fresh, chilled and frozen) [6]	0.01	0.04	0.05	0.32	0.21	0.31	0.26	0.34	0.48	0.57	0.40	0.36
Coffee (green)	0.81	1.27	1.25	1.41	1.26	1.45	1.38	1.41	1.54	1.51	1.44	1.34
Cocoa beans	0.26	0.29	0.25	0.28	0.21	0.23	0.27	0.37	0.31	0.30	0.29	0.39
Wool (actual weight)	0.10	0.29	0.17	0.16	0.12	0.19	0.15	0.16	0.17	0.17	0.11	0.13
Rubber (natural)	0.52	0.81	0.66	0.50	0.52	0.63	0.45	0.43	0.47	0.42	0.50	0.50

ANNEX TABLE 9C. – VOLUME OF REGIONAL IMPORTS OF MAJOR AGRICULTURAL COMMODITIES (*concluded*)

	Prewar average	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Million metric tons											
OCEANIA												
Wheat and wheat flour (wheat equivalent)	0.06	0.21	0.29	0.26	0.32	0.27	0.22	0.22	0.27	0.27	0.27	0.26
Sugar (raw equivalent) [2]	0.09	0.11	0.11	0.13	0.13	0.11	0.13	0.16	0.14	0.15	0.13	0.16
Rubber (natural)	0.01	0.04	0.05	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05
LATIN AMERICA												
Wheat and wheat flour (wheat equivalent)	1.67	2.80	3.42	4.13	3.40	3.95	4.20	4.24	4.86	5.08	5.53	5.20
Maize	0.02	0.06	0.35	0.39	0.96	0.16	0.21	0.22	0.38	0.64	0.65	0.70
Rice (milled equivalent) [1]	0.39	0.36	0.28	0.40	0.40	0.35	0.28	0.36	0.32	0.33	0.47	0.49
Sugar (raw equivalent) [2]	0.25	0.36	0.41	0.35	0.37	0.39	0.24	0.50	0.23	0.34	0.21	0.25
Bananas	0.18	0.18	0.19	0.26	0.27	0.25	0.27	0.27	0.24	0.27	0.24	0.25
Cattle [5]	0.22	0.28	0.20	0.30	0.24	0.21	0.30	0.35	0.38	0.39	0.30	0.32
Milk (condensed, evaporated and powdered)	0.03	0.10	0.12	0.17	0.15	0.17	0.15	0.18	0.20	0.22	0.21	0.22
Rubber (natural)	0.01	0.04	0.08	0.09	0.10	0.08	0.09	0.09	0.07	0.09	0.08	0.08
FAR EAST, excluding China (Mainland)												
Wheat and wheat flour (wheat equivalent)	1.01	4.89	5.66	8.84	7.87	8.40	10.26	9.18	8.52	11.48	13.33	14.22
Barley	0.05	0.69	0.97	0.37	1.07	0.50	0.02	0.18	0.10	0.22	0.21	0.14
Maize	0.21	0.20	0.42	1.72	0.82	1.15	1.65	2.20	2.78	3.10	3.56	3.84
Millet and sorghums	0.30	0.61	0.08	0.16	0.09	0.07	0.07	0.17	0.43	0.79	1.06	1.58
Rice (milled equivalent) [1]	6.16	3.11	3.58	3.63	3.85	3.17	3.90	3.77	3.48	4.19	4.22	4.30
Sugar (raw equivalent) [2]	1.72	1.17	2.13	2.17	2.08	1.91	2.08	2.28	2.48	2.34	2.43	2.52
Vegetable oils and oilseeds (oil equivalent) [4,9]	0.30	0.22	0.44	0.59	0.50	0.54	0.60	0.61	0.68	0.75	0.80	0.78
Milk (condensed, evaporated and powdered)	0.11	0.23	0.30	0.37	0.36	0.36	0.38	0.42	0.45	0.49	0.48	0.46
Wool (actual weight)	0.10	0.04	0.10	0.20	0.13	0.18	0.20	0.26	0.22	0.25	0.24	0.26
Cotton (lint)	0.89	0.52	0.77	1.02	0.75	0.90	1.15	1.26	1.04	1.14	1.14	1.15
Jute	0.04	0.27	0.33	0.16	0.14	0.12	0.21	0.16	0.18	0.15	0.15	0.24
Rubber (natural) [9]	0.07	0.08	0.13	0.23	0.18	0.22	0.24	0.26	0.28	0.27	0.29	0.30
NEAR EAST												
Wheat and wheat flour (wheat equivalent)	0.28	1.42	1.67	3.44	2.29	2.90	3.99	4.24	3.75	4.43	3.33	3.77
Maize	0.01	0.16	0.07	0.27	0.12	0.23	0.21	0.31	0.51	0.46	0.67	0.50
Rice (milled equivalent) [1]	0.10	0.09	0.18	0.13	0.19	0.40	0.36	0.39	0.30	0.32	0.37	0.38
Sugar (raw equivalent) [2]	0.35	0.55	0.84	1.23	1.05	1.13	1.17	1.51	1.31	1.07	1.35	1.43
Vegetable oils and oilseeds (oil equivalent) [4]	0.04	0.04	0.04	0.12	0.09	0.11	0.12	0.10	0.19	0.22	0.22	0.19
AFRICA												
Wheat and wheat flour (wheat equivalent)	0.28	0.75	0.87	1.63	0.79	1.66	1.75	2.01	1.93	1.62	1.32	1.55
Barley	0.06	0.02	0.03	0.14	0.01	0.01	0.01	0.38	0.26	0.12	0.12	0.11
Rice (milled equivalent) [1]	0.39	0.18	0.33	0.51	0.38	0.53	0.50	0.52	0.60	0.55	0.67	0.70
Sugar (raw equivalent) [2]	0.41	0.55	0.90	1.10	1.01	1.08	1.12	1.11	1.21	1.03	1.24	1.39
Potatoes	0.11	0.14	0.23	0.30	0.29	0.26	0.32	0.35	0.29	0.17	0.19	0.16
Cattle [5]	0.12	0.21	0.22	0.25	0.22	0.23	0.27	0.29	0.25	0.26	0.22	0.20
Wine	0.06	0.15	0.28	0.25	0.20	0.22	0.26	0.32	0.25	0.23	0.23	0.23

[1] Including paddy converted at 65 percent. – [2] Including refined sugar converted at 108.7 percent. – [3] Oranges, mandarines and lemons. – [4] Groundnuts, copra, palm kernels, soybeans, olive oil, groundnut oil, coconut oil, palm oil, palm kernel oil, soybean oil. – [5] Million head. – [6] Beef and veal, mutton and lamb, pork. – [7] Average 1955-57. – [8] Excluding trade between the United States and its territories. – [9] Excluding imports into Malaysia for re-export.

ANNEX TABLE 10. – VOLUME OF WORLD AND REGIONAL EXPORTS OF FISHERY PRODUCTS [1]

	1938	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964
	Thousand metric tons										
WORLD											
Fresh, chilled or frozen fish	448.8	625.6	773.0	1 114.4	956.0	1 057.0	1 128.0	1 127.2	1 304.0	1 402.3	1 501.0
Dried, salted or smoked fish	681.0	588.4	670.4	568.6	613.4	574.0	554.0	554.1	547.4	539.3	522.4
Crustaceans and mollusks, fresh, frozen, dried, salted, etc.	86.2	126.1	162.2	212.5	178.2	207.6	209.8	227.0	240.0	241.0	296.0
Fish products and preparations, whether or not in airtight containers	282.0	276.0	387.2	510.9	474.0	511.0	505.0	523.0	541.4	506.1	582.2
Crustacean and mollusk products and preparations, whether or not in airtight containers	21.0	21.5	32.5	44.3	37.6	45.9	45.1	44.2	48.9	52.9	54.4
Oils and fats, crude or refined, of aquatic animal origin	184.3	223.0	345.4	580.4	476.0	544.4	593.7	619.7	668.1	742.5	637.8
Meals, solubles and similar animal feedstuffs of aquatic animal origin	163.0	211.1	470.3	1 107.7	657.0	797.5	1 019.5	1 351.9	1 712.7	1 772.0	2 414.2
WESTERN EUROPE											
Fresh, chilled or frozen fish	317.0	451.2	478.4	675.1	591.0	645.0	691.0	681.1	767.3	847.2	847.0
Dried, salted or smoked fish	475.0	379.2	449.4	349.2	391.0	345.0	329.0	330.7	350.5	330.6	319.7
Crustaceans and mollusks, fresh, frozen, dried, salted, etc.	65.0	66.0	78.6	97.1	84.0	102.0	96.0	98.8	104.7	95.8	121.1
Fish products and preparations, whether or not in airtight containers	105.0	103.2	156.0	197.0	178.0	196.0	192.0	207.7	211.1	197.5	204.7
Crustacean and mollusk products and preparations, whether or not in airtight containers	1.0	2.8	4.4	7.2	5.0	7.0	7.0	8.0	9.0	9.0	11.0
Oils and fats, crude or refined, of aquatic animal origin	102.0	128.4	144.6	221.9	214.0	229.0	214.0	208.8	243.8	199.8	190.2
Meals, solubles and similar animal feedstuffs of aquatic animal origin	103.0	104.6	235.4	242.4	250.0	222.0	228.0	280.0	232.0	296.6	412.0
EASTERN EUROPE AND U.S.S.R.											
Fresh, chilled or frozen fish	—	1.2	0.8	2.3	3.0	2.0	2.0	2.0	2.6	5.8	10.0
Dried, salted or smoked fish	—	—	0.7	33.3	13.4	35.0	45.0	32.1	41.0	43.9	55.3
Crustaceans and mollusks, fresh, frozen, dried, salted, etc.	—	—	—	0.2	0.2	0.1	0.2	0.2	0.3	0.2	0.9
Fish products and preparations, whether or not in airtight containers	—	2.8	6.4	19.9	9.0	19.0	21.0	25.3	25.3	18.6	20.5
Crustacean and mollusk products and preparations, whether or not in airtight containers	—	2.4	4.7	3.8	4.1	4.1	4.0	3.7	3.0	5.0	5.3
Oils and fats, crude or refined, of aquatic animal origin	—	2.4	5.6	16.3	5.0	8.0	35.4	17.9	15.3	31.7	41.0
Meals, solubles and similar animal feedstuffs of aquatic animal origin	—	1.0	3.1	4.9	4.0	7.4	4.5	4.9	3.7	3.4	4.2
NORTH AMERICA											
Fresh, chilled or frozen fish	55.0	114.2	135.8	147.1	148.0	140.0	147.0	142.5	157.9	159.4	196.7
Dried, salted or smoked fish	51.0	87.9	79.0	67.6	74.0	71.0	68.0	65.3	59.9	70.0	61.4
Crustaceans and mollusks, fresh, frozen, dried, salted, etc.	11.0	13.4	15.2	16.6	14.0	14.5	16.6	19.1	19.0	22.8	24.5
Fish products and preparations, whether or not in airtight containers	69.0	72.2	49.8	35.1	49.0	46.0	30.0	24.2	26.4	31.2	42.8
Crustacean and mollusk products and preparations, whether or not in airtight containers	5.0	5.2	7.4	5.8	5.0	7.0	6.0	4.5	6.6	7.2	7.7
Oils and fats, crude or refined, of aquatic animal origin	17.2	35.0	68.6	67.5	51.0	82.0	81.0	61.6	61.9	130.3	87.4
Meals, solubles and similar animal feedstuffs of aquatic animal origin	20.0	30.4	40.5	39.0	29.5	46.3	34.0	38.8	46.2	54.3	60.9

ANNEX TABLE 10. – VOLUME OF WORLD AND REGIONAL EXPORTS OF FISHERY PRODUCTS [1] (*continued*)

	1938	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964
	Thousand metric tons										
OCEANIA											
Fresh, chilled or frozen fish	2.0	3.0	3.0	3.4	3.0	4.0	4.0	3.0	3.0	3.2	4.0
Dried, salted or smoked fish	—	—	—	—	—	—	—	—	—	—	—
Crustaceans and mollusks, fresh, frozen, dried, salted, etc	0.2	1.7	3.6	4.8	4.0	4.0	5.0	5.0	6.0	6.0	7.0
Fish products and preparations, whether or not in airtight containers	—	1.4	—	—	—	—	—	—	—	—	—
Crustacean and mollusk products and preparations, whether or not in airtight containers	—	—	—	—	—	—	—	—	—	—	—
Oils and fats, crude or refined, of aquatic animal origin	0.1	3.4	16.4	14.0	19.0	15.0	17.0	11.8	8.0	4.0	5.3
Meals, solubles and similar animal feedstuffs of aquatic animal origin	—	—	0.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
LATIN AMERICA											
Fresh, chilled or frozen fish	3.0	9.2	17.4	30.1	24.0	37.0	28.0	28.5	33.1	35.6	25.3
Dried, salted or smoked fish	—	—	—	—	—	—	—	—	—	—	—
Crustaceans and mollusks, fresh, frozen, dried, salted etc	2.0	17.4	29.2	51.4	39.0	45.0	52.0	58.9	62.0	60.2	65.5
Fish products and preparations, whether or not in airtight containers	—	9.4	16.6	18.7	15.0	18.0	17.0	22.8	20.6	18.8	21.2
Crustacean and mollusk products and preparations, whether or not in airtight containers	—	3.3	3.4	3.9	3.0	3.0	4.0	3.9	4.4	5.8	4.5
Oils and fats, crude or refined, of aquatic animal origin	33.0	29.8	31.0	95.3	46.0	50.0	79.0	140.4	161.1	153.7	140.6
Meals, solubles and similar animal feedstuffs of aquatic animal origin	—	21.4	55.2	590.6	158.5	323.7	554.0	774.2	1 142.8	1 138.7	1 585.1
FAR EAST [1]											
Fresh, chilled or frozen fish	53.8	34.1	106.2	213.6	155.8	196.0	213.0	223.5	280.4	294.6	375.6
Dried, salted or smoked fish	126.0	75.0	86.8	62.9	75.0	70.0	60.0	62.4	47.3	47.0	38.3
Crustaceans and mollusks, fresh, frozen, dried, salted, etc	6.0	24.2	30.8	33.8	32.0	34.0	33.0	34.5	35.6	43.7	65.0
Fish products and preparations, whether or not in airtight containers	91.0	24.4	75.4	130.1	135.0	139.0	127.0	110.7	138.6	139.6	155.7
Crustacean and mollusk products and preparations, whether or not in airtight containers	13.0	4.8	10.2	22.4	19.0	23.0	22.0	23.0	25.0	25.0	25.0
Oils and fats, crude or refined, of aquatic animal origin	26.0	7.4	49.8	110.6	110.0	106.0	108.0	114.9	113.9	172.9	107.8
Meals, solubles and similar animal feedstuffs of aquatic animal origin	31.0	3.8	7.0	22.0	26.0	30.1	11.0	13.0	30.0	15.0	19.0
NEAR EAST											
Fresh, chilled or frozen fish	14.0	4.0	13.4	10.2	10.0	7.0	12.0	13.0	9.0	9.2	11.2
Dried, salted or smoked fish	5.0	9.6	12.4	6.1	6.0	5.0	7.0	7.7	4.7	6.6	7.2
Crustaceans and mollusks, fresh, frozen, dried, salted, etc	—	—	—	2.0	—	1.0	1.0	2.9	5.1	3.8	3.5
Fish products and preparations, whether or not in airtight containers	1.0	1.2	3.8	1.3	3.0	1.0	1.0	0.7	0.7	0.6	0.4
Crustacean and mollusk products and preparations, whether or not in airtight containers	—	—	—	0.7	0.5	0.8	1.1	0.9	—	—	—
Oils and fats, crude or refined, of aquatic animal origin	—	0.8	0.6	—	—	—	—	0.1	0.1	0.1	0.3
Meals, solubles and similar animal feedstuffs of aquatic animal origin	—	—	—	—	—	—	—	—	—	—	—

ANNEX TABLE 10. – VOLUME OF WORLD AND REGIONAL EXPORTS OF FISHERY PRODUCTS[1] (*concluded*)

	1938	Average 1948-52	Average 1953-57	Average 1958-62	1958	1959	1960	1961	1962	1963	1964
	Thousand metric tons										
AFRICA											
Fresh, chilled or frozen fish	4.0	8.7	18.0	32.6	22.0	26.0	31.0	33.6	50.7	47.3	31.2
Dried, salted or smoked fish	24.0	36.6	41.8	49.3	54.0	48.0	45.0	55.9	44.0	41.2	40.5
Crustaceans and mollusks, fresh, frozen, dried, salted, etc.	2.0	3.4	4.8	6.7	5.0	7.0	7.0	7.6	7.3	8.5	8.5
Fish products and preparations, whether or not in airtight containers	16.0	61.4	79.2	108.8	85.0	92.0	117.0	131.6	118.7	99.8	136.9
Crustacean and mollusk products and preparations, whether or not in airtight containers	2.0	2.9	2.4	0.8	1.0	1.0	1.0	0.2	0.9	0.9	0.9
Oils and fats, crude or refined, of aquatic animal origin	6.0	15.5	28.8	54.7	31.0	54.4	59.3	65.0	64.0	50.0	65.2
Meals, solubles and similar animal feedstuffs of aquatic animal origin	9.0	49.9	128.9	207.8	188.0	167.0	187.0	240.0	257.0	263.0	332.0

[1] Excluding China (Mainland). Data for 1965 not yet available.

ANNEX TABLE 11. – VOLUME OF WORLD [1] AND REGIONAL TRADE IN FOREST PRODUCTS

	Unit	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
		Million units												
Exports														
WORLD														
Pulpwood	m³	9.3	8.5	10.9	10.6	10.3	8.5	9.0	10.8	13.1	12.4	11.7	13.4	13.9
Coniferous logs	"	2.1	1.7	1.8	1.8	2.1	2.8	3.3	4.2	5.9	6.4	8.6	9.9	10.3
Broadleaved logs	"	3.1	5.9	7.0	7.7	8.4	9.4	11.9	13.3	14.0	14.2	17.4	17.5	18.0
Sawn softwood	"	23.4	29.1	32.0	28.1	30.4	29.7	32.3	36.3	36.3	38.2	41.4	43.9	42.9
Sawn hardwood	"	2.5	3.1	3.7	3.4	3.5	3.5	3.9	4.5	4.2	4.3	4.4	5.0	5.3
Plywood and veneers	"	0.5	1.0	1.2	1.1	1.3	1.4	2.0	1.8	1.9	2.2	2.5	3.1	3.3
Fibreboard	t	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1
Mechanical woodpulp	"	1.0	1.2	1.2	1.3	1.3	1.1	1.2	1.3	1.3	1.2	1.3	1.4	1.4
Chemical woodpulp	"	4.4	5.7	6.3	6.5	6.6	6.6	7.3	8.4	8.5	9.0	10.1	11.0	11.0
Newsprint	"	5.4	6.2	6.6	7.0	6.9	6.8	7.0	7.5	7.7	7.5	7.8	8.5	9.0
Other paper and paperboard	"	2.0	2.8	3.1	3.2	3.5	3.5	4.0	4.5	5.0	5.2	5.9	6.8	7.3
EUROPE														
Pulpwood	m³	3.53	4.11	5.74	5.20	5.12	4.20	4.68	5.92	7.31	5.56	5.10	5.78	5.85
Coniferous logs	"	1.71	0.99	0.96	0.75	0.79	1.04	1.11	1.44	1.47	1.31	1.31	1.30	1.17
Broadleaved logs	"	0.42	0.56	0.77	0.68	0.68	0.60	0.79	1.04	0.98	0.93	0.92	0.98	1.02
Pitprops	"	3.00	2.44	2.99	3.01	3.11	2.60	2.09	1.84	2.05	1.53	1.25	0.97	0.76
Sawn softwood	"	12.64	14.76	15.28	13.90	14.77	13.60	15.07	17.19	16.27	16.33	16.83	17.85	16.66
Sawn hardwood	"	0.83	1.16	1.30	1.08	1.19	1.11	1.25	1.66	1.58	1.63	1.69	1.83	1.92
Plywood and veneers	"	0.30	0.54	0.60	0.49	0.56	0.51	0.65	0.76	0.73	0.76	0.85	0.97	1.03
Fibreboard	t	...	0.37	0.46	0.48	0.54	0.57	0.67	0.75	0.77	0.81	0.88	0.94	0.90
Particle board	"	...	...	...	...	...	0.06	0.11	0.15	0.19	0.24	0.28	0.37	0.53
Mechanical woodpulp	"	0.72	0.95	0.99	1.06	1.02	0.88	0.93	1.10	1.06	0.97	1.05	1.15	1.12
Chemical woodpulp	"	2.79	3.42	3.69	3.89	3.87	3.93	4.40	4.78	4.56	4.88	5.44	5.96	5.87
Newsprint	"	0.87	1.01	1.12	1.30	1.29	1.34	1.36	1.56	1.66	1.67	1.76	1.94	2.06
Other paper and paperboard	"	1.49	2.21	2.41	2.44	2.68	2.60	2.95	3.37	3.69	3.87	4.35	4.92	5.18
U.S.S.R.														
Pulpwood	m³	0.06	—	0.55	0.53	0.59	0.82	1.18	1.59	2.33	3.26	3.50	4.05	4.15
Coniferous logs	"	0.09	0.06	0.12	0.24	0.65	0.99	1.14	1.50	1.83	2.45	2.63	3.22	3.25
Pitprops	"	0.29	0.78	0.84	0.64	0.82	0.99	0.89	1.11	1.00	1.20	1.40	1.39	1.50
Sawn softwood	"	0.82	1.74	2.33	2.21	3.46	3.63	4.38	4.98	5.20	6.00	6.53	7.68	7.70
Plywood	"	0.05	0.06	0.09	0.05	0.10	0.11	0.12	0.13	0.13	0.14	0.15	0.18	0.19
Chemical woodpulp	t	0.06	0.10	0.14	0.15	0.15	0.22	0.20	0.24	0.27	0.27	0.25	0.26	0.26
NORTH AMERICA														
Pulpwood	m³	5.68	4.37	4.58	4.89	4.51	3.29	2.91	3.12	3.17	3.20	2.88	3.14	3.44
Coniferous logs	"	0.33	0.60	0.71	0.70	0.54	0.60	0.79	1.00	2.28	2.24	4.33	4.85	5.25
Broadleaved logs	"	0.23	0.25	0.22	0.26	0.25	0.27	0.24	0.34	0.31	0.40	0.41	0.38	0.45
Sawn softwood	"	8.41	11.15	12.60	10.81	10.22	10.76	11.38	12.55	13.28	14.50	16.68	17.36	17.43
Sawn hardwood	"	0.60	0.46	0.63	0.61	0.57	0.53	0.64	0.62	0.55	0.60	0.59	0.69	0.74
Plywood and veneers	"	0.05	0.12	0.17	0.16	0.13	0.13	0.22	0.19	0.21	0.29	0.31	0.45	0.47
Mechanical woodpulp	t	0.25	0.22	0.24	0.26	0.23	0.21	0.22	0.22	0.22	0.24	0.23	0.26	0.29
Chemical woodpulp	"	1.58	2.16	2.48	2.37	2.41	2.27	2.59	3.18	3.45	3.60	4.09	4.47	4.53
Newsprint	"	4.50	5.14	5.42	5.55	5.51	5.27	5.47	5.74	5.84	5.68	5.74	6.29	6.60
Other paper and paperboard	"	0.44	0.49	0.58	0.59	0.68	0.70	0.78	0.89	0.99	1.05	1.22	1.57	1.76
OCEANIA														
Coniferous logs	m³	—	—	—	—	—	0.04	0.15	0.14	0.27	0.29	0.29	0.36	0.36
LATIN AMERICA														
Pulpwood	m³	—	—	—	—	0.05	0.18	0.24	0.18	0.24	0.34	0.24	0.41	0.39
Broadleaved logs	"	0.40	0.36	0.40	0.48	0.37	0.39	0.28	0.31	0.35	0.31	0.30	0.27	0.27
Sawn softwood	"	1.25	1.30	1.60	0.99	1.75	1.44	1.22	1.26	1.37	1.06	1.07	0.77	0.75

ANNEX TABLE 11. – VOLUME OF WORLD [1] AND REGIONAL TRADE IN FOREST PRODUCTS (*continued*)

	Unit	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
		Million units												
FAR EAST[1]														
Broadleaved logs	m³	0.76	2.60	2.95	3.57	3.99	4.66	6.54	6.92	7.81	8.31	10.83	10.20	10.80
Sawn hardwood	"	0.56	0.87	1.05	1.08	1.04	1.05	1.13	1.40	1.24	1.20	1.29	1.51	1.60
Plywood	"	0.02	0.18	0.26	0.31	0.39	0.54	0.78	0.54	0.63	0.73	0.94	1.17	1.30
All other paper and paperboard	t	...	0.09	0.12	0.15	0.14	0.13	0.14	0.20	0.28	0.24	0.25	0.26	0.27
AFRICA														
Broadleaved logs	m³	1.19	2.05	2.54	2.64	3.00	3.38	3.92	4.60	4.44	4.13	4.79	5.60	5.15
Sawn hardwood	"	0.17	0.35	0.38	0.42	0.47	0.57	0.58	0.61	0.58	0.60	0.57	0.70	0.75
Imports														
EUROPE														
Pulpwood	m³	3.73	4.16	6.21	6.03	5.59	5.10	5.59	7.50	9.61	8.82	8.07	10.12	10.45
Coniferous logs	"	3.56	1.14	1.36	1.23	1.39	1.63	1.87	2.48	2.70	2.77	2.79	2.72	2.67
Broadleaved logs	"	1.54	2.43	3.27	3.26	3.62	3.91	4.66	5.93	5.95	5.70	6.26	6.96	6.79
Pitprops	"	3.89	3.05	3.88	3.57	3.66	3.23	2.53	2.47	2.39	2.15	1.83	1.88	1.73
Sawn softwood	"	11.21	15.93	17.42	15.23	17.56	16.48	18.39	21.79	21.46	22.38	23.89	26.65	25.95
Sawn hardwood	"	1.25	1.39	1.75	1.58	1.72	1.69	1.77	2.17	2.14	2.04	2.31	2.61	2.71
Plywood and veneers	"	0.34	0.58	0.69	0.54	0.68	0.68	0.78	1.01	0.97	1.04	1.15	1.39	1.46
Fibreboard	t	0.04	0.27	0.33	0.35	0.42	0.42	0.48	0.55	0.57	0.63	0.69	0.77	0.74
Mechanical woodpulp	"	0.72	0.90	1.03	1.06	1.02	0.92	0.95	1.12	1.06	0.97	1.04	1.16	1.24
Chemical woodpulp	"	2.22	3.22	3.66	3.71	3.92	3.93	4.29	5.21	5.18	5.28	6.14	6.65	6.48
Newsprint	"	0.40	0.75	0.92	1.01	1.13	1.18	1.15	1.37	1.48	1.55	1.61	1.75	1.77
Other paper and paperboard	"	0.84	1.35	1.62	1.58	1.85	1.92	2.22	2.75	3.12	3.39	3.87	4.56	4.90
U.S.S.R.														
Sawn softwood	m³	0.96	0.78	0.61	0.49	0.42	0.34	0.27	0.21	0.21	0.16	0.11	0.08	0.05
Sawn hardwood	"	0.02	0.13	0.08	0.15	0.17	0.18	0.22	0.24	0.27	0.27	0.24	0.24	0.23
NORTH AMERICA														
Pulpwood	m³	4.94	3.66	4.08	4.42	4.18	3.31	3.05	3.42	3.43	3.39	3.08	1.85	1.83
Coniferous logs	"	0.90	0.99	0.91	0.90	0.74	0.64	0.75	0.90	0.97	1.21	1.23	1.46	1.60
Broadleaved logs	"	0.42	0.42	0.54	0.55	0.41	0.33	0.33	0.36	0.22	0.28	0.24	0.26	0.25
Sawn softwood	"	5.24	7.01	8.20	7.84	6.79	7.87	9.32	8.97	9.86	12.15	12.11	11.73	11.72
Sawn hardwood	"	0.64	0.67	0.87	0.92	0.81	0.83	1.09	0.94	0.83	0.97	0.97	1.00	1.08
Plywood	"	0.11	0.31	0.44	0.46	0.46	0.55	0.90	0.66	0.73	0.96	1.07	1.31	1.43
Mechanical woodpulp	t	0.25	0.22	0.23	0.25	0.21	0.18	0.21	0.24	0.28	0.30	0.31	0.32	0.32
Chemical woodpulp	"	1.71	1.69	1.83	1.93	1.76	1.78	2.06	1.98	2.01	2.34	2.28	2.42	2.60
Newsprint	"	4.33	4.53	4.68	5.05	4.74	4.43	4.77	4.91	4.96	4.97	4.91	5.40	5.74
Other paper and paperboard	"	0.15	0.21	0.30	0.28	0.24	0.26	0.29	0.26	0.29	0.30	0.28	0.30	0.33
OCEANIA														
Sawn softwood	m³	0.66	0.54	0.77	0.66	0.65	0.60	0.56	0.70	0.71	0.60	0.58	0.73	0.75
Newsprint	t	0.16	0.19	0.26	0.23	0.21	0.31	0.22	0.25	0.30	0.20	0.22	0.26	0.29
Other paper and paperboard	"	0.16	0.13	0.14	0.14	0.11	0.12	0.12	0.14	0.20	0.15	0.17	0.17	0.18
LATIN AMERICA														
Broadleaved logs	m³	0.31	0.30	0.37	0.41	0.32	0.34	0.24	0.27	0.28	0.23	0.22	0.25	0.25
Sawn softwood	"	1.09	1.09	1.48	1.10	1.62	1.42	1.08	1.05	1.32	1.09	1.03	1.17	1.15
Chemical woodpulp	t	0.27	0.50	0.51	0.43	0.45	0.40	0.44	0.40	0.49	0.38	0.41	0.46	0.50
Newsprint	"	0.36	0.39	0.42	0.48	0.55	0.54	0.52	0.60	0.64	0.58	0.54	0.54	0.55
Other paper and paperboard	"	0.26	0.22	0.27	0.35	0.36	0.36	0.33	0.30	0.31	0.28	0.29	0.31	0.32

ANNEX TABLE 11. – VOLUME OF WORLD [1] AND REGIONAL TRADE IN FOREST PRODUCTS (*concluded*)

	Unit	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
		Million units												
FAR EAST [1]														
Pulpwood	m³	...	0.02	—	—	—	0.10	0.13	0.19	0.42	0.47	0.49	0.65	0.70
Coniferous logs	"	0.04	0.30	0.11	0.21	0.27	0.60	1.01	1.25	2.68	3.25	4.45	5.51	5.70
Broadleaved logs	"	0.44	1.99	2.41	2.97	2.84	4.02	5.09	5.65	6.78	8.00	9.61	9.75	10.40
Sawn softwood	"	0.15	0.18	0.24	0.22	0.31	0.37	0.56	0.37	0.75	0.81	1.04	1.15	1.15
Sawn hardwood	"	0.17	0.15	0.17	0.13	0.12	0.09	0.12	0.09	0.10	0.40	0.17	0.19	0.20
Chemical woodpulp	t	0.06	0.16	0.12	0.18	0.25	0.13	0.22	0.30	0.38	0.49	0.74	0.77	0.80
Newsprint	"	0.14	0.19	0.23	0.21	0.21	0.19	0.23	0.23	0.29	0.24	0.26	0.39	0.35
Other paper and paperboard	"	0.18	0.31	0.33	0.31	0.35	0.30	0.33	0.37	0.39	0.38	0.42	0.45	0.47
NEAR EAST														
Sawn softwood	m³	0.38	0.75	0.65	0.52	0.60	0.53	0.65	0.69	0.63	0.72	0.68	0.69	0.70
All paper and paperboard	t	0.05	0.09	0.11	0.11	0.12	0.14	0.15	0.16	0.18	0.21	0.24	0.23	0.24
AFRICA														
Sawn softwood	m³	1.47	1.21	1.38	1.13	1.23	1.27	1.13	1.28	1.12	1.01	1.12	1.22	1.25
Sawn hardwood	"	0.25	0.55	0.61	0.50	0.53	0.55	0.45	0.55	0.40	0.30	0.36	0.43	0.43
Newsprint	t	0.08	0.09	0.11	0.13	0.13	0.14	0.14	0.16	0.16	0.13	0.14	0.16	0.17
Other paper and paperboard	"	0.21	0.29	0.31	0.25	0.30	0.31	0.28	0.36	0.36	0.36	0.37	0.39	0.40

[1] Excluding China (Mainland).

ANNEX TABLE 12A. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF EXPORTS OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY COMMODITY GROUPS

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	..... *Indices, average 1957-59 = 100*												
Export volume													
WESTERN EUROPE													
Agricultural, fishery and forest products	...	...	91	92	99	98	102	114	120	119	128	133	136
Agricultural products	65	54	89	88	99	100	101	112	122	121	131	133	139
Food and feed	61	54	90	86	100	98	102	114	124	123	131	135	144
Beverages and tobacco	56	51	81	96	97	119	84	97	108	100	121	121	114
Raw materials	121	59	83	101	95	89	116	108	118	130	142	113	115
Fishery products	[1]64	70	90	97	97	100	102	104	108	113	114	118	133
Forest products	...	...	97	97	99	95	106	119	119	119	126	137	133
NORTH AMERICA													
Agricultural, fishery and forest products	...	...	81	99	103	96	101	117	122	119	134	153	149
Agricultural products	48	79	70	97	105	96	99	120	124	118	134	157	148
Food and feed	27	75	72	99	97	97	106	116	127	132	151	178	174
Beverages and tobacco	87	94	113	104	104	99	98	103	104	100	106	109	99
Raw materials	102	85	51	90	137	89	74	143	121	74	83	102	76
Fishery products	[1]77	90	107	101	96	105	100	92	91	97	115	125	133
Forest products	...	...	106	102	100	97	104	114	120	124	135	148	152
OCEANIA													
Agricultural, fishery and forest products	...	...	92	97	99	92	109	106	120	121	129	132	133
Agricultural products	69	85	92	97	99	92	109	106	120	121	129	132	132
Food and feed	79	87	97	107	98	92	110	106	128	126	142	151	147
Beverages and tobacco	81	55	73	83	92	92	115	134	168	196	234	240	239
Raw materials	61	83	89	90	100	92	109	106	112	115	117	113	117
Fishery products	[1]11	42	96	92	100	101	99	118	104	115	110	130	139
Forest products	...	...	46	65	88	100	112	106	103	108	141	158	169
LATIN AMERICA													
Agricultural, fishery and forest products	...	...	92	99	95	99	106	111	114	121	121	116	122
Agricultural products	92	86	93	99	95	99	106	110	113	118	119	113	120
Food and feed	96	77	86	91	98	103	99	110	110	113	107	112	125
Beverages and tobacco	85	96	95	103	95	95	110	112	110	113	124	110	111
Raw materials	98	79	104	111	83	98	118	104	128	150	141	123	134
Fishery products	[1]11	42	68	80	79	95	125	167	213	265	262	318	259
Forest products	...	...	106	83	108	101	92	89	101	88	89	78	79
FAR EAST [2]													
Agricultural, fishery and forest products	...	...	98	99	98	98	104	102	108	112	117	119	116
Agricultural products	141	85	103	102	100	98	102	100	106	109	113	114	110
Food and feed	208	80	106	103	107	96	97	110	115	112	127	129	121
Beverages and tobacco	87	76	81	101	98	105	97	97	108	111	117	109	106
Raw materials	109	93	109	101	96	97	107	95	99	106	101	105	104
Fishery products	[1]68	28	63	84	82	104	114	101	98	120	120	132	121
Forest products	...	...	67	78	82	96	122	123	133	137	169	183	192
NEAR EAST													
Agricultural, fishery and forest products	...	...	90	89	98	90	112	111	108	117	126	125	122
Agricultural products	72	75	90	89	98	90	112	110	108	116	126	125	122
Food and feed	70	66	82	102	105	102	93	115	109	135	136	139	134
Beverages and tobacco	47	84	85	87	125	84	91	81	115	118	[1]69	80	91
Raw materials	77	77	93	83	89	87	124	117	106	109	134	129	123
Fishery products	[1]75	55	164	187	118	104	78	105	126	118	105	107	97
Forest products	...	...	76	72	84	98	119	137	138	184	242	261	276

ANNEX TABLE 12A. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF EXPORTS OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY COMMODITY GROUPS (*continued*)

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100												
AFRICA													
Agricultural, fishery and forest products	...	...	90	95	98	97	105	109	117	124	123	127	130
Agricultural products	58	68	91	96	98	97	104	107	116	123	121	124	127
Food and feed	63	67	91	95	95	105	101	95	105	116	120	116	114
Beverages and tobacco	54	67	90	97	103	92	105	119	127	138	128	136	144
Raw materials	59	73	93	97	94	97	110	103	108	99	107	107	107
Fishery products	[1]24	64	85	84	94	98	108	124	143	142	132	152	138
Forest products	...	...	67	76	88	97	115	127	127	129	151	175	172
WORLD [3]													
Agricultural products	79	77	88	97	99	97	103	110	116	118	124	128	128
Food and feed	75	72	86	96	99	99	103	110	119	122	131	141	142
Beverages and tobacco	74	82	92	100	100	97	103	109	115	119	121	118	120
Raw materials	89	83	90	96	101	94	105	109	111	109	111	111	108
EASTERN EUROPE AND U.S.S.R.													
Agricultural, fishery and forest products	...	...	72	67	92	92	116	120	142	149	142	138	...
Agricultural products	...	...	72	66	93	90	118	116	141	144	130	116	...
Food and feed	...	...	64	55	92	87	121	112	149	157	133	107	...
Beverages and tobacco	...	...	61	86	91	93	117	134	121	110	149	153	...
Raw materials	...	...	102	95	97	97	107	120	124	114	109	127	...
Fishery products	...	34	66	79	72	87	141	173	165	168	182	221	225
Forest products	...	...	76	69	92	99	109	130	142	164	180	205	209
WORLD [2]													
Agricultural, fishery and forest products	...	...	89	95	98	97	105	111	118	121	127	132	...
Agricultural products	...	...	87	95	99	97	104	110	117	119	124	127	...
Food and feed	...	...	84	93	98	98	104	111	121	125	131	138	...
Beverages and tobacco	...	...	92	100	99	97	103	110	115	119	122	119	...
Raw materials	...	...	91	96	101	94	105	110	112	109	111	112	...
Fishery products	...	60	83	92	92	100	108	111	118	130	132	146	142
Forest products	...	...	96	94	97	96	106	118	122	126	139	151	153
Export value													
WESTERN EUROPE													
Agricultural, fishery and forest products	...	...	93	95	104	98	99	110	115	117	131	144	150
Agricultural products	30	63	89	91	103	98	99	109	115	118	138	148	158
Food and feed	29	62	90	90	103	97	100	112	116	118	137	150	162
Beverages and tobacco	35	58	82	87	99	115	87	97	109	115	146	151	152
Raw materials	45	74	92	110	114	84	103	102	109	116	136	118	103
Fishery products	[1]26	66	85	95	98	99	103	104	111	123	126	141	162
Forest products	...	...	102	104	107	96	98	114	117	114	121	138	135
NORTH AMERICA													
Agricultural, fishery and forest products	...	...	84	101	105	96	99	112	118	115	129	150	147
Agricultural products	22	95	76	102	108	96	96	114	123	118	134	158	151
Food and feed	14	92	75	103	99	97	104	110	126	131	152	181	179
Beverages and tobacco	38	72	102	94	102	99	99	108	111	108	115	120	110
Raw materials	42	115	66	101	145	90	65	131	117	73	78	94	69
Fishery products	[1]22	73	90	93	93	102	105	99	93	97	114	135	148
Forest products	...	...	102	101	100	95	105	110	109	110	119	133	140

ANNEX TABLE 12A. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF EXPORTS OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY COMMODITY GROUPS (*continued*)

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	..... *Indices, average 1957-59 = 100*												
OCEANIA													
Agricultural, fishery and forest products	...	...	95	98	110	85	105	102	112	113	134	147	135
Agricultural products	29	93	95	99	111	85	105	102	112	113	134	147	135
Food and feed	35	85	95	100	95	89	117	108	126	125	151	169	163
Beverages and tobacco	25	52	79	73	83	105	112	112	122	135	165	186	164
Raw materials	23	100	96	98	126	81	93	97	99	103	119	127	109
Fishery products	[1]5	38	79	86	103	97	100	112	108	143	132	151	180
Forest products	...	...	44	64	88	100	109	104	98	102	135	153	165
LATIN AMERICA													
Agricultural, fishery and forest products	...	...	102	105	105	99	96	100	102	106	116	122	124
Agricultural products	26	92	103	106	105	99	96	99	100	103	113	119	122
Food and feed	30	90	85	87	104	100	96	103	103	106	128	137	139
Beverages and tobacco	17	87	113	119	109	98	93	94	88	87	88	102	104
Raw materials	40	114	127	127	97	99	104	103	129	145	144	119	124
Fishery products	[1]3	33	52	70	77	96	126	136	172	252	258	309	265
Forest products	...	...	120	94	112	99	88	85	93	84	83	71	74
FAR EAST [2]													
Agricultural, fishery and forest products	...	...	103	99	99	94	107	110	103	106	114	115	109
Agricultural products	45	97	109	102	102	93	105	108	100	100	107	108	100
Food and feed	60	96	98	99	105	96	99	107	107	107	139	147	129
Beverages and tobacco	34	72	96	103	101	105	95	96	97	97	103	99	96
Raw materials	40	109	122	104	99	86	115	115	97	96	87	85	82
Fishery products	[1]18	28	55	80	82	107	110	108	106	145	135	146	148
Forest products	...	...	71	79	84	94	122	130	134	144	176	182	192
NEAR EAST													
Agricultural, fishery and forest products	...	...	93	98	110	92	98	104	98	101	113	115	116
Agricultural products	28	91	93	98	110	92	98	104	97	101	113	114	115
Food and feed	30	73	82	109	109	102	89	104	103	131	142	145	145
Beverages and tobacco	21	65	84	91	131	85	84	63	78	85	67	84	81
Raw materials	29	104	100	96	106	90	105	114	99	92	111	108	111
Fishery products	[1]27	44	77	97	107	97	95	105	121	118	117	134	133
Forest products	...	...	85	78	87	97	117	136	133	181	237	244	261
AFRICA													
Agricultural, fishery and forest products	...	...	93	95	98	102	100	101	104	107	115	120	115
Agricultural products	19	72	95	96	98	102	99	99	101	104	111	113	109
Food and feed	23	71	92	100	99	103	97	93	103	110	121	116	112
Beverages and tobacco	15	63	94	89	95	106	99	100	98	103	100	110	108
Raw materials	23	100	103	107	105	92	103	107	107	96	121	117	107
Fishery products	[1]8	63	83	87	98	98	104	114	131	128	123	146	136
Forest products	...	...	70	78	90	101	110	133	140	141	174	216	211
WORLD [3]													
Agricultural products	28	86	94	100	105	96	99	106	108	109	122	132	129
Food and feed	28	82	86	96	101	98	101	107	115	119	140	154	155
Beverages and tobacco	22	74	101	103	103	102	95	96	95	96	100	108	107
Raw materials	34	106	103	105	113	88	99	111	106	100	107	106	97

ANNEX TABLE 12A. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF EXPORTS OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS, BY COMMODITY GROUPS (*concluded*)

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100												
EASTERN EUROPE AND U.S.S.R.													
Agricultural, fishery and forest products	...	...	77	70	96	91	113	117	137	144	149	146	...
Agricultural products	...	...	76	69	96	88	115	113	135	139	142	128	...
Food and feed	...	...	66	57	93	85	121	111	143	153	151	127	...
Beverages and tobacco	...	...	59	80	92	94	115	131	114	104	156	156	...
Raw materials	...	...	122	105	109	97	94	113	120	108	105	119	...
Fishery products	...	23	61	78	76	89	135	160	158	156	170	186	196
Forest products	...	...	81	72	97	98	104	126	140	158	170	202	210
WORLD [2]													
Agricultural, fishery and forest products	...	...	93	98	103	96	101	108	111	113	125	135	...
Agricultural products	...	...	93	98	104	96	100	106	110	111	123	132	...
Food and feed	...	...	85	93	101	97	103	107	117	121	140	152	...
Beverages and tobacco	...	...	100	103	103	102	95	97	96	97	101	110	...
Raw materials	...	...	104	105	113	88	99	111	107	100	106	106	...
Fishery products	...	55	76	88	92	101	107	109	115	135	138	156	164
Forest products	...	...	98	97	101	96	103	115	118	119	129	146	149

[1] 1938. – [2] Excluding China (Mainland). – [3] Excluding the U.S.S.R., eastern Europe and China (Mainland).

ANNEX TABLE 12B. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF IMPORTS OF AGRICULTURAL PRODUCTS, BY COMMODITY GROUPS

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100												
Import volume													
WESTERN EUROPE													
Agricultural products	88	75	89	97	101	97	102	106	108	113	114	115	118
Food and feed	85	73	86	97	98	98	104	107	109	116	119	119	127
Beverages and tobacco	83	69	91	93	100	101	99	109	114	120	119	122	121
Raw materials	96	83	96	98	108	92	99	103	101	100	100	99	95
NORTH AMERICA													
Agricultural products	79	99	93	96	95	97	108	101	106	115	113	104	107
Food and feed	73	77	81	83	89	105	106	103	109	121	121	105	110
Beverages and tobacco	65	95	92	100	98	95	108	106	112	117	115	112	111
Raw materials	126	147	117	110	100	88	112	88	88	95	91	85	89
OCEANIA													
Agricultural products	49	75	98	94	99	104	97	98	96	93	102	104	109
Food and feed	44	68	87	94	100	105	95	97	103	107	115	115	119
Beverages and tobacco	57	76	98	91	101	101	99	101	102	91	97	94	100
Raw materials	46	81	111	97	94	109	97	96	78	80	93	106	113
LATIN AMERICA													
Agricultural products	49	76	90	85	99	103	98	102	106	112	122	129	129
Food and feed	49	73	87	83	97	102	101	102	106	115	122	132	131
Beverages and tobacco	75	101	95	94	107	110	83	95	109	102	116	112	118
Raw materials	30	80	102	95	104	102	94	105	103	103	125	122	120

ANNEX TABLE 12B. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF IMPORTS OF AGRICULTURAL PRODUCTS, BY COMMODITY GROUPS (*continued*)

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100												
FAR EAST [1]													
Agricultural products	82	63	78	94	101	97	102	121	128	122	142	150	156
Food and feed	77	66	78	92	102	100	98	115	114	115	140	154	161
Beverages and tobacco	73	72	95	108	105	94	101	108	147	165	170	155	144
Raw materials	91	55	76	97	101	89	110	134	153	132	143	142	148
NEAR EAST													
Agricultural products	28	56	70	85	93	95	111	124	136	141	144	143	150
Food and feed	23	51	65	85	93	94	112	130	144	145	150	148	154
Beverages and tobacco	54	80	95	87	96	98	106	103	113	120	117	114	123
Raw materials	21	53	73	74	87	100	113	127	133	175	159	188	208
AFRICA													
Agricultural products	48	60	86	95	99	94	107	118	128	126	117	124	132
Food and feed	48	55	82	90	97	92	111	121	130	130	117	123	134
Beverages and tobacco	53	75	99	114	104	99	97	108	120	108	110	117	121
Raw materials	23	61	94	93	104	100	96	116	130	150	143	151	153
WORLD [2]													
Agricultural products	80	77	88	95	100	97	103	108	112	115	119	119	122
Food and feed	76	71	83	93	97	99	104	109	112	118	123	124	131
Beverages and tobacco	73	81	92	97	99	99	102	107	114	119	118	118	117
Raw materials	96	86	95	100	105	92	103	107	109	107	108	107	106
EASTERN EUROPE AND U.S.S.R.													
Agricultural products	...	...	79	81	96	96	109	116	127	124	133	167	...
Food and feed	...	...	94	86	101	92	107	118	137	133	140	206	...
Beverages and tobacco	...	...	63	78	97	92	114	111	101	110	137	163	...
Raw materials	...	...	65	75	88	103	109	114	124	119	120	115	...
WORLD [1]													
Agricultural products	...	...	87	94	99	97	104	109	113	116	120	123	...
Food and feed	...	...	84	92	98	99	104	109	114	119	125	131	...
Beverages and tobacco	...	...	90	95	99	98	103	107	113	118	119	121	...
Raw materials	...	...	91	96	103	93	104	108	111	108	110	108	...
Import value													
WESTERN EUROPE													
Agricultural products	36	84	95	101	107	96	97	103	101	107	115	121	124
Food and feed	37	83	88	102	102	96	102	104	104	114	129	133	145
Beverages and tobacco	28	60	95	91	101	106	93	98	98	101	102	113	110
Raw materials	39	108	110	108	121	89	90	102	96	94	96	100	87
NORTH AMERICA													
Agricultural products	27	99	102	102	101	97	102	95	93	97	102	101	96
Food and feed	29	77	77	80	89	105	106	101	104	115	129	109	106
Beverages and tobacco	15	89	111	113	109	97	94	87	86	85	83	100	92
Raw materials	54	172	134	122	108	79	113	100	84	88	87	86	84

ANNEX TABLE 12B. – WORLD AND REGIONAL INDICES OF VOLUME AND VALUE OF IMPORTS OF AGRICULTURAL PRODUCTS, BY COMMODITY GROUPS (*concluded*)

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100												
OCEANIA													
Agricultural products	21	85	109	97	101	103	96	97	87	83	95	99	99
Food and feed	17	78	87	95	104	103	93	91	97	101	123	126	125
Beverages and tobacco	24	74	113	90	100	103	98	92	84	74	79	79	79
Raw materials	21	112	129	111	101	102	97	112	78	75	86	99	99
LATIN AMERICA													
Agricultural products	18	89	97	88	102	102	96	99	100	107	119	130	128
Food and feed	18	89	94	85	100	101	98	98	102	111	122	135	133
Beverages and tobacco	19	79	100	91	107	112	81	78	80	78	95	101	105
Raw materials	16	96	120	103	110	96	94	119	101	101	123	119	111
FAR EAST [1]													
Agricultural products	28	80	85	98	109	96	95	114	118	113	138	155	151
Food and feed	23	80	81	92	108	99	93	106	104	106	138	162	157
Beverages and tobacco	34	73	107	103	98	100	103	98	124	140	145	175	154
Raw materials	37	81	92	111	113	89	98	131	147	125	136	139	138
NEAR EAST													
Agricultural products	13	71	80	87	103	93	104	114	125	126	143	157	167
Food and feed	11	70	69	86	103	91	106	119	132	130	157	173	184
Beverages and tobacco	18	77	116	91	104	97	99	95	99	98	93	98	104
Raw materials	8	66	84	80	98	96	106	134	140	172	158	192	196
AFRICA													
Agricultural products	18	69	91	99	102	96	101	108	118	113	110	127	135
Food and feed	18	67	86	96	101	93	106	111	124	117	112	132	142
Beverages and tobacco	20	73	100	106	103	108	90	93	96	91	99	107	114
Raw materials	12	84	120	105	116	92	93	130	135	149	139	143	137
WORLD [2]													
Agricultural products	31	86	94	100	105	96	98	103	103	106	116	123	124
Food and feed	31	81	85	95	101	97	101	105	106	113	130	136	142
Beverages and tobacco	23	72	102	100	104	102	94	94	93	95	95	108	104
Raw materials	40	112	111	110	117	88	95	108	105	100	103	107	98
EASTERN EUROPE AND U.S.S.R.													
Agricultural products	...	...	84	84	101	95	105	113	119	116	132	174	...
Food and feed	...	...	95	87	105	91	105	113	128	126	151	228	...
Beverages and tobacco	...	...	63	74	96	95	112	103	90	94	123	153	...
Raw materials	...	...	77	85	98	100	102	116	119	111	111	109	...
WORLD [1]													
Agricultural products	...	...	93	98	105	96	99	104	104	107	118	128	...
Food and feed	...	...	86	95	102	97	101	105	108	114	132	144	...
Beverages and tobacco	...	...	100	98	104	102	95	94	93	94	97	111	...
Raw materials	...	...	106	107	114	89	96	109	107	101	104	107	...

[1] Excluding China (Mainland). – [2] Excluding the U.S.S.R., eastern Europe and China (Mainland).

ANNEX TABLE 13. – WORLD[1] AVERAGE EXPORT UNIT VALUES OF AGRICULTURAL, FISHERY AND FOREST PRODUCTS

	Prewar average	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100																		
AGRICULTURAL PRODUCTS	38	111	101	105	132	116	110	112	106	103	106	99	96	97	93	92	99	102	100
Food and feed	42	132	114	102	115	115	111	105	100	101	103	99	98	97	96	97	108	110	109
Cereals	45	168	135	115	124	137	134	114	107	103	102	100	98	98	97	103	103	106	104
Edible oils and oilseeds	32	140	117	105	136	108	112	107	96	100	101	98	101	97	95	91	98	99	110
Meat	40	78	83	77	90	95	96	98	97	97	95	101	105	108	106	102	107	121	127
Dairy products	50	132	124	96	106	116	113	109	109	111	104	92	104	103	96	96	102	106	115
Beverages and tobacco	29	79	76	94	104	104	107	130	110	103	104	105	92	89	83	81	84	92	91
Agricultural raw materials	40	102	98	120	187	128	110	110	114	108	112	94	94	103	97	92	96	96	90
FISHERY PRODUCTS	[2]39	104	99	85	92	92	91	91	91	97	100	100	100	101	102	108	109	113	123
FOREST PRODUCTS	...	...	...	...	...	...	97	99	103	103	104	99	97	98	97	95	94	97	98
	U.S. $ per metric ton																		
AGRICULTURAL PRODUCTS																			
Wheat	31.1	105.9	88.5	71.5	74.1	78.6	79.7	68.2	65.8	62.8	63.5	62.6	62.2	61.7	63.4	66.1	64.1	66.1	61.5
Wheat flour	44.4	139.8	116.1	96.9	105.5	112.4	111.2	102.9	92.6	86.8	85.8	81.6	77.5	75.3	78.0	81.0	80.6	84.0	85.2
Barley	25.8	105.4	64.9	59.1	72.0	77.4	62.9	53.1	55.7	55.1	50.9	51.3	52.6	52.7	47.0	57.5	55.7	55.9	62.5
Maize	18.8	93.2	64.2	60.4	77.7	85.3	69.7	60.8	61.5	59.9	55.1	50.6	50.2	50.1	49.1	47.7	52.1	54.7	56.7
Rice (milled)	29.2	164.1	152.2	126.9	135.1	167.1	183.5	146.9	117.7	115.5	115.5	120.4	110.6	110.8	107.9	120.7	121.2	124.9	127.1
Sugar (raw)	38.3	99.0	98.5	104.0	116.1	110.0	97.4	99.0	95.1	95.4	116.5	49.8	94.5	89.5	93.3	94.0	143.7	138.3	105.6
Apples	66.3	118.4	78.6	98.6	101.3	112.8	103.6	120.6	97.5	123.1	136.8	155.3	111.6	140.8	124.9	139.1	146.3	134.8	151.5
Bananas	30.6	100.0	105.0	103.7	100.6	97.2	99.9	99.9	100.1	102.8	102.4	93.1	86.8	80.7	84.0	86.0	83.4	82.7	81.4
Oranges and tangerines	56.5	115.8	126.2	107.7	102.9	102.7	96.0	105.1	102.1	124.5	134.8	127.9	104.9	109.4	119.8	114.4	130.0	112.8	119.1
Raisins	123.3	260.7	242.1	226.8	270.6	229.4	201.6	207.2	240.6	274.5	280.2	328.0	316.8	265.2	280.3	264.0	267.0	338.2	334.5
Copra	45.4	252.1	170.0	195.4	219.1	144.2	191.4	172.6	149.6	142.5	139.4	167.7	202.4	173.3	142.6	144.4	159.4	167.8	189.7
Palm kernels	37.0	132.1	148.1	120.2	173.1	155.7	152.0	136.3	121.6	123.5	120.5	125.1	159.2	158.4	127.1	121.2	138.8	139.6	166.2
Soybeans	37.7	134.0	100.6	95.1	122.1	114.4	108.3	113.3	94.9	96.0	91.1	86.6	84.3	83.3	94.4	93.0	99.2	99.4	104.9
Groundnuts (shelled)	50.6	214.2	209.5	149.3	210.0	225.4	210.3	210.3	185.7	194.9	203.8	171.7	164.6	182.2	179.7	168.8	168.2	173.8	180.1
Olive oil	268.8	950.4	738.7	547.5	783.2	584.1	586.0	529.0	560.9	719.5	664.5	598.2	510.2	518.0	533.3	574.2	784.3	570.8	641.2
Coconut oil	83.9	413.4	348.3	333.2	394.2	258.9	306.7	289.0	237.6	232.9	241.3	277.8	348.9	288.7	233.1	221.6	244.1	298.7	337.1
Palm oil	61.2	279.5	254.1	206.0	309.6	243.9	188.5	184.6	200.0	217.4	220.9	200.4	204.3	191.7	203.8	189.4	201.6	205.4	232.7
Palm kernel oil	108.4	360.8	373.8	293.9	366.0	250.8	295.7	265.9	240.3	236.5	242.4	253.3	316.6	296.6	230.7	213.2	241.9	256.4	245.5
Soybean oil	120.3	539.1	340.0	320.4	461.5	307.7	309.9	317.1	321.7	343.3	338.4	303.3	254.9	233.5	285.4	245.6	240.1	239.3	295.7
Groundnut oil	129.4	489.1	482.3	388.0	495.3	394.9	419.7	404.4	319.4	397.8	405.7	361.8	326.0	350.1	349.4	330.3	313.5	322.3	353.3
Cattle[3]	36.3	116.3	114.7	121.6	132.8	110.9	117.6	129.8	125.1	124.8	125.7	135.9	144.7	136.9	130.1	121.7	129.8	161.8	158.7
Beef and veal	120.9	312.7	361.7	353.3	458.7	500.3	439.2	464.2	451.1	418.4	437.8	503.8	577.9	596.9	563.3	525.1	567.1	685.2	739.4
Mutton and lamb	213.7	287.0	314.7	245.2	268.5	291.4	325.1	386.2	417.4	415.6	449.8	414.5	365.9	387.4	364.3	352.9	387.6	436.2	495.1
Bacon, ham, salted pork	409.0	776.2	751.6	612.5	650.1	711.8	674.1	666.0	663.6	722.7	679.2	707.1	667.5	681.8	660.5	666.7	719.4	773.2	746.3
Canned meat	270.0	593.4	639.5	733.3	846.1	858.9	954.9	906.5	873.9	869.2	826.7	854.3	889.0	905.2	941.6	912.6	879.8	948.5	982.7
Cheese	323.5	766.0	749.7	583.2	630.2	686.1	658.6	648.6	674.9	742.3	709.3	636.7	741.1	724.0	721.4	706.0	712.7	782.9	855.7
Butter	424.6	1 109.6	1 078.5	815.3	883.9	957.4	963.1	970.6	951.5	927.0	784.5	641.1	897.4	831.3	715.5	762.3	830.5	910.2	898.3

Milk condensed and evaporated	134.5	379.9	347.2	287.0	329.2	352.1	327.2	310.6	310.1	317.5	330.1	311.2	307.9	308.8	307.4	299.7	305.9	326.2	335.9
Milk, powdered	191.7	604.4	486.2	334.5	445.2	514.8	458.9	410.9	377.2	375.0	437.4	372.8	355.6	402.1	362.2	332.4	299.6	306.6	386.4
Potatoes	31.8	59.1	47.9	46.2	53.9	59.6	57.6	51.7	46.9	59.7	52.2	59.7	57.6	58.9	51.6	71.9	61.0	56.8	68.7
Oilseed cake and meal	23.6	92.0	62.2	58.2	74.5	75.6	72.6	71.9	73.3	67.7	61.8	54.7	67.8	67.9	63.7	69.6	77.8	76.0	78.9
Coffee	182.3	510.3	580.8	959.2	1 075.0	1 104.4	1 141.3	1 401.0	1 075.8	1 048.2	1 024.7	918.4	747.1	719.9	679.2	652.1	617.1	787.6	796.1
Cocoa	117.4	707.3	461.4	558.0	711.2	688.2	660.5	1 070.2	818.0	580.8	563.0	844.6	738.8	593.4	474.3	453.2	486.2	504.5	399.5
Tea	515.8	1 200.5	1 112.3	986.2	1 043.1	947.6	998.2	1 327.3	1 413.6	1 255.0	1 228.3	1 208.5	1 194.2	1 243.8	1 193.2	1 145.9	1 163.5	1 165.8	1 163.7
Wine	86.9	241.1	206.1	164.8	180.8	171.4	165.1	147.3	143.0	155.4	169.8	216.2	174.3	178.2	181.4	188.9	210.2	210.5	228.0
Tobacco (unmanufactured)	566.1	1 114.8	1 118.1	1 096.2	1 126.3	1 163.5	1 229.5	1 225.0	1 267.7	1 228.4	1 337.8	1 280.5	1 291.8	1 287.2	1 224.4	1 213.0	1 348.2	1 304.8	1 285.4
Linseed	44.9	222.0	180.0	148.9	166.8	170.4	132.1	112.6	130.3	143.5	115.5	123.9	130.4	128.0	124.8	132.7	121.7	118.9	118.8
Linseed oil	105.3	561.2	370.6	318.3	390.3	397.5	230.7	166.9	205.4	313.4	245.8	250.7	212.5	246.8	253.9	230.0	187.3	203.4	180.0
Cotton	261.2	856.4	797.6	837.7	1 169.5	1 002.5	771.5	828.3	805.2	739.9	741.8	680.5	593.1	630.2	647.2	619.2	613.3	589.6	599.7
Jute	63.9	327.6	301.1	243.6	327.6	250.2	175.9	185.1	189.4	184.0	209.5	195.2	177.5	223.7	310.2	215.5	209.8	164.0	185.1
Sisal	77.1	299.3	291.8	272.4	423.5	374.6	204.7	176.7	157.3	158.9	141.5	145.2	173.1	214.7	193.4	197.5	294.5	287.7	190.3
Wool (greasy)	446.0	1 027.8	1 164.1	1 527.5	2 589.8	1 413.1	1 593.1	1 549.2	1 357.3	1 379.6	1 600.3	1 133.8	1 084.5	1 163.8	1 144.6	1 134.1	1 324.2	1 446.1	1 215.7
Rubber (natural)	282.7	414.4	342.2	662.8	1 090.1	670.9	484.0	450.1	701.8	634.0	603.5	519.3	662.0	745.2	547.8	520.0	495.7	472.9	453.7
FISHERY PRODUCTS																			
Fresh, chilled or frozen fish	[2]100.7	221.7	212.7	228.6	242.3	251.0	262.9	263.5	259.4	273.9	281.9	295.7	279.4	287.7	302.7	320.3	307.3	320.8	...
Dried, salted or smoked fish	[2]88.4	252.4	251.0	228.5	243.9	272.7	252.6	250.5	266.2	287.1	296.2	295.2	305.8	329.0	331.3	346.8	362.3	373.3	...
Crustaceans and mollusks, fresh, frozen, dried, salted, etc.	[2]107.3	344.6	331.0	340.4	382.8	411.5	456.7	458.6	483.5	540.6	660.4	681.1	667.1	680.2	728.1	821.1	905.1	806.8	...
Fish products and preparations, whether or not in airtight containers	[2]236.9	603.9	588.6	497.5	508.8	539.0	546.4	548.5	539.4	610.1	607.6	644.6	631.6	622.5	600.4	694.3	646.9	639.8	...
Crustacean and mollusk products and preparations, whether or not in airtight containers	[2]459.5	758.7	800.0	888.4	995.7	994.9	1 136.2	1 178.8	1 080.5	1 069.9	1 045.3	1 131.3	1 079.0	1 074.4	1 145.3	1 146.0	1 251.2	1 286.4	...
Oils and fats, crude or refined, of aquatic animal origin	[2]84.8	482.3	386.1	263.2	341.8	265.0	210.5	213.0	213.0	237.0	241.9	207.2	191.8	179.7	172.6	133.3	137.3	182.4	...
Meals, solubles and similar animal feedstuffs of aquatic origin	[2]45.8	133.1	140.7	124.4	113.8	116.7	120.9	134.8	144.6	147.7	138.4	135.2	136.7	92.6	86.8	103.9	108.1	109.8	...
FOREST PRODUCTS																			
Fuelwood [4]	...	...	...	...	...	...	8.2	8.2	9.1	9.5	9.5	9.0	8.4	8.3	9.3	9.4	9.7	10.7	10.8
Charcoal	...	...	...	...	...	...	28.9	23.4	26.3	26.2	28.3	26.1	25.1	28.5	28.6	25.3	25.4	24.1	24.0
Coniferous logs [4]	...	...	...	...	...	...	15.8	16.1	19.2	15.7	17.3	16.4	16.5	17.0	18.0	19.1	15.5	16.3	16.7
Broadleaved logs [4]	...	...	...	...	...	...	20.0	19.8	21.2	19.6	18.4	18.4	18.8	22.6	21.9	22.9	24.0	24.5	24.5
Pulpwood [4]	...	...	...	...	...	...	12.7	11.6	12.7	12.2	12.4	11.7	10.6	10.5	12.0	11.6	10.6	11.9	12.0
Pitprops [4]	...	...	...	...	...	...	14.3	12.8	14.1	13.7	14.6	14.0	13.1	12.0	13.0	13.1	12.4	13.6	14.2
Poles, piling, posts [4]	...	...	...	...	...	...	34.4	31.2	30.0	32.1	32.8	27.2	24.5	24.2	22.5	24.3	24.4	26.5	27.0
Sawn softwood [4]	...	...	...	...	...	...	37.2	37.5	40.4	39.5	39.1	36.9	35.5	36.8	36.5	35.3	35.1	36.4	37.5
Sawn hardwood [4]	...	...	...	...	...	...	59.6	61.2	62.6	65.7	63.0	62.4	62.4	62.0	65.0	61.8	62.8	63.8	65.0
Sleepers [4]	...	...	...	...	...	...	36.3	34.4	35.2	39.2	42.4	39.8	41.5	37.6	36.5	40.1	38.1	40.5	41.0
Veneer sheets [4]	...	...	...	...	...	...	266.0	298.0	282.9	287.6	313.6	254.4	262.2	367.1	359.0	370.9	367.1	378.7	380.0
Plywood [4]	...	...	...	...	...	...	142.4	152.3	167.1	154.2	149.0	139.8	139.2	138.6	132.8	136.3	134.7	128.6	129.5
Particle board	...	...	...	...	...	...	—	—	138.8	125.9	110.7	116.5	112.0	111.8	111.1	109.3	108.2	108.6	108.5
Fibreboard	...	...	...	...	...	...	93.7	89.2	93.5	91.5	91.2	86.6	84.6	84.0	81.8	80.8	82.5	86.8	87.5
Mechanical woodpulp	...	...	...	...	...	...	67.9	68.8	70.2	76.6	77.1	70.5	67.4	66.5	66.1	65.6	64.6	64.9	65.5
Chemical woodpulp	...	...	...	...	...	...	134.0	141.1	143.5	147.8	150.0	140.4	133.9	132.8	131.7	124.9	124.5	133.4	135.5
Newsprint	...	...	...	...	...	...	128.6	130.2	130.5	135.3	140.8	138.2	139.8	134.6	128.8	126.9	125.4	125.8	126.0
Printing and writing paper	...	...	...	...	...	...	230.5	248.2	251.9	259.7	265.5	245.8	234.2	233.7	227.3	224.7	217.6	219.7	220.0

[1] Excluding the U.S.S.R., eastern Europe and China (Mainland). – [2] 1938. – [3] U.S. $ per thousand head. – [4] U.S. $ per cubic meter.

ANNEX TABLE 14. – REGIONAL INDICES OF AVERAGE EXPORT UNIT VALUES, BY COMMODITY GROUPS

	Prewar average	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965 (Preliminary)
	Indices, average 1957-59 = 100												
WESTERN EUROPE													
Agricultural products	47	116	100	102	104	98	98	98	94	98	107	111	111
Food and feed	47	115	99	104	103	99	98	97	93	96	105	109	110
Beverages and tobacco	58	118	98	89	101	96	103	100	100	114	123	124	132
Raw materials	38	124	109	108	119	93	88	94	92	90	95	104	90
Fishery products	[1]37	101	95	99	100	99	100	100	104	108	110	122	...
Forest products	...	...	106	106	107	101	92	95	98	96	96	101	103
NORTH AMERICA													
Agricultural products	50	119	106	102	103	101	96	96	100	101	100	101	102
Food and feed	53	121	102	101	102	100	97	96	99	100	100	102	103
Beverages and tobacco	43	76	90	90	98	101	101	105	107	108	109	110	112
Raw materials	44	138	134	114	108	103	89	94	99	100	96	94	93
Fishery products	[1]34	82	84	90	97	97	106	110	105	102	102	109	...
Forest products	...	...	95	98	103	97	100	96	90	89	88	90	91
OCEANIA													
Agricultural products	42	111	104	104	112	93	96	97	94	93	104	112	102
Food and feed	46	98	100	99	97	97	106	103	100	99	106	111	113
Beverages and tobacco	23	92	108	90	89	114	97	85	74	72	76	81	74
Raw materials	37	123	108	109	126	88	86	91	88	89	102	112	93
Fishery products	[1]51	157	83	93	102	94	104	92	100	111	112	106	...
Forest products	...	...	96	100	101	100	99	99	98	98	98	99	100
LATIN AMERICA													
Agricultural products	28	107	111	107	111	99	90	90	89	86	98	107	102
Food and feed	35	114	99	95	107	97	96	94	95	94	125	125	115
Beverages and tobacco	20	91	118	116	114	102	84	83	79	76	70	91	91
Raw materials	41	143	117	111	116	99	86	98	99	95	103	98	94
Fishery products	[1]14	78	81	91	98	101	101	86	88	103	111	114	...
Forest products	...	...	113	115	105	99	96	98	93	95	94	92	94
FAR EAST [2]													
Agricultural products	39	112	108	101	102	95	103	109	97	93	95	95	92
Food and feed	31	115	95	95	99	100	102	96	92	95	108	113	107
Beverages and tobacco	42	91	115	103	103	100	98	99	92	88	91	92	91
Raw materials	44	119	113	104	104	89	107	121	102	93	89	83	82
Fishery products	[1]31	101	91	96	101	103	97	109	110	120	117	116	...
Forest products	...	...	107	103	102	97	101	105	100	104	102	99	99
NEAR EAST													
Agricultural products	40	123	104	112	112	101	88	93	91	85	89	90	93
Food and feed	45	121	105	114	102	100	97	95	100	99	102	102	107
Beverages and tobacco	46	78	100	105	106	101	93	79	70	74	99	105	90
Raw materials	37	134	105	113	116	101	83	95	92	83	82	83	88
Fishery products	[1]34	76	48	49	79	90	131	115	158	174	170	261	...
Forest products	...	...	113	107	104	99	98	99	97	98	99	96	97
AFRICA													
Agricultural products	33	105	104	99	100	105	94	92	89	86	93	92	88
Food and feed	38	107	101	106	105	98	97	88	98	94	102	99	99
Beverages and tobacco	25	91	105	90	92	115	93	84	77	75	79	81	76
Raw materials	40	135	109	109	112	95	94	103	99	97	112	109	99
Fishery products	[1]30	108	98	105	104	100	96	91	90	94	97	97	...
Forest products	...	...	103	103	102	103	95	104	109	109	117	124	124

[1] 1938. – [2] Excluding China (Mainland).

ANNEX TABLE 15. – UNITED STATES: EXPORTS UNDER SPECIAL PROGRAMS IN RELATION TO TOTAL AGRICULTURAL EXPORTS

	Average 1942-45	Average 1946-52	Average 1953/54	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
	Million U.S. dollars													
Exports under Public Law 480														
Title I	—	—	—	265	641	755	752	730	993	853	970	1 151	1 224	867
Title II	—	—	—	121	102	71	84	56	79	195	143	174	116	94
Title III (barter)	—	—	—	260	373	244	65	176	118	181	137	75	123	182
Title III (donations)	—	—	—	188	186	165	159	107	122	155	178	169	185	160
Title IV	—	—	—	—	—	—	—	—	—	1	42	51	99	123
Total	—	—	—	834	1 302	1 235	1 060	1 069	1 312	1 385	1 470	1 620	1 747	1 426
Agency for International Development (AID) programs[1]	—	—	—	362	449	318	214	158	157	179	35	11	23	26
Total special programs	1 341	1 473	527	1 196	1 751	1 553	1 274	1 227	1 469	1 564	1 505	1 631	1 770	1 452
Commercial exports[2]	415	1 982	2 350	1 999	2 419	2 954	2 580	2 722	3 355	3 466	3 526	3 953	4 577	4 777
TOTAL AGRICULTURAL EXPORTS	1 756	3 465	2 877	3 195	4 170	4 507	3 854	3 949	4 824	5 030	5 031	5 584	6 347	6 229
	Percent													
Exports under special programs as percentage of total agricultural exports	76	42	18	37	42	34	33	31	30	31	30	29	28	23
Exports under Public Law 480 as percentage of total agricultural exports	—	—	—	26	31	27	28	27	27	28	29	29	28	23

[1] Formerly Mutual Security Act. - [2] Includes shipments of some commodities with government assistance in the form of export payments, short and medium-term credit, and sales of government-owned commodities at less than domestic market prices.

ANNEX TABLE 16. – SUMMARY INFORMATION ON RICE PROCESSING IN THE FAR EAST

Processing method		Yield of processed product from raw material	Economics of processing
Type	Approximate cost, in US$		
Hand pounding with pestle and mortar		60-78 percent rice, 22-40 percent mixture of husk, brokens and bran	Suitable only for milling of rice for home consumption in remote areas
Simple huller type mill	$560 including electric motor; with diesel engine $720. Capacity 250kg/hr	58-63 percent milled rice including brokens, 37-42 percent mixture of husk, brokens and bran	Cheap equipment, low yield of edible rice, low value of by-product due to admixture of husks. Mainly used for milling of rice in small lots. Miller is generally paid in the form of by-product
Simple huller type mill combined with primitive parboiling	$600-800, capacity 250 kg/hr	65-68 percent parboiled rice including brokens, 32-35 percent mixture of husk, brokens and bran	Cheap rather efficient equipment. Low value of by-products. Operating cost approximately $6 per ton not including fuel cost for parboiling
Huller and cone polisher mill	$2 000 for mill with capacity of 500 kg/hr, including prime mover	65-68 percent milled rice or 67-69 percent parboiled rice if parboiling plant is attached, 8-10 percent fine white rice bran, and 6-8 percent parboiled bran, approximately 25 percent husk and losses	Improved outputs are obtained compared with single huller type mills. Relatively cheap equipment. Operating cost approximately $4 per ton of paddy
Japanese self-contained type rice mill *without* parboiling plant	$8 000 without prime mover. Power required 20 hp. Capacity 1 ton of paddy/hr	68-71 percent milled rice, 9-11 percent bran, 20-22 percent husk	Increased milling yields at reasonable cost. Cost of operation partly depending on cost of spare parts. Based on 250 days of 8 hr, approximately $5 per ton of paddy
Japanese self-contained type rice mill *with* parboiling plant but without artificial drier	$25 000 including prime mover and boiler	Up to 71 percent parboiled rice	Good milling yields at about double the milling cost of Japanese mill without parboiling plant
Standard (European) type self-contained mill	$20 000 for mill equipment, $12 000 for steam power plant, or $3 700 for diesel power, or $1 500 for electric power	Approximately 62 percent rice and brokens, 10 percent rice bran, 2 percent small brokens, 3 percent coarse bran	Production of high quality rice is possible. Production cost $3 per ton of paddy
Standard type rice mills manufactured in Far Eastern countries	$10 000 for mill equipment. For power see above	Some of the better makes approach the yields given above	Production cost approximately 10 percent below those of European manufactured mills
Large-size mills	$120 000 for machinery including prime movers	Value of products 2-5 percent above those of smaller plants of conventional design	Only justified when mill can be supplied with paddy for 200 days' operation for 24 hours per day. Operating cost $3 per ton of paddy
Mysore parboiling plant with sun drying	$6 000 for machinery without building and boiler. Capacity 50 tons per day		

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THE STATE OF FOOD AND AGRICULTURE

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