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**THE STATE  
OF FOOD  
AND AGRICULTURE  
1963**

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS**

THE STATE OF FOOD AND AGRICULTURE 1963

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
ROME 1963

*The statistical material in this publication has been prepared from the information available to FAO up to 30 June 1963*

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## FOREWORD

*The World Food Congress, held at Washington in June of this year, centered world attention as never before on one of the greatest issues now facing mankind. It declared that the persistence of hunger and malnutrition was unacceptable morally and socially. It emphasized the extent to which the explosive growth of population is multiplying human needs and heightening the urgency of meeting them. It called on all men and women, all governments, and all international and other organizations to take up the challenge of eliminating hunger, within the framework of world-wide development, as a primary task of this generation. At the same time it expressed its conviction that scientific and technological progress now make it possible to free the world from hunger if human and natural resources are mobilized to this end through balanced economic and social development.*

*The current issue of FAO's annual report on The state of food and agriculture underlines the timeliness of this declaration. Although agricultural production in 1962/63 recovered from the setback of the year before, per caput food production has remained virtually unchanged over the past five years. Moreover, although the percentage growth of production has been almost as fast in the developing as in the more developed regions of the world, the former have fared less well on a per caput basis because of the accelerating growth of their populations. Their food consumption levels have been maintained only by a shift in the pattern of international trade, including large imports of surplus foods from the more developed countries. It is however clear that any sustained attack on the problem of hunger must come from a much more rapid growth of food production in the developing countries themselves.*

*To achieve this goal, many technical, educational, and economic problems of agricultural development must be solved. Research must be expanded to fill the gaps in our knowledge, hitherto based mainly on agricultural science and experience in temperate zones. New and more productive systems and methods of farming adapted to local conditions need to be worked out and applied in the developing countries. In addition to advances in general education, there is the special problem of making the producers aware of the new possibilities opened up to them, and promoting the more rapid adoption of improved practices.*

*The economic and social aspects of agricultural development are no less important. Production is hampered in developing countries not only by primitive methods of farming, but also by obsolete institutions, notably in land tenure, credit, and marketing, which in many countries take away much of the incentive for farmers to adopt improved techniques needed to increase their output over and above the needs of their own families.*

*A number of these problems have been highlighted in earlier issues of this report. This year, a special chapter analyzes the growth of productivity in agriculture. Productivity in agriculture at the national level is shown to depend not only on natural conditions and technical progress, but to be closely related also to the level of demand. Very high productivity of land has sometimes been achieved at an early stage of economic development in countries or areas where the pressure of population on land resources has been heavy, resulting in a high intensity of total demand for agricultural products in relation*

*to those resources. However, high productivity per man, and therefore high per caput income in agriculture, appears to come only at a later stage of economic development, when there is a large and rapidly expanding urban market for farm products.*

*But a high level of demand offers only the potentiality of high productivity in agriculture. This potentiality will not be realized except through the wider application of science and technology in agricultural production, combined with improvements in the institutional structure. The chapter provides welcome evidence of the speed with which agricultural productivity has been raised in some countries when technical, institutional, and economic conditions were favorable.*

*One of the most effective technical measures for raising agricultural production and productivity is the increased use of fertilizers, which is the subject of the second special chapter in this issue. This is a field in which FAO's programs are already making considerable progress, aided by a generous contribution from the fertilizer industries to the Freedom from Hunger Campaign. The possibilities offered by increased use of fertilizers raise the question to what extent developed countries can expand the inclusion of fertilizers in their aid programs in future. The chapter emphasizes, however, that fertilizers cannot make their full contribution to production without parallel improvements in other directions, including irrigation, plant breeding, the adoption of improved planting materials by farmers, the better control of weeds, diseases, and pests, and the expansion of suitable fertilizer distribution systems.*

*This interrelationship of measures and investments required if potentialities for increased productivity are to be realized is a major factor in the almost universal adoption of planning in less developed countries. More effective development planning in the agricultural sector is urgently needed if the 5 percent annual rate of over-all economic growth envisaged for the United Nations Development Decade is to be achieved. An innovation in this year's report is a table showing some characteristics of the development plans of more than 70 countries.*

*The Freedom from Hunger Campaign is FAO's contribution to the United Nations Development Decade. But freedom from hunger should not be interpreted to mean only increased food supplies. It eventually depends on raising all-round purchasing power through economic development, and thus on the successful implementation of development plans.*

*A crucial factor in the execution of these plans is the foreign exchange which is needed for the import of capital goods. In most developing countries this comes mainly, if not entirely, from agricultural exports. An analysis in this report of the recent trends in international trade in agricultural products shows that the volume of agricultural exports from the developing countries has grown by well over a third during the past decade. Their value in real terms has grown scarcely at all, however, because of the fall in agricultural prices and the rise in prices of exports of manufactured goods. In relation to population, agricultural export earnings have fallen heavily over the past decade, and FAO projections published last year hold out few prospects for any material improvement in this situation.*

*A more encouraging feature of the year under review is the increasing intensity with which ways are being sought to alleviate these problems. Examination has continued of proposals for the compensatory financing of short-term fluctuations in export earnings. Progress in respect of international commodity agreements includes the negotiation of a long-term agreement for coffee and the preparation of a draft cocoa agreement for consideration at an international conference later this year. The possibilities for commodity arrangements of a more comprehensive character are also being explored. Active preparations, in which FAO is participating fully, are under way for the vital United Nations Conference on Trade and Development, which is to convene next year to seek new approaches to the problem of raising the export earnings of the developing countries.*

*Consideration will also have to be given to providing a larger flow of direct aid if even minimum acceptable rates of economic growth are to be attained. If further progress toward disarmament can be achieved, there could be no better use for at least part of the immense resources thereby released than to devote an increasing share of the abundance of the economically more developed countries to speeding the agricultural and economic development of the countries where poverty, hunger, and malnutrition are still grim realities.*

A handwritten signature in black ink, appearing to read "B. R. Sen".

B. R. SEN  
*Director-General*

## Chapter I. - SUMMARY

## Chapter II. - World review and outlook

### AGRICULTURAL PRODUCTION

World agricultural production rose by between 2 and 3 percent in 1962/63, according to FAO's preliminary estimates. This is slightly more than the estimated annual population growth of just under 2 percent, and thus made up at least partly for the setback of 1961/62, when as a result mainly of widespread bad weather the increase in production was unusually small.

In 1962/63 agricultural production appears to have increased appreciably in each of the main regions of the world except Latin America and the Far East. First estimates for Latin America suggest a slight fall in production, chiefly because of lower output of coffee in Brazil, sugar in Cuba, and winter grains in Argentina. Agricultural production in the Far East (excluding Mainland China) is estimated to have risen by little more than 1 percent in 1962/63. On the other hand, in Africa and the Near East, the two regions where production fell the year before, and also in Oceania and western Europe the increase in production was as much as 4 to 5 percent. Production is estimated to have risen by about 3 percent in eastern Europe and the U.S.S.R. in 1962/63, and by about 2 percent in North America. For Mainland China, official estimates of agricultural production are still not available, but it appears that there was some increase in production in 1962/63, following the series of unfavorable seasons that began in 1959/60.

During the last five years there seems to have been very little change in world food production per caput, which has varied only between 11 and 13 percent more than before the war. The main increases in per caput production since the war have been in Europe and North America, rather than in the less developed regions, where levels of food production per caput are far lower.

The Near East is the only one of the less developed regions where food production per caput has

been consistently maintained at more than the prewar level, though here too there has been some decline in recent years. In Africa the prewar level was recovered comparatively quickly, but there have subsequently been considerable fluctuations, and food production per head was somewhat less than before the war in both 1961/62 and 1962/63. In the Far East (excluding Mainland China), the most populous region in the world, the prewar level of per caput food production has been briefly regained only in the single year 1960/61. In Latin America the prewar level was regained only in 1958/59, and there has since been a fairly steep decline. Total food production in Latin America has increased in relation to the prewar period faster than in any other region, but the rate of population growth has also been faster than elsewhere. In fact, the increase in total food production in the less developed parts of the world, but their populations have been rising much faster.

The main contributors to the 2-3 percent increase in world agricultural production (excluding Mainland China) in 1962/63 were wheat, barley, and cotton. For most other agricultural commodities the increase in production was rather small in 1962/63, and output of a number of products declined slightly, including oats, maize, sugar, citrus fruit, coffee, cocoa, and jute.

According to preliminary estimates, the world fish harvest increased by a further 8 percent in 1962. Peru, with a further massive expansion, came within a few thousand tons of overtaking Japan as the world's largest producer of fish. Denmark, France, and Iceland also had exceptionally good fishing results in 1962, but the United States catch was slightly smaller than in 1961.

World roundwood removals are estimated to have risen by 2 percent in 1962. As in the last few years, fuelwood production was practically unchanged, while industrial wood removals rose by about

4 percent. The largest increase in fellings was in North America in 1962, and removals were reduced in the major European timber exporting countries.

#### CHANGES IN STOCKS

Large unsold stocks of a number of commodities remain, as for more than a decade now, a major feature of the world food and agricultural situation. The downward movement of these stocks that had begun in 1961/62, partly as a result of the poor harvests of that year, was less marked during 1962/63. The surplus stocks, with the major exception of those of coffee, are predominantly located in North America, and the total value of the holdings of the United States Commodity Credit Corporation rose again in 1962/63 after three successive years in which they were slightly reduced.

United States wheat stocks fell in 1962/63 for the second year in succession, and the total stocks of the four major exporters will probably close at about 2 percent less than the year before. For coarse grains also there was a substantial reduction in United States stocks for the second year in succession. Reflecting the current world shortage of sugar, stocks of this commodity are at the lowest level for many years. The slowing down in the rate of accumulation of coffee stocks became more marked during 1962/63, and there was also probably a small reduction in stocks of cocoa. The dairy surplus, in contrast, continued to rise steeply in 1962, with substantial increases in United States stocks of butter and dried skim milk, though in the first half of 1963 European butter stocks have been sharply reduced. Stocks of cotton in the United States rose by about a third in 1962/63, and world cotton stocks are estimated to have increased by about 10 percent, after remaining fairly stable for three years.

#### ECONOMIC ACTIVITY AND THE DEMAND FOR AGRICULTURAL PRODUCTS

The level of economic activity continued to rise in 1962 and the first half of 1963 in the industrialized countries of North America, Europe, and Japan that are the main markets for imports of agricultural products. Generally, however, the rate of growth was somewhat slower than a year ago.

The limited data available for the less developed

countries indicate that here too there has probably been some slackening in growth rates. In Latin America the stimulus of the Alliance for Progress has not yet led to a higher tempo of economic development, and in the Far East it is estimated that there has been a fall in average real incomes per caput in the region.

#### FOOD SUPPLIES AND CONSUMPTION

As a result of changes in imports and exports of food, trends in regional food supplies per caput have diverged less widely than in regional production per caput. In the developed regions, except Oceania, the increase in per caput food supplies has been less rapid than in per caput production. In each of the less developed regions, on the other hand, the trend of food supplies appears to have been more favorable than that of production, and per caput supplies are above the prewar level even where production has lagged behind.

Imports and exports of food are too small, however, to have any appreciable effect on the relative consumption levels of the different regions. These depend to a large extent on the level of income, and in fact the gap in actual food consumption levels between the more and less developed regions has tended to widen, since there has been more improvement in the per caput supplies of the more developed than in those of the less developed regions.

#### INTERNATIONAL TRADE IN AGRICULTURAL PRODUCTS

There were no major developments in world agricultural trade in 1962. Import demand continued to grow slowly and export supplies of most commodities were ample. The few changes which did take place, however, tended to interrupt at least temporarily trends which have persisted over the past decade.

The most conspicuous development was the increase in the prices of a number of commodities, in particular sugar, which began in the latter part of 1962 and continued into the early months of 1963. Although offset by further falls in prices of some other products, these increases led to a break in the longer-term falling trend of the average price level of all agricultural exports, which in 1962 showed no change from the year before. These price increases were due almost exclusively to specific factors affecting the supply of a few commodities,

and appear to be of short-term nature. The price of sugar, for example, which reached a peak in May 1963, has since started to decline. The longer-term factors which have tended to hold down prices, including the slow growth of demand for many products, rapid increases in output and productivity, and government efforts to expand exports, all remained largely unaltered.

Average unit values of exports of manufactured goods also showed little change from the year before. Thus, for the first time for about a decade there was practically no fall in the "terms of trade" for agricultural exports.

The volume of imports into the industrialized countries increased in 1962 by about 3 percent, while those of the less developed regions (except the Near East) and of the Sino-Soviet area fell slightly. Most of the increase, both into the more developed regions and the Near East, was in imports of food-stuffs, while reduced food imports mainly accounted for the smaller volume of imports into the other less developed regions and into Mainland China. These developments were in contrast to recent trends, as the most rapid increases in food imports over the last decade, apart from western European intra-regional trade, have been into the less developed countries. Because of lower prices and large shipments under special terms, it is unlikely that the larger food imports have led to an increased outlay of foreign exchange by developing countries.

Of the other main commodity groups, the volume of imports of raw materials of agricultural origin generally fell in 1962, while those of beverage crops increased, though there was a further reduction in their prices. Trade in fisheries and forestry products continued to expand.

In contrast to the trends of the past decade, the volume of exports of each of the economically more developed regions was somewhat lower in 1962 than the year before, while those of each of the less developed regions, except the Near East, increased by about 3 percent. Price movements, however, tended to offset these differences in the volume of shipments.

Over the period 1952-53 to 1960-62 agricultural exports from the more developed regions have increased much faster both in volume and value than those from the less developed regions. This disparity, however, largely reflects shipments under special terms, mainly from North America. If commercial exports only are considered, the volume of exports from both developed and less developed regions has increased by about one third. The value

of commercial exports from the developing regions has increased by about 8 percent at current prices and those from the economically more developed regions by about 13 percent.

The largest increases in export earnings over this period have occurred in the case of meat and cattle, fresh fruit, edible oils and oilseeds, oilcake, sugar, tobacco, and natural rubber. Export earnings from dairy products as a whole have grown rather slowly. The value of exports of cereals and cotton has been maintained only by shipments under special terms. Earnings from wool exports have shown no growth over the period, while earnings from exports of cocoa, tea, and especially coffee have declined since the peak level of 1954.

Earnings from agricultural exports, the main and often almost the only source of foreign exchange of most developing countries, show little likelihood of growing at a rate commensurate with their needs for economic development, and indeed have fallen sharply on a per caput basis over the past decade.

Efforts to improve prospects for agricultural exports were continued actively in 1962 and 1963. One step forward was the adoption by the International Monetary Fund of a new policy which will go some way to meeting the needs of primary producing countries for financing to compensate fluctuations in their export earnings. New commodity agreements have been negotiated or drafted for coffee and cocoa, while the exploration continues of the possibilities for commodity arrangements of a more comprehensive character. The problems of international trade in relation to the development of the "new" nations will be taken up at the United Nations Conference on Trade and Development, which will open in March 1964.

#### FARM PRICES AND INCOMES

In most of the countries for which data are available, the prices received by farmers tended to be somewhat higher in 1962 than in 1961, rising more rapidly in the second half of the year and in the early months of 1963. These developments were in some cases due to government price support measures, in others to lower output resulting from bad weather. At the same time, however, the persistent increase continued in the prices farmers pay for production requisites, wages, interest, taxes, and other farm expenses.

In several of the rather few countries that publish

data, total farm expenses rose more rapidly than gains in gross receipts from farm sales and government payments in 1962, and farm incomes consequently declined. On the other hand, in a number of countries, including Australia, Canada, the Federal Republic of Germany, Italy, and Japan, a higher volume of sales, sometimes accompanied by higher prices or larger government payments, more than offset the rise in farm expenses.

The trend in the more developed countries is toward a reduction in the number of farms and in the labor employed in agriculture, and income per farm and per head of farming population has therefore grown faster in these countries than the income of the farm sector as a whole. Thus while there was a negligible gain in the net income of the farm sector in the United States in 1962, income per farm rose by 4 percent, and income per head of the farm population also increased slightly. As a result of the rapid rise in industrial wages, the disparity between per caput incomes in agriculture and those in nonagricultural occupations may have grown in a number of western European countries.

#### AGRICULTURAL CREDIT

Especially in the less developed countries, where the need is greatest, the supply of agricultural credit is still far from sufficient. Although comparatively few data are available, all of the evidence seems to indicate that a substantial portion of credit needs is still supplied by such noninstitutional sources as moneylenders, retailers of farm production requisites, agricultural produce brokers, and friends and relatives. Thus the data on institutional credit collected through the biennial FAO questionnaire on agricultural credit do not indicate the total amounts of credit available. They are, however, of particular interest for the less developed countries, where increases in institutional agricultural credit are so necessary.

Over the period 1951-61, for which data on institutional credit are now available, there has been a strikingly rapid growth of credit in the developed countries, accompanied by some shift toward longer-term financing. The total amount of loans advanced in most of the developing countries has also increased during this period, although in general the growth neither began as early nor was as steady as in the more developed countries. In almost all of the less developed countries the government, through central banks, development banks, and a wide variety of

government lending agencies, or indirectly through the encouragement, subsidizing, and financing of credit co-operatives, is the main stimulus behind the expansion of institutional agricultural credit.

#### CONSUMER PRICES

Of the countries for which indices of retail food prices and of the cost of living are available, both indices went up in almost three quarters in 1962. Taking the five-year period 1958-62, the rise in the cost of living has been fairly moderate, averaging one to two percent per year, in about half of the countries for which data are available, but in only three countries was there a decline in the cost of living over this period. The movement in the food price index was for the most part rather similar, though in seven countries where the cost of living rose over the five-year period food prices declined.

#### AGRICULTURAL POLICIES AND DEVELOPMENT PLANS

While the past year has seen, in comparison with other recent years, rather few major changes in agricultural policies, it has been characterized by particularly intensive negotiations in the sphere of international trade, including preparations for the forthcoming round of tariff negotiations in the General Agreement on Tariffs and Trade, and for the United Nations Conference on Trade and Development.

Attention has also been focused on developments in the European Economic Community, and in particular on the negotiations concerning United Kingdom membership that were broken off in February 1963, the new Convention of Association with the 18 African Associated States that was initiated in December 1962, and the common agricultural policy. The common agricultural policy went into force in 1962 for those products for which regulations had been agreed, and while for the remaining products progress has been much slower than scheduled, it has been agreed that regulations for most of them should be finalized by the end of 1963. In other regions schemes of regional economic co-operation continue to make progress, though there has been no major new development during the past year.

Progress has been made with international agreements for certain commodities. A five-year Inter-

national Coffee Agreement was concluded in August 1962, in place of the previous series of annual agreements. A new three-year International Wheat Agreement became effective in August 1962, and a second International Olive Agreement was negotiated in April 1963. The draft international agreement for cocoa is to be placed before a United Nations Negotiating Conference in September 1963.

Concerning domestic agricultural policies, in the United States the main preoccupation continues to be the achievement of a better balance between supplies and requirements of surplus commodities, while at the same time increasing farm incomes and rural welfare. While no spectacular progress has yet been achieved, recent programs, particularly those in respect of grains, have been more successful than those employed earlier, and for the current period have been continued more or less unchanged. For wheat, however, following the producers' referendum of May 1963, no restrictions on acreage will be in effect and price supports will be drastically reduced for the 1964 crop, if no new legislation is enacted in the meantime. As regards the utilization of the surplus stocks, the experimental multilateral World Food Program, under the aegis of FAO and the United Nations, went into operation at the beginning of 1963.

Outside the United States, the problem of surplus production has chiefly concerned the major coffee producers and some countries of western Europe, where dairy products in particular have tended to outrun demand. In western Europe, however, most of the changes in price supports during the last year have been upward rather than downward. The main agricultural policy measures in western European countries have been intended to promote improvements in the structure of the agricultural industry in order to increase the efficiency of production, especially through the development of an economic size of farm and assisting the movement of farm labor into other occupations.

Elsewhere, however, the main objective remains to increase production, especially of foodstuffs for local consumption. In eastern Europe and the U.S.S.R. the agricultural sector has lagged in recent years, and measures have been taken in the U.S.S.R. to reinforce control over agricultural production and to increase the supply of the physical means of production. In the less developed countries reliance on planning as a major tool in the struggle to emerge from poverty and underdevelopment is now nearly universal. The year under review, however, saw

the formulation or initiation of relatively few new development plans (most of the current round began in the two or three previous years) except in Latin America, where most countries are now formulating plans as a condition of aid under the Alliance for Progress.

Information on the actual course of implementation of agricultural plans continues to be lacking in most cases. It is, however, encouraging to note that many new measures, especially in the institutional field, designed to remove obstacles to, and provide greater incentives for increased production, have been taken during the period under review. Measures to improve land tenure conditions continue to receive especial prominence, and in connection with the Alliance for Progress new agrarian reform laws were passed in at least six countries of Latin America toward the end of 1962. Increasing attention is being paid to the need to increase agricultural credit facilities, particularly in some countries of the Far East. In spite of the difficulties of administering agricultural price support policies in less developed countries, there is evidence that these countries are increasingly adopting such systems. Many new agricultural marketing organizations have been set up, especially in African countries, in some cases covering foodstuffs for domestic consumption as well as the export crops to which organized marketing facilities have often been mainly confined in the past.

Problems related to regional economic integration have recently been the major influence on national fishery policies. When it became clear early in 1963 that the European Economic Community would not expand in the near future, a number of countries announced their intention to extend offshore fishing limits. The United Kingdom has called a conference of all European fishing nations. Outside Europe, in the countries with developed fisheries, such as Japan, the U.S.S.R., and the United States, government policy has been directed mainly toward opening up new raw material sources, rationalizing methods of production, and developing internal and external markets. In a number of less developed countries craft are being acquired and crews trained in the more advanced fishing countries. Many Far Eastern countries are increasingly relying on fisheries development to assist in solving their food and nutritional problems.

As regards forest policies, there has been a change in the more developed countries in the habitual attitude of management policies toward assessing the

allowable cut, which has been considerably increased in recent years, initially in northern Europe, and more recently in North America, central Europe, and Japan. The increasing levels of living in Europe have affected some aspects of forestry, and considerable forest areas are being lost, mainly to housing and industry, though at the same time the rural exodus or the abandonment of marginal croplands have given new opportunities for forestry expansion and restoration. In the less developed regions progress in respect of forest policies continues on a wide variety of fronts, but a major difficulty continues to be the shortage of trained personnel.

#### SHORT-TERM OUTLOOK

No great change in the world food and agricultural situation seems likely during the rest of 1963 and the early part of 1964. Supplies of most commodities will remain large, though the slackening in the rate of accumulation of surplus stocks should continue. The recent revival in world prices for some commodities will probably prove only temporary.

The chapter is concluded with brief notes on the 1963/64 agricultural production prospects in each of the main regions, and on the short-term commodity outlook.

### Chapter III. - Basic factors affecting the growth of productivity in agriculture

Higher agricultural productivity is a key element in economic development. Higher productivity of land is necessary in all but the most sparsely populated countries to provide an adequate diet for the rapidly growing population and to meet its requirements of fibers and other agricultural raw materials. Higher productivity of labor is necessary if manpower is to be released from agriculture to industry and other occupations, an essential feature of economic development; it is also necessary to raise farm incomes and to remedy the abject poverty of most rural people in developing countries. A more prosperous agriculture in turn can be a powerful stimulus to general economic development by providing an expanding market for the newly established industries. It is with these two aspects, the productivity of land and of labor, that the present chapter is mainly concerned, though the limited information available on the productivity of capital, and on over-all agricultural productivity is also briefly reviewed.

At the working level, raising productivity in agriculture is largely a technical problem, by applying especially in less developed countries the knowledge and techniques devised by agricultural science. Further research is also of course necessary, especially on the problems of tropical agriculture, for hitherto agricultural science has been primarily concerned with the agriculture of the temperate zones. Raising agricultural productivity also involves the establishment of an economic and social environment in which farmers have the incentive and also the means to put into practice improved methods of farming.

The present study, however, is not primarily concerned with these technical and institutional aspects, many of which have been discussed in recent issues of *The state of food and agriculture*. It deals rather with some of the underlying economic factors which stimulate or retard the growth of agricultural productivity, and hence with the interrelations between agricultural productivity and economic development as a whole.

#### THE PRODUCTIVITY OF LAND

Over the period 1934-38 to 1956-60 world agricultural production increased by about 50 percent. The available statistics do not permit any global estimates of how much of this increased output came from a larger area under cultivation and how much from higher productivity. For 12 main crops for which fairly complete statistics are available, however, it is shown that nearly the whole of the increase in the economically more developed regions resulted from increased yields, sometimes in spite of a declining crop area. In the economically less developed regions, on the other hand, much the greater part of the increase was due to an extension of the crop area. Latterly, however, there have been appreciable increases in crop yields in some of the less developed countries.

Comparisons between countries bring out the wide range of productivity of land at the present time. Average yields of wheat, for example, vary from about 4 to 40 quintals per hectare, a range

of about tenfold. For rice the range is about sevenfold. While such differences are to a large extent due to natural conditions of soil and climate, detailed examination suggests that they reflect no less the technical level of agriculture in the country. Thus, over the last 50 years, yields of wheat and rice in some countries have scarcely changed, while in others, often with very similar natural conditions, they have increased up to two or threefold, exceptionally more. A ranking of countries in order of cereal yields would therefore have shown an entirely different picture immediately before the first world war from that which obtains today. In some countries, almost the whole increase has been compressed into the last one or two decades, and it is evident that when technical, economic, and social conditions are favorable, yields can be raised rather rapidly.

The measurement of the productivity of livestock is more difficult, and statistics are more scanty. In the case of milk yields there is a very wide range between countries, and in some instances milk yields have been increased at rates comparable with the faster increases in crop yields.

The over-all productivity of land, which depends not only on differences in yields of individual crops and livestock, but also the managerial skill with which the various farm enterprises are integrated, shows an even wider range than for single crops. The countries like the United Arab Republic, the Netherlands, and China (Taiwan) with the highest national averages of total output per hectare show a level some 40 or more times as high as the countries at the bottom of the list. Examination of the ranking of the countries shows that high over-all productivity of land is principally associated with three factors: high density of total population relative to the agricultural area; high per caput income, and hence high per caput expenditure on food and other agricultural products; and substantial exports of farm products. Each of these factors tends to raise the demand for farm products, and it thus appears that a major factor influencing the productivity of land is the level of demand in relation to the area cultivated.

#### THE PRODUCTIVITY OF LABOR

Whether measured in terms of labor input per unit of output (e.g., as the number of hours required to produce a given quantity of various farm prod-

ucts), or as the output per man engaged in agriculture, the data show that the range between the countries with highest and lowest labor productivity is even wider than in the case of land productivity. For example, in less developed countries some 30-50 times as many man-hours are required to produce a quintal of grain as is needed in some economically more developed countries. The range varies, however, from product to product, and is considerably smaller for crops which have not yet been successfully mechanized.

When measured in aggregate terms, either as the gross output per man, or as the net output per man after deducting the cost of inputs from outside agriculture, the range is still wider. Gross output per man in the countries with the highest labor productivity (New Zealand, Australia, the United States) ranges from 50 to 80 times as high as that in the less developed countries at the foot of the list. The range in the case of the net output, although very large, is narrower because of the increased portion of gross returns used for the purchase of intermediate goods and services from the nonfarm sectors and from abroad in the technically more advanced agricultures.

An examination of the ranking of the countries shows that labor productivity bears little relationship to the productivity of land, but is closely related to the general level of economic development. Higher per caput incomes in developed countries mean higher expenditures on food and other farm products. High incomes are also associated with an occupational distribution of the population where a relatively small proportion is engaged in farming. In countries at the top of the list, the proportion seldom exceeds 20 percent and is often much less, compared with up to 70 percent in the countries with the lowest productivity among those for which data are available, and probably higher percentages in still more underdeveloped countries, where available statistics do not permit productivity measurements.

As with the productivity of land, labor productivity also tends to be higher in exporting than in agricultural importing countries. In each case the effect is to enlarge the available market in relation to the work force engaged in agriculture. A fairly close relationship is in fact found to exist between the potential market for farm products in relation to the agricultural labor force, and labor productivity in agriculture.

Data on changes in labor productivity in agri-

culture over time are scarce. The limited data available suggest that it rises more rapidly than in the economy as a whole as a country moves along the road of economic development. Except in a few countries, however, it remains below the average level of productivity in other sectors.

#### CAPITAL IN AGRICULTURE

Rather little information is available on the contribution of fixed capital to agricultural productivity, and the comparatively few national studies which have been carried out are of unequal value and doubtful comparability. So far as they go, these studies suggest that, relative to the level of output, capital requirements in agriculture (even excluding the value of land) are usually higher than in manufacturing or mining, though lower than in public utilities or housing. They thus do not confirm the widely held impression that the capital/output ratio in agriculture is generally low, at least in developing countries, and that agriculture is a bargain sector requiring relatively little capital. This somewhat surprising finding, if found to be widely applicable, may largely reflect the general underutilization of much of the capital stock in agriculture, in particular of machinery and equipment, but often also of buildings.

Available data show clearly, however, that the share of working capital used to purchase production requisites from nonfarm sectors and abroad becomes much higher in the economically more developed countries, and may in some cases reach as much as 50 percent of the value of gross output, compared with a maximum of some 5 percent in many less developed countries.

Given the general shortage of monetized capital, steps to reduce the relative capital needs of agriculture are important. Two ways in which this can be done are by the fuller use of manpower in rural areas for capital formation on the farms, such as construction of irrigation dams, bunds, farm roads, etc., and by the achievement of more rapid turnover of capital by concentrating investments, whenever possible, on projects that yield a quick return, rather than on large-scale projects which take many years to mature. The turnover is most rapid when capital is used as working capital, and this emphasizes the value of raising yields by the increased use of fertilizers and other methods needing mainly short-term working capital.

#### CONCLUSIONS

The general pattern which emerges from inter-country comparisons of agricultural productivity is one of close correspondence between productivity and the demand for agricultural products. Demand, and especially demand from the nonagricultural and export sectors, appears to be a major stimulus of agricultural growth, and this rate of growth, in relation to available land and labor, in turn determines the growth of productivity. But though a main stimulus, the rate of growth of effective demand also places, within fairly wide limits, some kind of ceiling on the growth of productivity, since production cannot for long exceed profitable outlets, at least in the absence of expensive forms of government intervention.

The study also emphasizes the immense capacity for agricultural expansion made possible by modern techniques, and the rapid increase both in yields and in over-all agricultural productivity which some countries have been able to achieve. Except in very unfavorable natural conditions, national levels of productivity appear to reflect the technical level of agriculture as much as or more than conditions of soil and climate.

But although a close relationship between demand and productivity is shown to exist over a wide range of countries with very different natural conditions, levels of development and density of population, it does not follow that the growth of demand leads automatically to increased production. This will occur only if economic, social, and technical conditions are favorable. If, as in many developing countries today, the impact of urban demand at the farm level is weakened by unsatisfactory systems of marketing or obsolete forms of land tenure, farmers will have little incentive to increase output for the market, and production will lag behind demand. This is also likely to occur if there is a lack of educational and extension services to make farmers aware of improved methods, or a lack of farm credit which precludes them from adopting improved methods, even if they know about them.

A close relationship between demand and output is not, of course, unusual and applies to other goods and services as well as to agriculture. What is remarkable in agriculture is that the relationship applies over so wide a range of natural and economic conditions, and that it determines also the level of productivity. In industry, for example, an in-

creased demand can be met by taking on more workers without necessarily any change in the level of productivity. In agriculture, on the other hand, the land is there with few alternative uses, and there is commonly an oversupply of labor with no other available employment. Both therefore tend to be used at very varying levels of intensity according to the level of demand. Also remarkable is the great flexibility which has made it possible to attain levels of productivity of land and especially of labor up to 80 times as great in advanced agricultures as in those at an early stage of development.

Estimates of the magnitude of exports in relation to total output in representative exporting countries bring out the great significance of exports to the agricultures of these countries, but suggest that in a great majority of cases the level of domestic demand is much the more important determinant of productivity. The same applies in representative importing countries.

High average productivity per man in agriculture is found only in countries at an advanced stage of economic development, where per caput expenditure on farm products is high, and where the farm labor force is a small part of the total population. The gradual decline in the size of the agricultural population in the course of economic development is shown to have a major influence on the growth of labor productivity. It becomes especially important in the later stages of economic development, when the size of the nonfarm population, and hence of the nonfarm market, increases at a rapidly accelerating rate in relation to the size of the agricultural

work force. It is this change, together with the development of agricultural science, which appears to account for the remarkably rapid growth of farm labor productivity in economically more developed countries in the last few decades. It follows that the growth of farm labor productivity can be effectively stimulated by measures to reduce the farm population, e.g., by facilitating the movement of manpower to other occupations or the retirement of elderly farmers.

While a high level of labor productivity is found only in economically more developed countries, there are a number of instances where a high output per hectare has been attained in countries at a fairly early stage of economic development, and with the progress of agricultural science this becomes increasingly possible. This seems a point of considerable importance, as it is the output per hectare which mainly determines the total food supply, and hence the possibility of feeding the rapidly growing population in developing countries at an adequate nutritional level. In view of the explosion of population, it is certain that for some decades to come a majority of the people in developing countries will remain in agriculture, and largely subsistence agriculture. But this need not necessarily condemn them, as so often at present, to malnutrition and poverty, if they were aware of and encouraged to adopt improved methods of farming. They could then increase their output, with little additional labor or expense, sufficiently to provide an ample diet for their families, even though their market outlets in towns were still limited.

## Chapter IV. - Fertilizer use: spearhead of agricultural development

The immense possibilities for sustained increases in crop production which can be realized through greater and more efficient use of fertilizers and manures have already been amply demonstrated in many countries in all parts of the world. It is in less developed countries where populations are growing rapidly, hunger and malnutrition are widespread, and a large part of the population is poorly housed that the greatest increase in the production of food and fiber is needed, and the greatest potentialities therefore exist for a fuller use of fertilizers.

Apart from higher yields, benefits which may result from the increased use of fertilizers include a widening of the range of crops that can be grown

efficiently, notably in areas where certain crops could not be grown because of deficiencies of one or more plant nutrients. New crops in turn may mean new opportunities for mechanization and for changes in the farm labor requirement. The use of fertilizers is a powerful "lead" practice for the adoption of new ideas because its benefits are quickly realized. Their use is regarded by many as a criterion of the degree to which modern agricultural practices have been adopted.

The efficient use of fertilizers must go hand-in-hand with the provision of other inputs. Irrigation, for example, may be a prerequisite, and so may be the development of crop varieties which can utilize

larger applications of fertilizers, or of the methods of controlling diseases and pests in the more intensively cultivated crops.

World consumption of commercial fertilizers has increased from about 2 million tons at the beginning of the century to 9 million tons 1938/39, and 28.5 million tons in 1960/61. Although the use of fertilizers in the developing countries is increasing, most of the world's supply is used by a few economically more developed countries. For example, North America, Oceania, and certain countries in Europe, with only about a quarter of the world's arable land, use three quarters of the fertilizer.

An attempt is made to estimate the contribution of fertilizers to present-day crop yield, and typical response data for fertilizers are shown for selected crops in a number of countries. The need for a balanced supply of nutrients in the soil is emphasized, particularly in the tropics where, because of the nature of the soil, deficiencies are easily induced by excessive rates of application of certain nutrients. Symptoms of nutrient deficiency, the toxic effects of excess trace elements, the nutrient requirements of different crops, and the residual effects of fertilizers are discussed. The use of fertilizer in forestry and fisheries is briefly considered. In forest nurseries fertilizer requirements are estimated by means of chemical tests. Even in silviculture proper, where sizable areas of trees are grown in stands on relatively long rotations, the possibility of using fertilizers is receiving considerable attention. For many years fertilizers, particularly in the organic form, have been used in fish ponds for the purpose of stimulating the growth of plants on which fish feed. Recently, the kinds and amounts of fertilizer required have been studied more intensively, with the result that soil and water tests are being used to predict fertilizer requirements. Inorganic fertilizers are replacing the organic forms in many places.

Physical factors affecting the use of fertilizers include chemical and physical properties of soils. The important chemical properties are those which affect the amount and availability of the sixteen elements which are essential for plant growth. The role of these elements, which are equally important but required in widely different quantities, is discussed. Climate is a major factor influencing the development of soils, the type of crop which can be grown on them, and hence the kind and amount of fertilizers. The inherent differences in climate and other factors are outlined and the distribution of these broad soil groups is plotted on a map. The

fact that chemical properties can be modified fairly readily places more emphasis on physical properties which do not lend themselves so readily to modification. Texture and structure are two physical properties which receive most attention because they are key properties in determining the plant-air-water relationship and therefore the physical environment in which the plant grows. Manure plays a dual role, acting both as a source of nutrients and as a soil conditioner.

Economic and social factors with an important influence on fertilizer use include price relationships between fertilizers and the crops to which they are applied; the level of income of the farmers and conditions of land tenure, which if unfavorable may reduce the incentive to use fertilizers; and adequate credit and distribution facilities to ensure that supplies of fertilizers are available to farmers at the right time.

Agricultural extension is necessary to bring home to the farmer the value of fertilizers. The different approaches to the problem include soil surveys, long-term field experiments on important soil types, exploratory plots on farmers' fields, chemical analysis, and foliar diagnosis techniques. It is recommended that from some or all of these a local system should be developed which takes into account the soils, the farming system, the skill of the farmers, and the advisory staff in the particular area.

Estimates of the world reserves of fertilizer materials, though conservative, do not suggest any threat of shortage. The advisability of establishing domestic fertilizer industries in developing countries is receiving increasing attention in order to save foreign exchange, because of the availability of raw material, and for political reasons. The capacity of the plant and the extent to which this capacity is utilized are important factors in determining the success of newly established fertilizer industries.

In the concluding section it is shown that the yields of two staple crops, rice in Japan and wheat in the United Kingdom, have doubled twice since records were first kept a few centuries ago. A remarkable feature is that most of this increase occurred in the past few years and still shows no sign of leveling off. At least half of the increase in yields is attributed to fertilizer use.

In view of the remarkable response of crops to fertilizers and other treatments, and of the rapid advances currently being made in agricultural science, it is clear that very many times the present quantities of food can be produced. In this endeavor fertilizers will continue to play a very important part.

## Chapter II. - WORLD REVIEW AND OUTLOOK

### Agricultural production

World agricultural production rose by between 2 and 3 percent in 1962/63, according to FAO's preliminary estimates (Table II-1). This is slightly more than the estimated annual population growth of just under 2 percent, and thus made up at least partly for the setback of 1961/62, when as a result mainly of widespread bad weather the increase in production was unusually small.

In 1962/63 agricultural production appears to have increased appreciably in each of the main regions of the world except Latin America and the Far East (Table II-2). In the previous year Latin America showed a bigger expansion than any other region, but first estimates for 1962/63 suggest a slight fall in production, chiefly because of lower output of coffee in Brazil, sugar in Cuba, and winter grains in Argentina. Agricultural production in the Far East (excluding Mainland China) is estimated to have risen by little more than 1 percent in 1962/63.

The increase in production in 1962/63 was as much as 4 to 5 percent in Africa, the Near East, Oceania, and western Europe. In Africa and the

Near East, the two regions where production fell the year before, the much better results in 1962/63 came to a considerable extent from large grain harvests in northwest Africa and in those Near East countries that had previously suffered from several successive years of drought. Production is estimated to have risen by about 3 percent in eastern Europe and the U.S.S.R. in 1962/63, and by about 2 percent in North America.

For Mainland China, official estimates of agricultural production are still not available, and it is not possible to include this country in the FAO index of world production. It appears, however, that there was some increase in production in 1962/63, following the series of unfavorable seasons that began in 1959/60.

### FOOD PRODUCTION AND POPULATION

The progress of food production in relation to the growth of population has been examined in

TABLE II-1. - INDICES OF WORLD<sup>1</sup> AGRICULTURAL PRODUCTION IN RELATION TO POPULATION

	Prewar average	Average 1948/49-1952/53	Average 1953/54-1957/58	Average 1958/59-1962/63	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
..... Indices, average 1952/53-1956/57 = 100 .....									
<b>TOTAL PRODUCTION</b>									
All agricultural products .....	77	88	103	118	113	116	119	120	123
Food products only .....	76	88	103	119	114	117	120	120	123
<b>POPULATION</b> .....	81	93	102	112	108	110	112	114	116
<b>PER CAPUT PRODUCTION</b>									
All agricultural products .....	95	95	101	106	106	106	106	105	106
Food products only .....	94	95	101	106	106	106	107	105	106

NOTE: The world and regional indices of agricultural production shown in this report 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. While the coverage of most of the regional groupings used is self-explanatory, it should be noted 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 Mainland China no estimates are included until more complete data are available.

<sup>1</sup> Excluding Mainland China.

some detail in previous issues of this report. Because, however, of its great importance for human welfare, it is necessary to return to this subject each year for at least a brief review of the latest developments in the situation.<sup>1</sup>

During the last five years there seems to have been very little change in world food production per caput, which has varied only between 11 and 13 percent more than before the war (Table II-1 and Figure II-1). In the previous five-year period, 1953/54-1957/58, the stability of the index of per caput food production was less marked, and it ranged from 4 to 9 percent more than before the war. The five-year period before that, 1948/49-1952/53, saw the regaining of the prewar level of food production per caput, after the wartime setback when the increase in production had fallen behind the growth of population.

Thus, over the longer run, world food production has more than kept up with population growth. There are, however, two respects in which the situation is far from satisfactory: first, the increase in per caput food production has tended to slow down, and secondly, it has been most unevenly distributed among the different regions of the world.

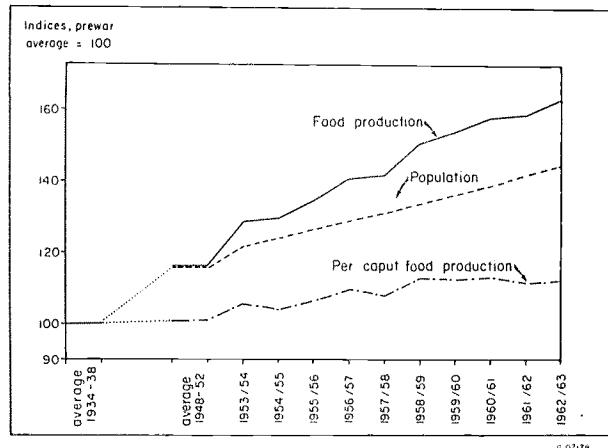
Food production per caput averaged about 7 percent more in 1953/54-1957/58 than in 1948/49-1952/53, but only about 5 percent more in 1958/59-1962/63 than in 1953/54-1957/58. Moreover, almost all of the progress in the latest five-year period occurred in the first year, 1958/59, when weather conditions were exceptionally favorable almost throughout the world, and food production rose by 6 percent in total and 4 percent on a per caput basis. The last four years have done little more than hold this gain.

The slower rise in per caput food production has come not only from a slackening in the rate of expansion of production, but also from an acceleration in population growth. As modern medicine and hygiene spread in the less developed countries, rates of population growth may be expected to accelerate still more. The rate of increase of food production will therefore have to be stepped up considerably in the future, in order to keep up with the more rapid population growth and to provide a sufficient margin above it for improvements in diets.

The data of world per caput food production

<sup>1</sup> In addition to the modifications brought by the latest year under review, there are also changes in most years in the details of what is known of the earlier situation, especially concerning individual regions, as a result of revisions in the data of both production and population.

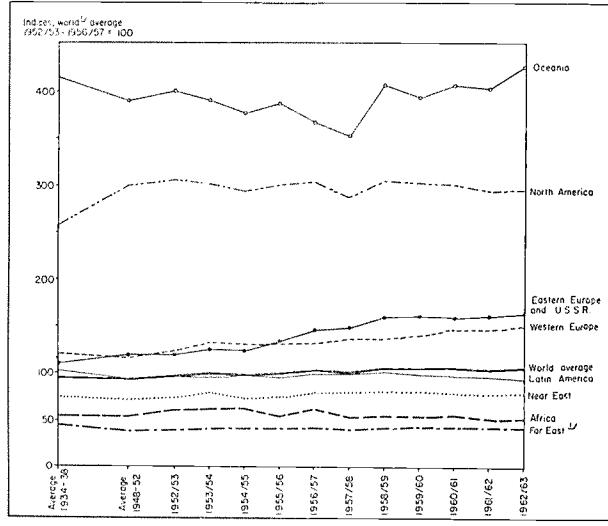
FIGURE II-1. TRENDS IN WORLD FOOD PRODUCTION IN RELATION TO POPULATION



discussed so far average out some substantial differences among the various regions. It is clear from Table II-2 that trends have diverged quite widely in the regions, while Figure II-2 brings out in addition the great gulf between the actual levels of food production per caput in the more and less developed regions. The figure also indicates that the main increases since the war have been in Europe and North America rather than in the less developed regions where they are most needed.

Oceania is the only one of the more developed regions where per caput food production is not now substantially greater than before the war; this is mainly because of the high rate of population growth resulting partly from immigration. In North America

FIGURE II-2. TREND AND LEVEL OF WORLD<sup>1</sup> AND REGIONAL FOOD PRODUCTION PER CAPUT



<sup>1</sup> Excluding Mainland China

TABLE II-2. - INDICES OF WORLD<sup>1</sup> 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 (Prelim- inary)
<b>Total production</b>												
<i>Indices, average 1952/53-1956/57 = 100</i>												
<b>ALL AGRICULTURAL PRODUCTS</b>												
Western Europe .....	82	86	101	101	102	103	107	109	112	118	119	124
Eastern Europe and U.S.S.R. ....	82	86	94	96	104	116	118	129	132	132	135	139
North America .....	68	93	99	97	101	103	98	105	108	109	109	111
Oceania .....	78	90	97	98	103	105	102	117	119	122	125	131
Latin America .....	73	88	96	100	102	107	112	118	122	121	125	124
Far East <sup>1</sup> .....	84	87	98	100	104	107	106	111	115	119	121	123
Near East .....	73	85	99	97	100	109	112	118	121	123	122	127
Africa .....	69	88	98	101	101	106	104	108	111	116	111	116
<b>ALL ABOVE REGIONS</b> .....	77	88	98	98	103	107	107	113	116	119	120	123
<b>FOOD PRODUCTS ONLY</b>												
Western Europe .....	82	86	101	101	102	103	107	109	113	119	119	124
Eastern Europe and U.S.S.R. ....	83	86	95	96	104	116	119	131	133	134	137	141
North America .....	66	92	98	97	101	104	101	109	110	111	110	113
Oceania .....	81	92	99	98	103	100	99	116	115	121	123	133
Latin America .....	70	88	96	100	101	109	111	117	117	119	120	121
Far East <sup>1</sup> .....	82	87	99	100	103	107	106	111	116	120	122	124
Near East .....	73	85	101	97	100	109	113	117	120	121	120	124
Africa .....	71	89	99	101	100	106	102	106	108	113	109	113
<b>ALL ABOVE REGIONS</b> .....	76	88	98	98	102	107	108	114	117	120	120	123
<b>Per caput production</b>												
<b>ALL AGRICULTURAL PRODUCTS</b>												
Western Europe .....	93	89	102	101	102	101	105	106	108	113	112	115
Eastern Europe and U.S.S.R. ....	84	92	96	96	103	113	113	122	123	121	122	124
North America .....	87	100	101	97	99	100	93	98	98	96	96	97
Oceania .....	103	99	99	97	101	100	95	107	106	107	107	110
Latin America .....	110	98	98	100	100	102	104	106	106	103	103	99
Far East <sup>1</sup> .....	109	94	100	100	102	103	100	103	104	105	105	104
Near East .....	96	94	102	97	98	104	104	107	108	107	104	107
Africa .....	92	95	100	101	99	102	97	100	99	101	95	97
All above regions .....	95	95	100	99	101	103	101	106	106	106	105	106
<b>FOOD PRODUCTS ONLY</b>												
Western Europe .....	93	89	102	101	101	101	105	106	108	113	113	116
Eastern Europe and U.S.S.R. ....	85	92	96	96	103	113	114	123	124	123	124	126
North America .....	85	99	100	97	99	101	96	101	100	100	98	98
Oceania .....	108	102	102	98	101	96	92	106	102	106	105	111
Latin America .....	105	98	98	101	99	103	103	105	102	101	99	97
Far East <sup>1</sup> .....	106	94	101	100	101	103	100	103	105	106	105	104
Near East .....	96	93	103	97	98	104	105	107	107	105	103	104
Africa .....	95	96	101	102	98	101	96	98	97	98	93	94
<b>ALL ABOVE REGIONS</b> .....	94	95	100	99	101	103	102	106	106	107	104	106

NOTE: See explanatory note to Table II-1.

<sup>1</sup> Excluding Mainland China.

almost all of the increase in per caput food production took place during the war and the immediate postwar years, when production in that region was immensely stepped up to help make good the deficiencies in

other parts of the world. Since then the increase would have been even greater but for the attempts that have been made to restrain the growth of surplus stocks.

Among the less developed regions, where, however, there is likely to be a considerable margin of error in the production statistics, the Near East is the only one where food production per caput has been consistently maintained at more than the prewar level, though here too there has been some decline since the peak level of just over 10 percent more than before the war was reached in 1958/59 and 1959/60. In Africa the prewar level was recovered comparatively quickly, but there have subsequently been considerable fluctuations, and food production per caput was somewhat less than before the war in both 1961/62 and 1962/63.

The Far East is the most populous region in the world, and it is therefore particularly disquieting that in this region (excluding Mainland China) the prewar level of per caput food production has been briefly regained only in the single year 1960/61. In Latin America also the prewar level was regained only in 1958/59, and there has since been a fairly steep decline, with per caput food production in 1962/63 estimated as about 7 percent less than before the war. Total food production in Latin America has increased in relation to the prewar period faster than in any other region, but the rate of population growth has also been more rapid than elsewhere.

In fact it is evident from Table II-3 that the increase in total food production in the less developed

regions has matched that in the more developed parts of the world, but their populations have been rising much faster. Further indications of the interplay between trends in production and population are given by the indices of total and per caput food production in individual countries assembled in Annex Table 1.

Data of per caput food production do not, of course, indicate trends in food consumption per caput. It is true that for the world as a whole food production and consumption per caput are roughly the same, except for the comparatively small effect of changes in the level of stocks. For individual regions and countries, however, the divergent trends and levels of per caput production noted above tend to some extent to be evened out by a redistribution of supplies through international trade. Thus, as is discussed later in this chapter, each of the less developed regions appears to have been able to maintain actual food supplies per caput at levels somewhat greater than before the war, by means of larger imports and often smaller exports of food.

This has been at the expense of a reduction in the foreign exchange available for the import of the capital goods needed for the execution of economic development plans, though in a good many countries the effect on the balance of payments has been mitigated by food shipments under special terms.

While the above analysis of per caput production has been in terms of food products alone, it is clear from Table II-2 that the course of per caput production of agricultural products as a whole has differed rather little. In both Latin America and the Far East (excluding Mainland China), however, the prewar level of per caput production appears still not to have been regained, even for a single year, for agricultural products as a whole. In Africa and Oceania per caput production of all agricultural products, as opposed to food products alone, remains greater than before the war.

TABLE II-3. - CHANGES IN FOOD PRODUCTION AND POPULATION, AVERAGE 1958/59-1962/63 IN RELATION TO PREWAR PERIOD

	Population	Total food production	Per caput food production
<i>..... Percentage increase .....</i>			
Western Europe ....	19	42	20
Eastern Europe and U.S.S.R. ....	11	63	46
North America ....	43	67	17
Oceania .....	52	50	— 2
Four above regions ..	21	57	30
.....			
Latin America ....	76	70	— 3
Far East <sup>a</sup> .....	47	45	— 2
Near East .....	50	64	9
Africa .....	53	54	1
Four above regions ..	52	54	2
<b>ALL ABOVE REGIONS</b>	<b>39</b>	<b>56</b>	<b>13</b>

<sup>1</sup> Prewar average to average 1958/59-1962/63. Minus sign indicates decrease. <sup>a</sup> Excluding Mainland China.

#### REGIONAL AGRICULTURAL PRODUCTION

The usual account follows of the recent agricultural production situation in the main regions of the world. Data are also included, as far as possible, on individual countries, though the FAO country production indices are not yet available for 1962/63. Statistics of the regional production of the major commodities are presented in Annex Tables 3-10.

## Western Europe

In spite of widespread drought in the late summer of 1962, agricultural production in western Europe is estimated to have increased by as much as 4 percent in 1962/63. Revised estimates indicate that in the previous season the increase was less than 1 percent, with production declining in northwest Europe, especially in France and the Federal Republic of Germany (Table II-4).

The region's grain production showed a substantial expansion in 1962/63, with both wheat and barley at record levels. The increase in wheat production was especially marked in France, Portugal, Spain, and the United Kingdom; in several countries the quality was poor, and relatively large quantities had to be used for feed. Maize production again declined slightly, because of drought in southern Europe. Sugar production decreased in 1962/63 for the second year since the large harvest of 1960/61. The reduction in the potato area continued, with the major exception of the United Kingdom, but

was more than compensated by higher yields. In most of the countries affected by the drought the fruit harvest was smaller than the year before, but quality was generally above average. The region's olive oil production was the lowest since 1955/56.

The worst effects of the drought were felt by forage crops and pastures, while perennial fodders and clover also suffered from the cold weather during the spring. Beef and veal production increased considerably in most countries in 1962/63, as the fodder shortage induced farmers to reduce cattle numbers. Pigmeat production continued to increase, though at a slower rate in late 1962 and early 1963. The increase in milk production was also slower, since yields declined in the second half of 1962 as a result of the fodder situation. Deliveries to dairies continued to rise faster than milk production, because of smaller utilization for feed, and butter production again increased. Production of eggs and poultry meat increased further.

TABLE II-4. - INDICES OF AGRICULTURAL PRODUCTION IN WESTERN EUROPE

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
..... Indices, average 1952/53-1956/57 = 100 .....											
NORTHWESTERN EUROPE											
Austria .....	91	103	96	102	107	112	116	109	122	126	...
Belgium-Luxembourg.....	93	96	104	107	100	106	110	103	117	119	...
Denmark .....	100	101	101	97	101	111	110	110	116	125	...
Finland .....	98	105	100	97	100	109	109	110	126	127	...
France .....	91	99	104	104	102	105	105	111	125	122	...
Germany, Federal Republic .....	95	101	101	100	102	105	111	107	121	112	...
Ireland .....	95	97	105	99	105	115	105	98	111	114	...
Netherlands .....	100	99	100	104	98	105	115	117	122	123	...
Norway .....	97	99	99	97	108	101	101	98	102	103	...
Sweden .....	104	103	101	91	101	99	95	97	99	101	...
Switzerland .....	101	100	103	99	98	99	108	106	110	111	...
United Kingdom .....	97	98	100	99	106	105	101	110	116	120	...
Subtotal .....	95	100	102	101	102	106	107	109	120	119	...
SOUTHERN EUROPE											
Greece .....	79	102	100	109	111	128	121	124	114	130	...
Italy .....	92	104	96	105	103	101	116	114	108	115	...
Portugal .....	87	106	104	102	102	105	99	101	103	100	...
Spain .....	100	96	102	98	104	108	110	118	119	122	...
Yugoslavia .....	70	114	92	120	104	147	119	158	144	133	...
Subtotal .....	90	103	98	105	104	112	114	121	116	120	...
REGIONAL TOTAL .....	93	101	101	102	103	107	109	112	118	119	124

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 1962/63.

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

The rapid growth of agricultural production in eastern Europe and the U.S.S.R. that took place during the decade of the 1950s seems to have slowed down, at least temporarily. Following a negligible increase in 1960/61 and a rise of about 2 percent in 1961/62, the region's production is estimated to have increased by about 3 percent in 1962/63, in comparison with the much larger increases achieved earlier.

Climatic conditions were unfavorable in many parts of the U.S.S.R. in 1962/63, and yields per hectare were generally low. Because of expanded area, however, total grain production rose from 138 million tons in 1961/62 to 147.5 million tons in 1962/63, as against the 164 million tons expected from the planned diversion of 18 million hectares from forage crops and fallow, which however was only partially accomplished. The area of oats was reduced by 40 percent in a single year. The production of pulses (included in total grains in U.S.S.R. statistics) was almost doubled in 1962/63, but potato production declined by 20 percent, and there were also small decreases for sugar beet and cotton. Meat production rose by as much as 8 percent in 1962, which may partly reflect increased slaughterings, especially in the private sector, as a result of the reduction in forage area. Milk yields fell further, though the total output of milk and also eggs was slightly more in 1962 than the year before.

Almost all of the eastern European countries were affected in 1962/63 by a cold winter and spring and by subsequent drought. The production of grains, potatoes, and sugar beet declined. There were, however, good harvests of grapes, vegetables, and tobacco in Bulgaria, of grain and potatoes in eastern Germany, and of grain, potatoes, and sugar beet in Hungary. In most countries meat production increased only slightly, though there was heavy slaughter of cattle and calves because

of the continued shortage of fodder. Meat production fell by as much as 22 percent in eastern Germany, where heavy slaughterings in 1961 had reduced the herds. Milk production tended downward, except in Poland.

### *North America*

Agricultural production in North America increased by about 2 percent in 1962/63, after a slight decline the year before. In 1961/62 Canadian production fell by about 12 percent because of the drought in the Prairie Provinces, while production failed to increase in the United States (Table II-5). The 1962/63 season brought a substantial recovery in production in Canada, and a small increase in the United States.

Wheat production in Canada was almost twice the drought-affected level of 1961/62; barley increased by about half and oats by about three quarters. The production of pigmeat, milk, and eggs also rose sharply, but output of oilseeds, potatoes, fruit, tobacco, beef, and poultry was slightly less than the year before.

In the United States wheat production dropped by 12 percent in 1962/63, and was the smallest since 1957/58. As a result of the diversion of acreage under the Feed Grain Program, the coarse grain acreage was the lowest ever recorded, but yields rose further, bringing an increase in production of about 2 percent. Tobacco production rose by 10 percent, and was the largest for more than a decade, while there was a small increase in the cotton harvest. Soybean production, however, was slightly less than the exceptionally large crop of 1961/62, and the citrus harvest was sharply reduced by the severe weather in Florida at the end of 1962. There was some reduction in the output of poultry meat and eggs, but other meat and dairy products increased further.

TABLE II-5. - INDICES OF AGRICULTURAL PRODUCTION IN NORTH AMERICA

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Prelim- inary)
<i>Indices, average 1952/53-1956/57 = 100</i>											
Canada .....	110	103	78	99	109	93	97	100	106	93	...
United States .....	98	98	99	101	103	99	106	109	110	110	...
REGIONAL TOTAL .....	99	99	97	101	103	98	105	108	109	109	111

NOTE: See explanatory note to Table II-4.

TABLE II-6. - INDICES OF AGRICULTURAL PRODUCTION IN OCEANIA

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Prelim- inary)
<i>Indices, average 1952/53-1956/57 = 100</i>											
Australia .....	97	97	97	104	105	99	119	119	123	126	...
New Zealand .....	97	95	100	103	105	109	115	120	122	124	...
REGIONAL TOTAL .....	97	97	98	103	105	102	117	119	122	125	131

NOTE: See explanatory note to Table II-4.

### Oceania

According to preliminary estimates, there was an increase of about 5 percent in agricultural production in Oceania in 1962/63. In contrast to most earlier years, food production increased rather more than the output of nonfood products.

Australian wheat production increased by about 25 percent to a record level in 1962/63, largely because of an expansion in acreage. To some extent wheat seems to be replacing wool in the Australian wheat-sheep areas, and wool production was lower than the previous year. Sugar production set a new record, with the harvesting of a greater proportion of the standing cane as a result of the good

prospects on world markets. Meat production showed a large increase. Cheese production rose somewhat in Australia, but the increase in butter production was temporarily halted. In New Zealand, in contrast, butter production increased and cheese declined slightly.

### Latin America

In 1961/62 agricultural production in Latin America rose by about 3 percent, in spite of declines in output in Chile, Cuba, and Venezuela (Table II-7). Cuba's production is estimated to have fallen by nearly 20 percent to the lowest level since 1955/56.

TABLE II-7. - INDICES OF AGRICULTURAL PRODUCTION IN LATIN AMERICA

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Prelim- inary)
<i>Indices, average 1952/53-1956/57 = 100</i>											
<b>CENTRAL AMERICA</b>											
Cuba .....	99	97	94	99	111	114	114	115	127	103	...
Guatemala .....	93	96	99	102	110	115	121	131	131	138	...
Honduras .....	99	104	94	97	106	107	110	120	120	126	...
Mexico .....	84	88	104	110	114	130	143	142	144	152	...
Panama .....	91	99	98	106	105	114	120	123	117	127	...
Subtotal .....	89	92	100	106	112	123	132	133	137	136	...
<b>SOUTH AMERICA</b>											
Argentina .....	100	97	99	97	107	108	111	105	100	106	...
Brazil .....	93	96	99	106	106	115	124	142	135	144	...
Chile .....	101	95	102	103	99	109	105	106	112	106	...
Colombia .....	98	101	98	101	102	109	112	117	118	118	...
Peru .....	98	98	103	102	98	100	107	113	115	122	...
Uruguay .....	97	108	101	98	96	90	86	78	92	93	...
Venezuela .....	94	98	100	101	106	108	113	119	127	126	...
Subtotal .....	96	97	100	102	106	110	115	119	117	122	...
REGIONAL TOTAL .....	95	96	100	102	107	112	118	122	121	125	124

NOTE: See explanatory note to Table II-4.

For 1962/63 preliminary estimates indicate a drop of about 1 percent in the region's production. The decline was mainly in nonfood products, however, and food production is estimated to have increased slightly. This is in contrast to the last few years, when nonfood products, primarily coffee, have tended to increase faster than food production.

Production of the main grains was at about the same level in 1962/63 as the year before; the output of winter grains in Argentina was sharply reduced as a result of prolonged drought. Sugar production declined further with the policy of diversification in Cuba, combined with organizational problems resulting from the nationalization of the industry. The main influence on the region's total production, however, was a drop of 17 percent in coffee production, owing to drought and the downswing in the two-year production cycle in Brazil. Meat production increased further, partly because of emergency slaughtering in Argentina and Uruguay during the drought.

#### *Far East*

Agricultural production in the Far East (excluding Mainland China) is estimated to have increased by about 2 percent in 1961/62 and about 1 percent in 1962/63. These comparatively small increases are in strong contrast to the three previous years of rapid expansion, which culminated in 1960/61 with the temporary regaining of the prewar level of food production per caput.

The region's grain production increased slightly in 1962/63. Rice harvests were generally satisfactory, and there were record crops in Ceylon and Japan. There was some decline in rice production in India as a result of drought, and in Pakistan owing to floods, and there have been reports in recent months of sharp price rises in eastern India, where supplies from central government stocks have not been able to prevent local shortages. A poor 1962/63 rice crop has also produced a critical food situation in the Republic of Korea. Wheat production was large in India and Pakistan, but there was some reduction in Japan. The region's sugar production increased only slightly in spite of favorable market conditions. Jute output was lower in Pakistan, because of adverse weather combined with low prices at sowing time, and in Thailand. Rubber production increased slightly, but tea and coffee were affected by bad weather. The growth of livestock production remained slow, except in Japan, where the rapid expansion continued.

In Mainland China, in spite of reports of bad weather in some areas, all sources agree that 1962/63 was the second consecutive year of gradual improvement in the production of basic foods. Official reports indicate, without giving any statistics, that the harvests of rice and wheat were the best since 1959/60, though the production of cotton, oilseeds, and other crops remained low. Food rations seem to have improved somewhat, in both quantity and variety, and have recently included some meat, eggs, and fish. Shortages have persisted, however, and heavy grain imports have continued.

TABLE II-8. - INDICES OF AGRICULTURAL PRODUCTION IN THE FAR EAST

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Prelim- inary)
<i>Indices, average 1952/53-1956/57 = 100</i>											
Burma .....	102	98	96	97	107	93	107	112	111	110	...
Ceylon .....	94	95	101	108	102	106	110	111	115	121	...
China (Taiwan) .....	88	94	101	104	112	119	125	123	130	133	...
Federation of Malaya .....	95	93	99	105	108	108	110	119	123	126	...
India .....	90	100	100	102	108	107	111	114	120	121	...
Indonesia .....	92	100	105	101	102	104	107	109	108	110	...
Japan .....	96	85	94	114	110	115	116	120	123	123	...
Korea, Republic of .....	86	105	104	106	99	109	113	114	116	120	...
Pakistan .....	99	98	102	98	104	103	103	108	111	115	...
Philippines .....	93	98	99	101	109	113	114	117	123	129	...
Thailand .....	88	106	86	105	115	94	108	114	127	129	...
REGIONAL TOTAL <sup>1</sup> .....	92	98	100	104	107	106	111	115	119	121	123

NOTE: See explanatory note to Table II-4.

<sup>1</sup> Excluding Mainland China.

### Near East

After declining slightly in 1961/62, agricultural production in the Near East is estimated to have risen by nearly 5 percent in 1962/63. In 1961/62 production fell by about 15 percent in the United Arab Republic, and although there was some recovery in Iraq and Syria, production in both these countries remained much less than in earlier years (Table II-9).

The region's total grain production increased sharply in 1962/63, and was only slightly below the record crop of 1957/58. The drought was finally broken in Iraq and Syria, which had their first large harvests of wheat and barley for three years. Grain production also rose by 15 percent in Turkey, but the rice crop in the United Arab Republic recovered by only about 10 percent over the very low level of 1961/62. After stagnating for two seasons, cotton production increased by some 15 percent. High yields in the United Arab Republic brought a recovery of 47 percent over the insect-damaged crop of 1961/62; cotton output declined, however, in Iran and Sudan.

### Africa

In Africa agricultural production fell by 4 percent in 1961/62, and preliminary estimates indicate that in 1962/63 a rise of about the same percentage took production back to approximately the level of 1960/61. The tendency for nonfood products to increase somewhat faster than food production appears to have continued in 1962/63.

A major factor in the decline in production in 1961/62 was the disastrously small harvests in Algeria,

Morocco, and Tunisia as a result of drought. Total production in these three countries dropped by more than 20 percent, while south of the Sahara there appears to have been only a slight decline (Table II-10). In 1962/63 in Morocco wheat production was more than twice and barley production nearly three times the previous year's level; both wheat and barley production doubled in Tunisia, and Algeria's harvests also recovered. South Africa again had a very large maize crop in 1962/63, though it was about 4 percent below the 1961/62 record. There was a further increase in groundnut production in Nigeria, but a decline in Senegal. The region's coffee production increased sharply but cocoa harvests were slightly smaller than in 1961/62. Cotton production, which had fallen sharply in 1961/62, was at more normal levels with the recovery of Uganda's crop from the drought-affected level of the previous year.

### MAIN AGRICULTURAL COMMODITIES

The main contributors to the 2-3 percent expansion in world agricultural production (excluding Mainland China) in 1962/63 were wheat, barley, and cotton (Annex Table 2A). For most other commodities the increase in production was rather small in 1962/63, and output of a number of products declined slightly, including oats, maize, sugar, citrus fruit, coffee, cocoa, and jute.

Grain production recovered sharply in 1962/63, and in contrast to the previous year, when the production of each of the main grains declined, there were further slight decreases only for oats and maize. Wheat production in 1962/63 was the largest ever, rising by 11 percent over the small harvest of 1961/62.

TABLE II-9. - INDICES OF AGRICULTURAL PRODUCTION IN THE NEAR EAST

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
..... Indices, average 1952/53-1956/57 = 100 .....											
Iran.....	90	98	99	104	109	122	122	125	117	125	...
Iraq.....	85	105	118	88	104	126	105	100	102	109	...
Israel .....	81	92	100	104	124	129	150	167	162	189	...
Syria .....	88	98	115	80	120	136	96	100	104	115	...
Turkey .....	100	108	86	99	107	105	121	123	127	127	...
United Arab Republic .....	96	92	102	103	107	115	117	121	127	109	...
REGIONAL TOTAL .....	94	99	97	100	109	112	118	121	123	122	127

NOTE: See explanatory note to Table II-4.

TABLE II-10. - INDICES OF AGRICULTURAL PRODUCTION IN AFRICA

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<i>Indices, average 1952/53-1956/57 = 100</i> .....											
<b>NORTHWEST AFRICA</b>											
Algeria .....	91	100	106	96	106	98	93	100	103	83	...
Morocco .....	<sup>1</sup> 91	<sup>1</sup> 101	<sup>1</sup> 109	<sup>1</sup> 97	<sup>1</sup> 101	<sup>1</sup> 81	115	101	104	83	
Tunisia .....	94	109	103	81	112	99	134	112	127	85	...
Subtotal .....	92	102	107	94	105	92	107	102	107	83	...
<b>SOUTH OF SAHARA</b>											
Ethiopia <sup>2</sup> .....	98	99	100	100	102	99	99	104	104	106	...
South Africa .....	89	98	101	103	109	105	110	113	121	125	...
Subtotal <sup>3</sup> .....	94	97	100	103	106	103	109	112	118	117	...
REGIONAL TOTAL .....	94	98	101	101	106	104	108	111	116	111	116

NOTE: See explanatory note to Table II-4.

<sup>1</sup> Former French zone only. - <sup>2</sup> Excluding Eritrea. - <sup>3</sup> Derived by subtraction of subtotal for northwest Africa from regional total.

There were particularly big increases in wheat production in western Europe, and in the areas affected by drought in 1961/62 in Australia, Canada, northwest Africa, and the Near East. As a result of acreage reductions, wheat production declined in the United States, in spite of near-record yields.

The production of barley also recovered very sharply, and set a new record. The increase was fairly general, except for Argentina and Australia. Maize production declined in Europe as a result of drought, but elsewhere was about the same as the year before. For oats the decline in production in 1962/63 continues the long-term trend. The upward trend in world rice production was resumed in 1962/63, with a rise of about 2 percent, though the crop was disappointing in a number of countries, including India and Pakistan.

Sugar production again fell slightly in 1962/63, and for the second year in succession was substantially below current requirements. In addition to a further reduction in the Cuban crop, the harvest of beet sugar in Europe was again affected by bad weather.

The production of citrus fruit is estimated to have fallen by about 13 percent in 1962/63, mainly because of frost damage at the end of 1962 in Italy, Spain, and the United States. Apple production increased sharply, however, with the upturn in the biennial production cycle, and a further slight increase is estimated in banana production. The

1962/63 production of dried fruit was also large.

The world output of vegetable oils and oilseeds is estimated to have declined slightly in 1962/63. The United States soybean crop was only fractionally below the high level of the year before. There was a modest increase in groundnut production in all of the major producing countries except Senegal. Copra production increased in 1962/63, but there was some reduction in the output of palm oil. Olive oil production was down by about one third from the 1961/62 level. The production of linseed recovered sharply, especially in the United States.

Wine production, which had dropped in 1961/62, rose by about 15 percent in 1962/63. World tobacco production registered the first substantial increase for some years, gains in the United States, India, and Japan more than offsetting smaller crops in the Federation of Rhodesia and Nyasaland, Brazil, and Canada.

The production of coffee fell by about 10 percent in 1962/63, chiefly because of the effect of drought and cyclical fluctuation on the Brazilian crop, and for the third successive season world output remained below the 1959/60 record figure. Cocoa production declined slightly for the second consecutive year from the peak level reached in 1960/61. The production of tea was at approximately the same high level as in 1961/62.

Cotton production again increased in 1962/63, and was 5 percent more than the previous year's

record crop. Production rose sharply in the United Arab Republic and India, and there was a small increase in the United States. Jute production dropped sharply, however, with reductions in Pakistan and Thailand. Hard fiber production remained constant for the fourth year running. Wool production also has remained more or less unchanged for the past four seasons. Natural rubber output was close to the high level of 1961/62.

Statistics of livestock products are particularly scanty and unreliable in the less developed countries; these countries, however, are still responsible for a very small proportion of the total production of these commodities, which are so important nutritionally. There were considerable increases in 1962 in meat and dairy products in the more developed parts of the world.

1963

#### FISHERY PRODUCTION

According to preliminary estimates, the world fish harvest increased by a further 8 percent in 1962, to reach approximately 44.5 million tons (Table II-11 and Annex Table II).

There was a further massive expansion of some 30 percent in Peruvian production, which at about 6.8 million tons was within a few thousand tons of overtaking Japan as the world's largest producer of fish. The steady rise in Japanese production continued, with favorable demand conditions for the country's major export products. The U.S.S.R. reported that production targets had been substantially exceeded in 1962.

The United States catch was slightly less than in 1961, but its gross value, at \$385 million, the highest

ever. Production of menhaden (used for fish meal) was slightly lower in 1962, but Maine herring (chiefly used for bait) was taken in considerably larger quantities than in 1961. Catches of shrimp increased, and this was again the most valuable single crop in the total catch. Canada, too, increased production of species for which the consumer is prepared to pay high prices, and the fishery industry experienced a prosperous year as a result of favorable conditions in markets for salmon, lobster, and cod.

Among the leading fishing countries of Europe, France, Iceland, and Denmark had exceptionally good fishing results in 1962. With good results in their herring fisheries, Iceland's total catch increased by more than 15 percent in 1962, and that of Denmark by almost 25 percent. In the United Kingdom and the Federal Republic of Germany there were small increases over the year before. Norway's production continued to decline, however, primarily in the winter herring fishery but also because no capelin were caught in 1962. Production also decreased in Italy, the Netherlands, and Poland. Catch trends were not always reflected in value, and in the Netherlands, for example, the value of the catch rose by 20 percent.

Fish production rose further in South Africa (including South West Africa). Catch quota restrictions were modified, and increased quantities of pelagic fish were taken for fish meal production. The remarkable expansion of Chile's production, also mainly for fish meal, continued in 1962. Elsewhere in the less developed regions, there were further increases in production in 1962 in almost all of those countries for which data are so far available. In many cases the expansion of catches partly reflects greater stress on fisheries in national devel-

TABLE II-11. - ESTIMATED WORLD CATCH OF FISH, CRUSTACEANS, AND MOLLUSKS

	1938	Average 1948-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
..... Million metric tons, live weight.....												
Western Europe .....	5.44	6.19	6.77	7.24	7.35	7.77	7.33	7.18	7.62	7.37	7.66	8.0
Eastern Europe and U.S.S.R. ....	1.70	1.99	2.28	2.58	2.84	2.99	2.94	3.04	3.21	3.53	3.75	4.0
North America .....	3.15	3.60	3.62	3.83	3.79	4.13	3.80	3.76	3.99	3.80	3.95	4.0
Oceania .....	0.09	0.09	0.11	0.11	0.10	0.10	0.11	0.11	0.12	0.13	0.12	0.1
Latin America.....	0.24	0.50	0.73	0.80	0.97	1.09	1.33	1.84	3.19	4.68	6.52	8.0
Far East <sup>1</sup> .....	9.10	7.42	9.78	10.46	11.27	11.61	13.06	13.93	15.10	15.91	16.38	17.0
Near East .....	0.33	0.38	0.43	0.43	0.40	0.44	0.42	0.43	0.44	0.43	0.46	0.5
Africa .....	0.45	1.03	1.52	1.56	1.59	1.78	1.92	1.95	2.07	2.17	2.32	2.5
WORLD TOTAL <sup>1</sup> .....	20.50	21.20	25.24	27.01	28.33	29.91	30.91	32.24	35.74	38.02	41.16	44.5

<sup>1</sup> Including estimates for Mainland China.

opment plans, in order to improve diets, replace costly imports (especially in some countries of west Africa and the Far East) or, in a few countries, increase foreign exchange earnings.

#### FORESTRY PRODUCTION

World roundwood removals are estimated to have risen by 2 percent to about 1,810 million cubic meters in 1962 (Table II-12). As in the last few years, fuelwood production was practically unchanged, while industrial wood removals rose by about 4 percent.

The largest increase in fellings was in North America in 1962. In the major European timber exporting countries, however, removals were reduced. In Africa removals of hardwood logs for export decreased, but there was an increase in removals for conversion at local sawmills and plywood and veneer factories, so that there was little change in the total volume of removals. Similarly in Latin America, a decline in removals of softwood sawlogs was offset by an increase in pulpwood. In the Far East removals, especially of exportable tropical logs, recovered sharply in 1962. In the U.S.S.R. removals were reported as about 4 percent more than in 1961.

Among the main forest products, world output of sawnwood increased by about 3 percent in 1962.

Sawn softwood production rose by 11 percent in Canada, as a result of strong import demand in the United States, and also increased in the U.S.S.R., the United States, and Japan. In Europe, however, sawn softwood production was lower, on account of excess stocks and restrained import demand, although consumption remained high, and in Latin America also there was some decline in output.

For sawn hardwood the increase in world output is estimated at some 3 percent in 1962. North American output recovered strongly from the depressed level of 1961, and there were also increases in Africa, the Far East, Oceania, and the U.S.S.R. In Latin America the output of sawn hardwood was barely maintained, and in Europe there was a slight fall.

The most rapid growth among panel products continued to be in particle board. In Europe there was a 20 percent increase in output in 1962, though there were indications that in western Europe production capacity is expanding more rapidly than consumption. The expansion of the plywood industry continued, not only in the larger producing countries such as the U.S.S.R., the United States, Japan, Canada, and Finland, but also in developing countries like China (Taiwan), the Philippines, Surinam, and a number of west African countries, and world output is estimated to have increased by about 7 percent in 1962. Increased production of veneers is reported from several tropical coun-

TABLE II-12. - ESTIMATED WORLD<sup>1</sup> ROUNDWOOD REMOVALS AND PRODUCTION OF FOREST PRODUCTS

	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Prelimi- nary)
<b>ROUNDWOOD REMOVALS</b>										
										<i>Million cubic meters</i>
Total industrial wood ..	738	839	<sup>2</sup> 914	943	934	937	1,002	1,026	1,004	1,045
Fuelwood .....	708	714	<sup>2</sup> 784	778	791	776	785	768	765	765
<b>TOTAL</b>	<b>1,446</b>	<b>1,553</b>	<sup>2</sup> 1,698	<b>1,721</b>	<b>1,725</b>	<b>1,713</b>	<b>1,787</b>	<b>1,794</b>	<b>1,769</b>	<b>1,810</b>
<b>PRODUCTION OF FOREST PRODUCTS</b>										
Sawnwood .....	248.3	279.6	<sup>2</sup> 299.4	302.6	294.0	306.1	326.2	327.6	328.5	339.0
Plywood .....	6.3	9.0	<sup>2</sup> 10.9	11.3	11.8	13.0	14.9	15.4	16.5	17.6
<i>Million metric tons</i>										
Fibreboard .....	2.1	2.8	3.1	3.3	3.4	3.6	4.1	4.3	4.5	4.7
Particle board .....	...	...	...	0.5	0.8	1.1	1.4	1.8	2.4	2.9
Wood pulp .....	34.1	42.5	46.5	49.6	50.1	50.0	55.0	59.2	62.4	65.2
Newsprint .....	8.8	10.4	<sup>2</sup> 11.2	12.0	12.3	12.1	13.1	14.0	14.4	14.7
Other paper and board..	33.7	41.1	<sup>2</sup> 45.7	48.6	49.3	50.7	56.0	60.1	63.7	68.3

<sup>1</sup> Including estimates for Mainland China. - <sup>2</sup> Pre-1955 data are not strictly comparable with those for 1955 and subsequent years.

tries. North American and European production of compressed fibreboard expanded in 1962, but noncompressed fibreboard decreased in both regions.

While the world output of wood pulp rose by 4 percent in 1962, the increase was mainly composed of mechanical pulp, and most of the expansion was in North America, where there was a substantial increase in the demand for pulp products. In Europe higher pulp consumption was largely met by reductions in stocks. Operating ratios in northern Europe were held below 85 percent throughout 1962, following an agreement among Scandinavian producers to bring production into line with the slower increase in consumption.

Newsprint output showed only a slight increase in 1962. Canada, the largest producer, reduced output by 1 percent because of increased competition abroad. European producers also were forced

to adjust output to the slower growth of demand, and in both North America and Europe the problem of surplus newsprint capacity remained acute. Countries in other regions continued to expand production, especially South Africa and New Zealand, where plantations of exotic conifers are providing an economic base for the expanding pulp and paper industries.

The production of other types of paper and board is estimated to have increased by about 7 percent. North America accounted for most of the increase, but all other regions also contributed. Paperboard output continued to expand rapidly to meet the demand for packaging, and the production of fine coated and special purpose paper also increased. Paper production in the United Kingdom, Europe's largest producer, declined by 1 percent, however, in the face of increasing competition from the Scandinavian countries.

### Changes in stocks

Large unsold stocks of a number of commodities remain, as for more than a decade now, a major feature of the world food and agricultural situation. The downward movement of these stocks that had begun in 1961/62, partly as a result of the poor harvests of that year, was less marked during 1962/63. The reduction of coarse grain stocks continued, and there was a slight further decline in stocks of wheat. Other commodities of which stocks were reduced in 1962/63 included sugar and soybeans, but there were large increases for dried skim milk and cotton. For most other agricultural products there was little change in the level of stocks in 1962/63.

United States end-of-season wheat stocks have fallen for the second year in succession, and for 1962/63 are estimated as about 17 percent below the peak level reached in 1960/61 (Table II-13). While the United States wheat crop again declined in 1962/63, the Canadian crop recovered sharply, and wheat stocks in Canada therefore rose to about 22 percent more than in 1961/62, when they were at their lowest level since 1952/53. Australian wheat stocks are also expected to rise somewhat above the low level of the past two years, and the total stocks of the four major exporters will probably close at about 2 percent less than the year before.

For coarse grains, the reduction of 15 percent

in United States stocks in 1961/62, the first for over a decade, was followed in 1962/63 by a further decline of about the same proportion. In Canada coarse grain stocks rose sharply from the low level of 1961/62.

Linked with the reduction in United States stocks of coarse grains in 1961/62, was a sharp rise in stocks of soybeans, to which some acreage was diverted from coarse grains. Soybean production was again at a high level in 1962/63, but there was also a big expansion in exports, so that stocks are estimated to have fallen substantially by the end of the season.

Reflecting the current world shortage of sugar, stocks of this commodity are at the lowest level for many years. World stocks, which dropped by almost one fifth in 1961/62, are likely to have fallen still more by the end of the 1962/63 season, mainly as a result of the further decline in Cuban production and the poor harvests in Europe.

The slowing down in the rate of accumulation of coffee stocks became more marked during 1962/63. Mainly because of the lower harvest in Brazil, stocks at the end of the 1962/63 season are likely to show only a comparatively small increase. For cocoa there are no reliable statistics of the level of stocks, but a comparison of production and grindings indi-

TABLE II-13. - ESTIMATED STOCKS OF MAJOR AGRICULTURAL AND FOREST PRODUCTS

	Date	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 (Fore- cast)	
<i>Million metric tons</i>														
<b>WHEAT</b>														
United States .....	1 July	7.0	16.5	25.4	28.2	28.1	24.7	24.0	35.2	35.8	38.4	35.5	31.7	
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	12.9	
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	0.4	
Australia .....	1 Dec.	0.5	1.0	2.6	2.6	2.4	1.1	0.5	1.8	1.7	0.7	0.5	0.8	
Total 4 major exporters ...		13.5	29.9	46.4	47.8	47.5	47.3	43.4	54.4	55.0	56.4	46.8	45.8	
<b>RICE (milled equivalent)</b>														
Asian exporters <sup>1</sup> .....	31 Dec.	0.7	1.4	1.6	0.8	0.7	0.6	0.5	0.5	0.3	0.2	0.2	0.3	
United States .....	31 July	0.1	--	0.2	0.8	1.1	0.6	0.6	0.5	0.4	0.3	0.2	0.3	
Total of above .....		0.8	1.4	1.8	1.6	1.8	1.2	1.1	1.0	0.7	0.5	0.4	0.6	
<b>COARSE GRAINS<sup>2</sup></b>														
United States .....	1 July <sup>3</sup>	18.5	24.7	29.4	37.3	39.3	44.4	53.8	61.7	68.0	77.2	65.4	55.8	
Canada .....	1 Aug.	3.6	5.1	5.6	3.7	4.3	6.6	5.2	4.9	4.6	4.5	2.8	4.4	
Total 2 major exporters ...		22.1	29.8	35.0	41.0	43.6	51.0	59.0	66.6	72.6	81.7	68.2	60.2	
<b>BUTTER</b>														
United States <sup>4</sup> .....		0.03	0.13	0.17	0.07	0.01	0.05	0.03	0.01	0.03	0.17	0.28	...	
Canada .....		0.02	0.03	0.04	0.05	0.04	0.03	0.04	0.05	0.06	0.09	0.11	...	
European countries <sup>5</sup> .....		0.04	0.06	0.05	0.04	0.10	0.12	0.08	0.06	0.12	0.14	0.13	...	
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	...	
Total of above .....	31 Dec.	0.14	0.27	0.32	0.22	0.20	0.26	0.21	0.17	0.28	0.47	0.58	...	
<b>CHEESE</b>														
United States <sup>4</sup> .....	31 Dec.	0.11	0.20	0.25	0.24	0.20	0.19	0.13	0.14	0.15	0.24	0.22	...	
<b>CONDENSED AND EVAPORATED MILK</b>														
United States <sup>4</sup> .....	31 Dec.	0.18	0.12	0.10	0.10	0.11	0.10	0.09	0.10	0.10	0.10	0.07	...	
<b>DRIED SKIM MILK</b>														
United States <sup>4</sup> .....	31 Dec.	0.08	0.23	0.06	0.04	0.04	0.05	0.06	0.04	0.14	0.14	0.28	...	
<b>LINSEED AND OIL (oil equivalent)</b>														
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	...	
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	...	
<b>LIQUID EDIBLE VEGETABLE OILS AND OILSEEDS (oil equivalent)</b>														
United States .....	1 Oct. <sup>6</sup>	0.24	0.63	0.52	0.35	0.29	0.29	0.33	0.56	0.39	0.45	0.73	0.60	
<b>SUGAR (raw value)</b>														
Cuba .....	31 Dec.	2.2	1.5	1.9	1.6	0.6	0.7	0.5	1.2	1.1	1.0	0.2	...	
World total <sup>7</sup> .....	31 Aug.	10.6	9.9	11.3	11.1	9.7	8.7	8.3	11.4	11.9	12.9	10.5	...	

TABLE II-13. - ESTIMATED STOCKS OF MAJOR AGRICULTURAL AND FOREST PRODUCTS (*concluded*)

	Date	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 (Forecast)
<i>Million metric tons</i>													
COFFEE													
Brazil .....		0.18	0.20	0.20	0.20	0.63	0.44	0.87	1.45	2.83	3.19	3.72	...
Total 5 countries <sup>8</sup> .....	30 June	0.53	0.51	0.49	0.38	0.84	0.69	1.17	1.85	3.42	3.84	4.35	...
World total .....	30 Sept.	...	...	...	...	...	...	...	...	3.76	4.23	4.39	...
TOBACCO (farm weight)													
United States <sup>9</sup> .....	1 Oct.	1.56	1.66	1.69	1.83	1.89	2.00	1.89	1.81	1.74	1.70	1.83	...
COTTON (lint)													
United States .....		0.60	1.22	2.11	2.43	3.14	2.47	1.89	1.93	1.64	1.57	1.69	2.28
Other net exporters .....		1.00	1.08	0.78	0.80	0.56	0.65	0.85	0.76	0.69	0.76	0.85	0.65
Importers .....		1.34	1.21	1.26	1.26	1.08	1.30	1.32	1.14	1.30	1.41	1.17	1.12
World total <sup>10</sup> .....	31 July	2.94	3.51	4.15	4.49	4.78	4.42	4.07	3.83	3.63	3.74	3.71	4.05
NATURAL RUBBER													
World total <sup>11</sup> .....	31 Dec.	0.73	0.72	0.73	0.76	0.74	0.76	0.75	0.70	0.77	0.77	0.72	...
NEWSPRINT													
North America <sup>12</sup> .....	31 Dec.	0.89	0.80	0.77	0.69	0.92	0.92	0.99	0.98	0.93	0.93	0.95	...
SAWN SOFTWOOD													
European importers <sup>13</sup> .....	31 Dec.	5.74	6.19	5.10	6.09	5.32	5.62	5.42	5.12	6.22	6.07	5.85	...
European exporters <sup>14</sup> .....	31 Dec.	4.31	3.63	4.05	4.50	4.26	3.75	4.42	3.60	4.50	5.20	4.90	...
North America .....	31 Dec.	14.01	15.68	14.23	14.18	16.23	15.88	14.96	15.18	17.47	15.36	14.27	...
SAWN HARDWOOD													
European importers <sup>15</sup> .....	31 Dec.	1.29	1.13	1.06	1.22	1.29	1.24	1.25	1.18	1.24	1.32	1.29	...
European exporters <sup>16</sup> .....	31 Dec.	0.31	0.28	0.27	0.32	0.47	0.45	0.41	0.39	0.38	0.52	0.50	...
North America .....	31 Dec.	5.11	5.41	4.62	4.17	4.76	4.73	4.77	4.79	5.06	4.11	4.43	...

NOTE: Quantities shown include normal carry-over stocks.

<sup>1</sup> Burma, Thailand, Rep. of Viet-Nam. - <sup>2</sup> Barley, oats, maize, sorghum, and rye. - <sup>3</sup> Maize and sorghum, 1 October. - <sup>4</sup> Manufacturers' stocks and CCC uncommitted supplies. - <sup>5</sup> Austria, Belgium, Finland, Federal Republic of Germany, Ireland, Netherlands, Norway, Sweden, Switzerland, United Kingdom, and (from 1957) France. - <sup>6</sup> Cottonseed, 1 August. - <sup>7</sup> Excluding U.S.S.R. and Mainland China. - <sup>8</sup> Brazil, Colombia, Ivory Coast, Uganda, and United States. - <sup>9</sup> Flue-cured types, 1 July. - <sup>10</sup> Excluding the U.S.S.R., eastern Europe, and Mainland China, and including estimates of cotton afloat. - <sup>11</sup> Including estimates of rubber afloat, but excluding strategic stockpiles. - <sup>12</sup> United States and Canadian mills and United States consumers. - <sup>13</sup> Belgium-Luxembourg, Denmark, Federal Republic of Germany, Netherlands, Switzerland, United Kingdom. - <sup>14</sup> Austria, Norway, Sweden, Yugoslavia. - <sup>15</sup> Belgium-Luxembourg, Federal Republic of Germany, United Kingdom. - <sup>16</sup> Austria and Yugoslavia.

cates that there has been a small reduction in 1962/63.

The dairy surplus, in contrast, continued to rise steeply in 1962. There was a substantial increase in butter stocks in the United States, where a large expansion in production coincided with a decline in consumption; in the first half of 1963, however, European butter stocks have been sharply reduced. Partly as a consequence of the increased butter

production, United States stocks of dried skim milk doubled during 1962. Dried skim milk plays an important part in the program of donations under Public Law 480, but in 1962 the rate at which it was acquired by the Commodity Credit Corporation (CCC) far exceeded the rate of disposals. United States cheese stocks have been reduced only slightly from the high level at the end of 1961.

Stocks of cotton in the United States rose by about a third in 1962/63, the first increase of more than a few percent since 1955/56. This was the combined effect of a considerable reduction in exports and a 10-percent fall in domestic consumption. Consequently, world cotton stocks, after remaining fairly stable for three years, are estimated to have risen by almost 10 percent.

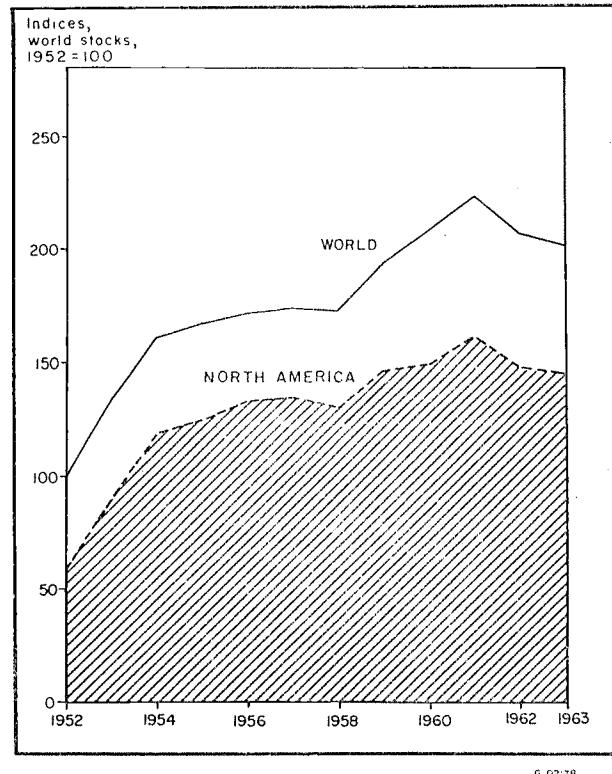
With such divergent movements in the stocks of the various commodities, it is difficult to arrive at a picture of the over-all stock situation. Figure II-3, based on a price-weighted index of the stocks of the agricultural products shown in Table II-13, suggests, however, that on balance there was a further very slight reduction in world stocks in 1962/63.

There again appears to have been little change in the proportion of total world stocks located in North America, which according to the FAO price-weighted index remains around 70 percent. The main stocks outside North America are those of coffee, which, it should be noted, inevitably loom rather large in any index based on price weights. The stocks of coffee are very largely in Brazil, where it is estimated that on 30 September 1962 about 85 percent of the world total was located.

The total value of the holdings of the United States Commodity Credit Corporation had risen to \$7,959 million by 30 April 1963, or 11 percent more than a year before (Annex Table 12). This renewed increase in CCC holdings comes after three successive years in which they were slightly reduced. Lower stocks of grains and soybeans were more than offset by increases for dairy products, cotton, and tobacco. United States disposals of surplus stocks are discussed in the section of this chapter devoted to international trade in agricultural products.

Stocks of forest products (not included in Figure II-3) were generally reduced during 1962, especially in Europe. There were substantial reductions in United Kingdom stocks of sawnwood, pulp, and some categories of paper, and in stocks of pulp in

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



Note: Indices are based on stocks shown in Table II-13 only, and exclude forest products

Finland and Sweden. Stocks of hardwood logs were excessive in African ports in the early part of 1962, owing to reduced demand from Europe, but the situation eased by the end of the year as a result of reduced logging activity and heavier buying by European importers. In North America stocks of sawn softwood were reduced from the excessive levels that had resulted from the 1960 recession. North American stocks of sawn hardwood rose in the second half of 1962, and newsprint stocks increased slightly during the year.

### Economic activity and the demand for agricultural products

The level of economic activity continued to rise in 1962 and the first half of 1963 in the industrialized countries that are the main markets for imports of agricultural products. Generally, however, the rate of growth was somewhat slower than a year ago.

The limited data available for the less developed countries indicate that here too there has probably been some slackening in growth rates.

In the United States gross national product (GNP) in 1962/63 is estimated as 4.3 percent more in

real terms than in 1961/62. Toward the end of 1962 and in the first half of 1963 economic activity expanded faster than had generally been expected. Consumer expenditures increased, in spite of the continuing high rate of unemployment, which averaged 5.8 percent (seasonally adjusted) in the first six months of 1963. Nondurables, including food, showed the highest increase in consumer expenditures in the first half of 1963. The balance of payments improved slightly in 1962, the deficit of \$2,200 million on current account being 8 percent less than the year before. To a considerable extent, however, this improvement was due to nonrecurrent dollar payments by foreign countries, and the deficit rose again in the first half of 1963, reaching an annual rate of \$3,300 million, or three quarters more than in the same period of 1962.

Canada's GNP increased by 6.2 percent in real terms in 1962, which is more than in any year since 1956, though there too the rate of growth slowed down during the course of the year. Improvements in the balance-of-payments situation, due mainly to currency devaluation, have enabled some of the austerity measures introduced in mid-1962 to be lifted.

In Europe the rate of growth of GNP in real terms fell from 4.5 percent in 1961 to 3.5 percent in 1962, the slackening in the tempo of expansion affecting most countries in both western and eastern Europe. In the countries of the European Economic Community (EEC), the rate of economic growth is showing the effects of readjustment after a rather long period of exceptionally rapid expansion, and the gross domestic product, also in real terms, rose by 4.5 percent in 1962, as compared with increases of 5.2 percent in 1961 and 7.1 percent in 1960. The slowdown in these countries is attributed to a slackening of certain elements of demand, particularly exports, while there was also a slower growth of domestic demand, mainly for fixed investment by private enterprises. Public investment and house construction expanded, though at a reduced rate as a result of the severe winter. Demand for consumer goods was the principal contributor to economic expansion in the EEC countries in 1962 and the first quarter of 1963.

As in the previous year, industrial production in the United Kingdom hardly increased in 1962. In the first quarter of 1963 the index of industrial production (seasonally adjusted) was less than in the corresponding period of 1962, though there was a slight improvement in the second quarter. Unemployment increased by one third between 1961 and

1962, though there has been some improvement since February 1963. The disinflationary policy adopted to spur exports had to be abandoned, and expansionary fiscal measures were introduced in April 1963 to stimulate domestic demand and private investment. It is still too early to see the effects of these measures on private investment or domestic consumption, but the value of retail sales in the first four months of 1963 was 3.4 percent more than in the same period of 1962. Exports in the first five months of 1963 were running some 4 percent more than the year before, as against an increase of only 2 percent in imports.

The rate of growth in the centrally planned economies of eastern Europe in 1962 remained far below planned targets. Poor harvests have been a main factor in some countries, but the growth of industrial production has also slowed down.

Australia's GNP, on the other hand, increased by 6.6 percent in 1962, as against an increase of 5.9 percent in the previous year and an average of 3.8 percent in 1957-61, though here too the rate of growth appears to have slowed down in early 1963. The value of exports rose by 15 percent in 1962; export prices increased by 4 percent and import prices were stable, so that the terms of trade improved considerably. With substantial sales to Mainland China and India, wheat has become the second largest foreign-exchange earner after wool. In New Zealand the recovery of the economy continued, and full employment of manpower and industrial capacity has been regained. The deficit in foreign transactions in 1961 was followed in 1962 by a substantial excess of exports over imports (including services). In Japan measures to restrain the boom reduced the growth of GNP at constant prices from the exceptionally high rate of 14 percent in 1961 to 5.7 percent in 1962. The balance of payments showed a surplus of some \$300 million in 1962/63, as against a deficit of \$436 million the year before.

In Latin America the stimulus of the Alliance for Progress has not yet led to a higher tempo of economic development. Activities so far have been mainly of a preparatory nature, such as the drawing up of plans and projects and of agrarian reform measures, and the rate of spending has lagged far behind the commitment of funds. Rapid inflation still persists in many of the Latin-American countries, and in March 1963 the cost of living in Argentina increased by almost 10 percent, which is the highest monthly rise ever recorded in that country. Foreign trade deficits continue in many countries,

and Brazil, Chile, and Uruguay have devalued their currencies. Among the few countries which reached the goal set by the Alliance for Progress of a 2.5 percent increase in GNP per caput were Mexico and Venezuela, where the GNP rose by about 5 percent and 7.8 percent respectively in 1962.

The rate of economic development was also disappointing in the Far East in 1962. It is estimated that real income per caput fell by an average of 2 percent in the countries of the ECAFE region (excluding Japan). Population pressure is steadily increasing, the expansion of agricultural production has slowed down, and in many countries export proceeds have failed to increase significantly. While foreign aid, particularly foodstuffs as grants or on special terms, has to some extent mitigated the effects of reduced

export earnings, severe measures to control imports have become necessary in several countries. In India, however, the government was able in April 1963 to attenuate some of the emergency restrictions and slightly reduce the heavy tax increases proposed earlier in the year.

No data are available on the rate of economic growth in Mainland China. However, imports of grain were again substantial in 1962, and any significant revival in economic activity seems improbable in view of the fact that industrial imports from outside the Soviet bloc are estimated to have been reduced, in order to pay for grain imports, from 48 percent of total imports in 1960 to 18 percent in 1961, and appear to have been at an equally low level in 1962.

### Food supplies and consumption

As indicated in Table II-3 above, world per caput food production (excluding Mainland China) averaged about 13 percent more in 1958/59-1962/63 than before the war. There were, however, wide differences among the various regions of the world, and in the less developed regions the increase over this period was only about 2 percent, as against some 30 percent for the more developed regions. Moreover in two of the less developed regions, the Far East (excluding Mainland China) and Latin America, per caput food production in 1958/59-1962/63 remained 2-3 percent less than before the war.

To arrive at an estimate of actual food supplies per caput, it is necessary to take account not only of production but also of the effects of changes in international trade in foodstuffs and in the stock situation. Figure II-4 attempts this for the main regions of the world,<sup>2</sup> on the basis of price-weighted indices. Only for North America has it been possible to allow for changes in stocks, though in other regions these are too small to affect the position significantly. While the estimates on which Figure II-4 is based should be regarded as only very rough approximations, they are probably sufficient to indicate the broad changes that have occurred

in the over-all level of food supplies in the four five-year periods under consideration.

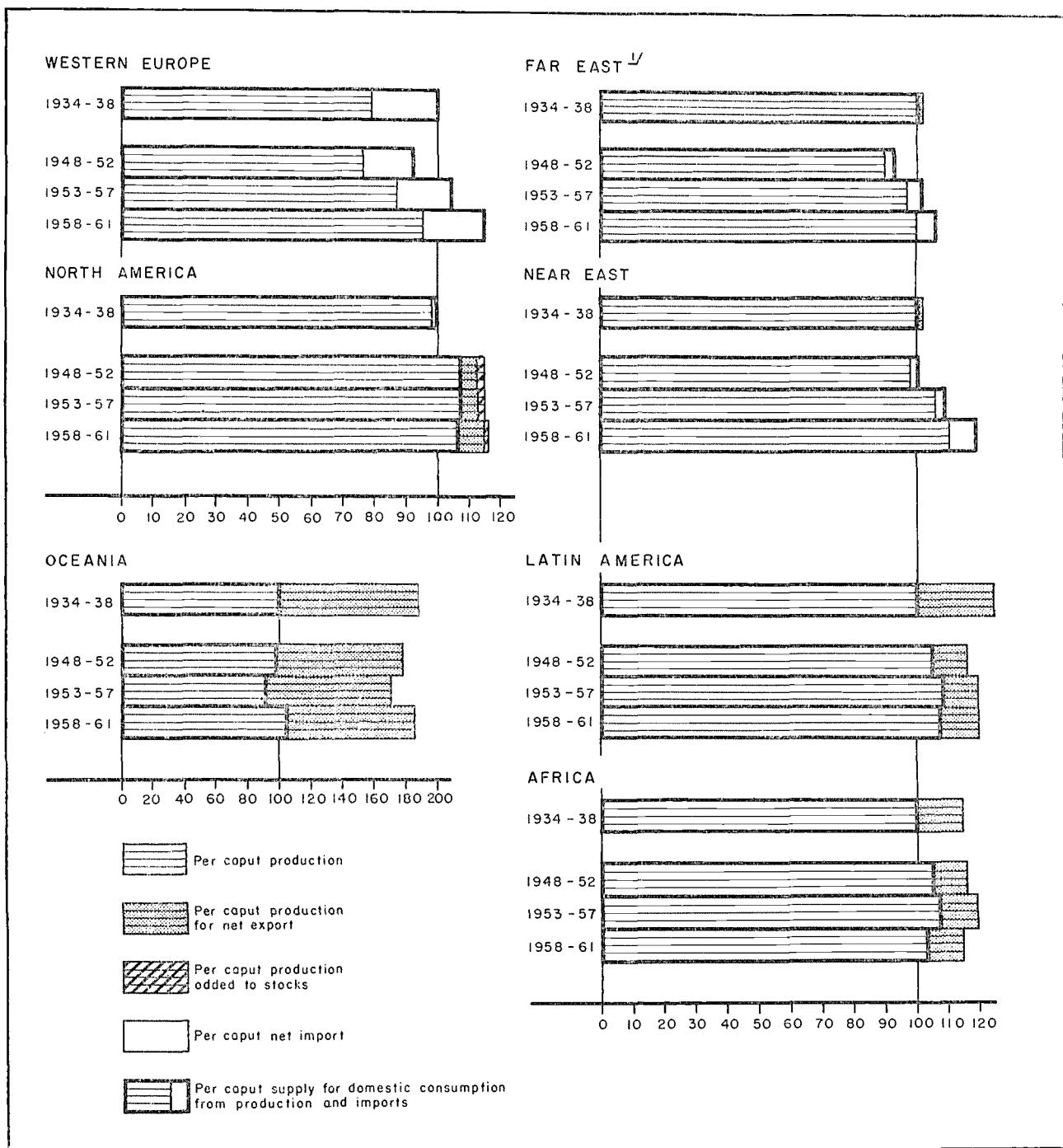
The changes in imports and exports of food have in fact been quite considerable, and it appears from Figure II-4 that the trends in regional food supplies per caput have diverged less widely than those in regional food production per caput discussed earlier. In the developed regions, except Oceania, the increase in per caput food supplies has been less rapid than in per caput production. In each of the less developed regions, on the other hand, the trend of food supplies appears to have been more favorable than that of production, and per caput supplies are above the prewar level even where production has lagged behind.

The largest increase in per caput food supplies has been in the Near East, where not only was per caput production in 1958/59-1962/63 some 10 percent more than before the war, but the small prewar net exports of food have turned into a rapidly rising net import. The region's total grain production for four years remained well below the peak level reached in 1957/58, and even when production recovered in 1962/63 there was still some shortfall from this level; on a per caput basis there was a considerable drop in grain production. However, the consequent increase in imports of grains would appear to have more than made good the deficit.

The Far East (excluding Mainland China) has also changed from a net exporter of food before

<sup>2</sup> In addition to Mainland China, it has been necessary to exclude eastern Europe and the U.S.S.R., because of inadequate data on the trade between these countries.

FIGURE II-4. ESTIMATED PER CAPUT FOOD PRODUCTION, NET TRADE, AND SUPPLIES, BY REGION  
(INDICES, PREWAR AVERAGE OF PER CAPUT SUPPLIES = 100)



<sup>1</sup> Excluding Mainland China

the war to a substantial net importer, as a result of smaller exports as well as larger imports. This has been sufficient to turn the slight lag in per caput food production in relation to before the war into a slight gain in respect of supplies.

Both Latin America and Africa remain net exporters of food. Partly because of the growth of im-

ports, however, Africa's net export has increased very little, while that of Latin America has only in recent years begun to approach the prewar level. In both these regions food supplies per caput in 1958/59-1962/63 appear to have been a few percent above the prewar level, though in both cases there has been a slight deterioration in comparison with

the previous five-year period, which may, however, fall within the margin of error of the estimates.

In Oceania net exports of food have slowly increased, but per caput food supplies, in contrast to per caput production, are slightly more than before the war. North America had a small net import of food before the war but is now the world's largest net exporting region. In western Europe, the largest net importer, the net import has increased comparatively slowly. In both western Europe and North America per caput food supplies have increased rather less than production.

The trade developments touched on briefly here are analyzed in more detail in the next section of this chapter, which brings out also the great importance of shipments under special terms in the food imports of the less developed regions, and especially of the Near East.

It will be recalled that Figure II-2 earlier in this chapter demonstrated that there were sharp differences not only in the trend but also in the level of per caput food production as between the more and the less developed regions. While trade changes have, as indicated above, tended to even out the divergences in the trend of per caput food production, imports and exports of food are too small in rela-

tion to total food supplies to have any appreciable effect on the relative consumption levels of the different regions. These depend to a large extent on the level of income, and in fact the gap in actual food consumption levels between the more and less developed regions has tended to widen, since there has been more improvement in the per caput food supplies of the more developed than in those of the less developed regions.

Much of the improvement in the per caput food supplies of the more developed regions shown by the price-weighted indices in Figure II-4 of course represents improvements not in the quantity but in the composition of the diet, through a shift to more expensive foodstuffs such as livestock products. Details of the nutritional characteristics of diets in those countries for which it is possible to calculate food balance sheets are shown in Annex Table 13. In most of the rather few less developed countries for which data are available, there seems to have been a gradual improvement in recent years both in total calorie intakes and in per caput supplies of animal protein. The table brings out especially the very low levels of animal protein consumption in the less developed countries compared with the more developed countries.

### International trade in agricultural products

There were few new developments in world agricultural trade in 1962. The general level of demand grew only slowly, and exportable supplies of most commodities were ample, though a few, notably sugar, were in short supply with a consequent rise in prices. According to preliminary estimates, the volume of world exports (excluding exports from eastern Europe, the U.S.S.R., and Mainland China), which had increased substantially in each of the three preceding years, showed little or no increase in 1962 over 1961. Both the volume and value of agricultural imports into the industrialized areas increased during the year, but this was offset by smaller imports into the less developed regions (except the Near East) and into the Sino-Soviet area.

The prices of a number of products started to rise, some of them steeply, in the course of 1962, and the movement continued into the early months of 1963. The turn came too late in the year and

affected too few products to raise the index of export unit values of agricultural products as a whole for the year. It did, however, check the falling trend of prices which has been evident through the past ten years or more. The factors behind the recent improvement in agricultural prices nevertheless appear to be of a short-term character, affecting a limited number of commodities, generally on the supply side. The main features which have characterized agricultural commodity markets for several years, the slow growth of import demand for many products, coupled with rapidly rising output in exporting countries and efforts to boost exports through government action – all remained largely unaltered.

With both the volume and average unit values of agricultural exports practically unchanged, there was no increase in global earnings from agricultural exports. Moreover, the prices of manufactured goods in world trade showed very little increase in 1962. The "terms of trade" of agricultural prod-

ucts in world trade, i.e., their purchasing power in terms of manufactured goods, and also the real value of agricultural exports therefore showed no appreciable change in 1962 from 1961 (Table II-14).

Contrary to trends in recent years, the volume of agricultural exports from each of the economically more developed regions fell somewhat in 1962, while the volume of exports from the less developed regions, except the Near East, continued to expand. About half the fall in exports from North America was accounted for by a decline in United States shipments under special terms from the high level of 1961. The course of prices, however, was on the whole less favorable for the developing than for the more developed regions, and this tended to offset the differences in the volume of shipments. Nevertheless, the aggregate earnings from agricultural exports of the less developed regions as a whole increased by about 2 percent at current prices compared with 1961, while those of the economically more developed regions fell in about the same proportion.

Over the longer term, however, the export earnings of the less developed regions have grown less rapidly than those of the economically advanced regions. This aspect is discussed more fully in a later section.

#### VOLUME OF IMPORTS

The volume of imports into the industrial and high income countries of western Europe, North America, Oceania, and Japan, which jointly account for some four fifths of the world's agricultural imports, expanded in 1962 by just over 3 percent, i.e., at about the average rate for the group over the last decade. The largest increase, of 7 percent, was in imports into North America, while western Europe imported 3.5 percent more than in 1961. Oceania also imported somewhat more, but the over-all volume of the region's agricultural imports is very small. These increases were partly offset by a steep fall in imports, particularly of raw materials, into Japan. The long-term expansion of Japan's imports has, however, been substantially faster than that of either North America or western Europe. At 67 percent, the increase since 1952-53 in Japanese imports of agricultural products is about one-third greater than that of imports into western Europe and more than 5 times as great as that of imports into North America, which today are only somewhat more than 10 percent higher than they were in the early 1950s.

In contrast to the imports into the industrialized countries, those of the nonindustrial countries fell

TABLE II-14. - INDICES OF THE VOLUME, UNIT VALUE, AND TOTAL VALUE OF WORLD<sup>1</sup> TRADE

	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
.....Indices, average 1952-53=100.....									
TOTAL VOLUME OF WORLD TRADE <sup>2</sup> (agricultural and nonagricultural) ....	87	118	128	135	133	142	156	164	172
TRADE IN AGRICULTURAL PRODUCTS									
Volume of exports.....	95	109	119	122	119	128	136	144	144
Volume of commercial exports <sup>3</sup> .....	95	104	110	113	112	120	126	134	135
AVERAGE EXPORT UNIT VALUE									
At current prices .....	100	94	92	94	87	85	85	83	83
In real terms <sup>4</sup> .....	104	97	91	90	85	84	82	79	78
TOTAL VALUE OF EXPORTS									
At current prices .....	94	103	109	114	105	109	115	119	119
In real terms <sup>4</sup> .....	98	106	108	110	102	107	111	113	112
VALUE OF COMMERCIAL EXPORTS <sup>3</sup>									
In real terms <sup>4</sup> .....	98	101	101	103	96	101	103	106	106
AVERAGE EXPORT UNIT VALUE OF MANUFACTURED GOODS <sup>5</sup> .....	97	97	101	104	103	102	104	105	106

<sup>1</sup> Excluding trade between the U.S.S.R., eastern European countries, Mainland China, North Korea, North Viet-Nam, and Mongolia, but including the trade of the rest of the world with these countries. - <sup>2</sup> United Nations index of the volume of world trade, adjusted to 1952-53 base. - <sup>3</sup> Excluding United States shipments under special terms from 1955. - <sup>4</sup> Deflated by the United Nations index of export unit value of manufactured goods. - <sup>5</sup> United Nations index adjusted to 1952-53 base.

TABLE II-15. - INDICES OF THE VOLUME AND VALUE OF AGRICULTURAL IMPORTS BY REGIONS

	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
..... Indices, average 1952-53 = 100 .....									
WESTERN EUROPE									
volume .....	95	113	122	127	123	130	135	136	141
value .....	96	108	115	121	109	111	117	115	119
.....									
NORTH AMERICA									
volume .....	100	93	96	96	97	107	101	106	113
value .....	91	94	94	93	89	94	87	85	88
.....									
JAPAN									
volume .....	64	118	131	128	124	140	156	179	167
value .....	66	108	114	117	98	103	120	138	127
.....									
OCEANIA									
volume .....	99	128	123	129	138	129	131	123	127
value .....	103	133	118	124	125	117	118	102	106
.....									
ALL ABOVE REGIONS									
volume .....	94	108	116	119	116	125	128	132	136
value .....	92	104	109	113	103	106	109	109	111
.....									
LATIN AMERICA									
volume .....	91	106	101	118	122	114	118	121	119
value .....	88	97	87	101	100	94	96	96	98
.....									
FAR EAST <sup>1</sup>									
volume .....	92	86	111	129	120	118	148	142	132
value .....	91	70	88	105	94	91	110	102	100
.....									
NEAR EAST									
volume .....	91	117	137	151	155	183	202	215	232
value .....	91	102	111	131	118	132	143	151	157
.....									
AFRICA									
volume .....	84	113	125	129	123	141	156	169	169
value .....	82	101	110	114	107	113	122	131	129
.....									
TOTAL LESS DEVELOPED REGIONS									
volume .....	91	99	114	129	126	129	149	150	148
value .....	89	86	95	109	101	101	113	112	112

<sup>1</sup> Excluding Japan and Mainland China.

in 1962 by about 2 percent. There were, however, significant differences as between regions. While those of the Far Eastern countries (other than Japan) fell by 7 percent, and those of Latin America and Africa were also slightly smaller, the imports into the Near East, which in the past decade have grown faster than those of any other major region of the world, rose by a further 8 percent.

Developments in 1962 thus differed from the longer-term trend, in that over the past decade the volume of agricultural imports into North America has grown more slowly than imports into other regions. The fastest rate of growth has been in western Europe and Japan (shown separately for the first time in this report) among the more industrialized areas, and in the Near East, Africa, and the Far East (Table II-15).

The table shows also the value of imports (adjusted to a c.i.f. basis) and brings out clearly the slower growth of the cost than of the volume of imports as a result of lower prices. This applies, of course, not only to the economically more developed, but also to the developing regions. For the developing countries as a whole, agricultural products account for about one third of the total value of imports,<sup>3</sup> of which over half consists of food and feedstuffs. The steep rise in the volume of their agricultural imports, especially those of the Near East and Africa, appears much more moderate in terms of value

<sup>3</sup> The average for 1959-60 of " food and raw materials of mainly agricultural origin " was about 35 percent, but the figure includes a small number of nonagricultural products. See GATT, *International trade 1961*, Annex Table II, Geneva, 1962.

owing to a fall in average unit values of 20-25 percent, in some regions even more. Moreover, as is shown later, a large share of these imports are accounted for by imports under special terms. While the cost to these countries of commercial imports of agricultural products is large in relation to their resources, it is doubtful if the larger over-all imports of food over the last decade have added much to their burden of foreign exchange payments. In some countries, indeed, the bill for food imports has probably been reduced.

#### *Food and feedstuffs*

In western Europe, the largest food deficit region, the volume of food imports, which showed little increase in 1961, grew in 1962 by some 6 percent. Domestic food production in the region had risen by 5 percent in 1960/61, but remained unchanged in 1961/62 with a consequent increase in import requirements. The largest increase, nearly 10 percent, was in imports of cereals, the output of grains having fallen by some 5 million tons (5 percent) in 1961/62. Imports of coarse grain in particular rose sharply, and imports of maize were one-third larger than in the calendar year 1961. Imports of wheat, however, were smaller.

Grains accounted for more than half of the total increase in the region's food imports, but most other foods also showed some increase. Imports of sugar regained part of the loss of 1961, when better crops in most importing countries had led to smaller imports. The long-term trend of sugar imports, however, is stationary, and the total volume for the region was no higher in 1962 than in 1948-52. Imports of vegetable oils and oilseeds recovered in part from a decline in 1961. There was little change in the imports of livestock products, but a further advance in imports of fruit and especially of oilcakes, two commodity groups where imports have risen rapidly in recent years.

Most of the 10 percent increase in food imports into North America, to a new postwar peak 40 percent above the 1952-53 average, was accounted for by a recovery in the imports of sugar, which had fallen in 1961 as a result of the break with Cuba, and a further steep increase, of one fifth, in imports of livestock products and cattle. Imports of livestock products and cattle have grown rapidly since 1956, and in 1962 their volume was three times

and their value more than twice as great as in the early 1950s. The largest increases have taken place in imports of cattle, which have risen sevenfold, and of beef, which in 1962 were 17 times as high as in 1952-53. In 1962 beef and cattle imports rose by 50 and 20 percent, respectively.

Compared with western Europe and North America, food imports into Japan are relatively small. They have, however, risen rapidly in the last few years. Following an increase of nearly 10 percent in each of the years 1960 and 1961, they expanded by a further 9 percent in 1962. The most rapid growth for some years has been in imports of maize and sorghum for animal feeding, which in 1962 were 5 times as high as in 1957. Wheat imports have also grown, although more slowly. In strong contrast, imports of rice and barley, which at their peak in 1954 accounted for some 40 percent of the country's total food imports, have since fallen to practically nothing, as domestic production has grown and as consumers have turned from barley to other grains.

Attention was drawn in last year's issue to the leveling off, since 1958, of food imports into Latin America and the Far East. This trend continued in 1962, when imports into Latin America fell slightly, and those into Far Eastern countries other than Japan fell by some 6 percent, mainly because of smaller imports of cereals. Cereals account for about two thirds of the total food import of the latter region. Imports of foodstuffs into Africa, which have been rapidly rising, showed a break in their climb for the first time since 1958.

Except perhaps in Latin America, these checks in the growth of food imports may be no more than temporary fluctuations, and the longer-term rising trend seems likely to reassert itself later. Thus per caput food production in the Far East region has fallen somewhat in the last two years, while the production of rice in the region's main importing countries, other than Japan, which had risen by about 8 percent in 1960/61, showed little further increase in either 1961/62 or 1962/63.

In contrast to the other less developed regions, food imports into the Near East continued to rise, and with an increase of 9 percent over 1961 reached a level 170 percent above the 1952-53 average. Cereals, which account for nearly half of the total volume of the region's food imports, have risen most steeply, but there has also been a rapid increase in imports of other foods, including sugar, livestock products, and cattle.

### *Beverages and tobacco*

Western Europe and North America account jointly for nearly 90 percent of the world imports of the products included in the group of beverages and tobacco.<sup>4</sup> In 1962, both regions increased their imports of these products by some 5-6 percent. Imports into the Near East also rose by about 5 percent, but elsewhere they either fell or remained unchanged.

The increase in imports into North America was entirely accounted for by coffee, of which 9 percent more was imported than in 1961. Imports of cocoa, the only other large North American import in this group, fell steeply, though consumption continued to increase by drawing on the stocks which had been built up in 1961 when a record quantity was imported.

The increase in North American coffee imports was associated with a further fall in the average import price by about 6 percent. Since 1954, the postwar peak of coffee prices (when, however, the volume of imports was below average), these imports have risen by 44 percent, while the average import price has fallen by about 46 percent. An increase of 4 percent in the volume of western European coffee imports in 1962 was offset by a decline of about 4 percent in the average unit value of imports.

Shipments of cocoa have risen rapidly since 1958 as larger supplies became available while prices have fallen, and the volume of imports into both western Europe and North America in 1962 was more than 40 percent higher than in 1958. The slow growth of tea imports into western Europe reflects near-saturation of tea consumption in the United Kingdom, currently some 4.4 kg per caput a year, estimated to equal 7-8 cups a day per person.

### *Raw materials*

The industrial countries account for nearly 90 percent of the world imports of agricultural raw materials. Western Europe alone takes nearly 60 percent of the total. The imports of western Europe, however, have risen only slowly, and those of North America have actually fallen in volume over the last decade. Only Japan's imports have shown a steeply rising trend, reflecting the country's rapid industrial development.

<sup>4</sup> Coffee, cocoa, tea, tobacco, wine.

In 1962, the volume of imports into both western Europe and Japan fell, by 1 and 18 percent, respectively, largely because of reductions in stocks of cotton. In Japan the mill consumption of cotton and wool was also smaller. There was a substantial recovery in imports into North America, where industrial production had risen, but not enough to offset the declines in western Europe and Japan.

The volume of raw material imports of the nonindustrial countries has risen at a very much faster rate since the war than those of the industrial regions, increasing by 48 percent between 1952-53 and 1962, compared with only 12 percent for the latter group. But while the share is rising, it still accounts for only 12 percent of the world total. This rise was interrupted in 1962, when imports fell by 4 percent, mainly because of a fall in imports of cotton into Far Eastern countries other than Japan.

### *Fishery products*

World trade in fishery products continued to expand in 1962. In terms of weight, the total volume of products traded internationally is estimated to have increased by about one sixth, to some 5 million tons. All of the principal importers of food fish, the United States, the United Kingdom, and the Federal Republic of Germany, purchased substantially larger quantities than in 1961. United States imports of tuna products were over one-third larger than the year before, and those of shrimps were up by about a tenth. The total value of imports into the United Kingdom increased by some 40 percent, and a smaller increase was registered also by the Federal Republic of Germany.

Among exporters, Japan, the principal source of food fish in international markets, expanded its exports of frozen tuna to western Europe, while continuing to supply a substantial amount of the raw material requirements of the United States tuna canning industry. The United Kingdom imported a record quantity of Japanese salmon, which in 1962 accounted for nearly half of the total value of the country's food fish imports. Norway and Canada increased their exports of frozen fish fillets, and there was a considerable increase also in the trade in herring products, of which Denmark and Iceland are the major suppliers. The importers of stockfish in west Africa continued their efforts to reduce their dependence on imported supplies, but

this did not substantially affect the exports of Norway and Iceland.

The trade in fish meal also continued its rapid growth. Demand in importing countries was strong, with the United States taking one-fifth more than the year before, and the Netherlands a quarter. Production in the exporting countries has continued to expand, particularly in Peru, the major exporter, whose sales in 1962 exceeded the 1961 level (in value terms) by nearly four fifths. South Africa, Chile, Iceland, and Norway also exported more.

#### *Forest products*

The over-all pattern of trade in forest products in 1962 was influenced by three main factors: the growth, although moderate, in economic activity and building in North America; the stock reduction in western Europe, associated with a slowing down in economic growth and some uncertainty about future prospects; and the long-term trend toward processing wood raw materials in the country of origin and exporting the more valuable semimanufactured or manufactured, products. The combined result of these tendencies was a further expansion of about 2 percent in the volume of world trade in forest products. Of the major commodities, the largest increase of over a tenth, was in exports of plywood. Shipments of sawnwood, wood pulp, and miscellaneous paper and board increased by some 4-5 percent, but those of roundwood and newsprint fell.

In North America there was expansion in both intraregional trade (notably the movement of sawn softwood and pulp from Canada to the United States) and imports from other regions (including pulp and newsprint from Europe, hardwood logs and sawnwood, plywood and veneers from Asia and from some Latin American countries). Stock reduction in Europe not only caused production and exports in Europe itself to lag behind consumption, which continued to increase, but also resulted in lower European imports of hardwood logs and sawnwood from Africa and Asia.

Of the African exporting countries, Ghana was worst affected; however, the heavy fall in hardwood log exports from this country in 1962 (for the second year in succession) was largely due to marketing difficulties. Other leading African exporters, among them Gabon, Nigeria, and Congo (Leopoldville), also exported fewer hardwood logs in 1962 than in

1961. The major exception was the Ivory Coast, which, with a more diversified selection of species available for export, was able to improve its share of the log trade and to move into some of the markets lost by Ghana. In 1962 Liberia also began small shipments of logs.

In contrast to African log exports, there was some growth in the region's sawn hardwood exports. In Ghana, for example, logs originally intended for export were diverted from congested export points to local sawmills and later exported as sawnwood. In the developing countries of Africa, as well as in other regions, forest industries are being planned or established both with a view to supplying the world market with a greater proportion of processed forest products and less of roundwood, and in the case of pulp and paper mills and particle board and fibreboard factories to reducing dependence on expensive imported forest products.

In the Far East, for which United States and Japan are the main markets, the exports of all major product groups increased. Shipments of tropical hardwood logs from the Philippines reached about 4 million cubic meters in 1962, a 25 percent increase over 1961. Proposals to curtail these exports have been put forward by the country's plywood and veneer manufacturers but so far no action has been taken. Burmese teak exports increased significantly, but those of Thailand, where there is a shortage of good quality logs, continued to decline.

#### SHIPMENTS ON SPECIAL TERMS

Table II-16 shows the value of shipments on concessional terms from the United States during the calendar years 1956-62, and the share of these shipments in the country's total agricultural exports.<sup>5</sup> These shipments fell slightly in 1962, both in value and as a proportion of the total United States agricultural exports. The largest fall was in exports of wheat and wheat flour, but as commercial shipments were also smaller, the share of concessional shipments remained unchanged at 68 percent. Owing to large commercial purchases of coarse grains, mainly by European countries, the share of special terms exports of these products fell steeply, though their actual value was scarcely less than in 1961. Concessional

<sup>5</sup> Shipments under Public Law 480, the most important of the special export programs, began in the United States fiscal year 1954/55, but calendar year data are available only from 1956 onward.

TABLE II-16. - UNITED STATES AGRICULTURAL EXPORTS UNDER GOVERNMENT PROGRAMS IN RELATION TO TOTAL UNITED STATES AGRICULTURAL EXPORTS, CALENDAR YEARS 1956-1962<sup>1</sup>

	Total shipments under Public Law 480 and Mutual Security Programs						
	1956	1957	1958	1959	1960	1961	1962
<i>Million dollars</i> .....							
Wheat and wheat flour .....	587	567	498	563	757	887	776
Coarse grains .....	219	147	125	123	145	159	156
Rice .....	105	74	45	44	86	48	86
Dairy products .....	189	154	129	75	52	71	72
Fats, oils and oilseeds .....	172	130	146	148	114	84	139
Cotton .....	332	387	264	192	230	197	153
Tobacco .....	51	22	30	55	60	72	54
Other agricultural products .....	95	71	35	24	25	45	69
<b>TOTAL</b> .....	<b>1,751</b>	<b>1,554</b>	<b>1,274</b>	<b>1,227</b>	<b>1,470</b>	<b>1,564</b>	<b>1,505</b>
Shipments under special programs as percentage of total United States agricultural exports							
<i>Percentage of total value</i> .....							
Wheat and wheat flour .....	73	64	68	73	74	68	68
Coarse grains .....	59	41	26	22	28	30	20
Rice .....	71	57	51	43	59	44	56
Dairy products .....	74	72	69	58	47	72	63
Fats, oils and oilseeds .....	29	21	30	23	19	14	20
Cotton .....	46	37	40	43	23	22	29
Tobacco .....	15	6	9	16	16	18	14
Other agricultural products .....	10	8	4	3	2	4	6
<b>TOTAL</b> .....	<b>42</b>	<b>34</b>	<b>33</b>	<b>31</b>	<b>30</b>	<b>31</b>	<b>30</b>

<sup>1</sup> Calendar year data are not available for earlier years.

sales of cotton fell by over 20 percent, but there was an even larger fall in commercial shipments, and in this case there was an increase in the share of shipments on special terms. In aggregate, concessional shipments continued in 1962 to account for about 30 percent of the total value of all agricultural exports from the United States.

As is evident from Table II-14, exports on special terms have since 1954 accounted for a substantial part of the increase in world agricultural exports. These shipments, which consist mainly of grants and of sales against payment in the receiving countries' currencies, have naturally accounted for a large part of the rise in the agricultural imports of the less developed parts of the world, to which they are mainly channelled.

Although much more information is available for the United States than for other countries carrying out similar though smaller programs, data on the share of concessional shipments in the imports of the recipient countries are limited. Rough estimates of the share of the cereal imports of each

region received under concessional terms are, however, set out in Table II-17. During the period covered, cereals accounted for 60-70 percent of the total United States concessional exports.

The contribution of shipments under special terms to the growth of cereal imports into the less developed regions is shown in Table II-18.

TABLE II-17. - IMPORTS OF CEREALS UNDER CONCESSATIONAL TERMS AS A PERCENTAGE OF TOTAL CEREAL IMPORTS, 1959-61

	Wheat and wheat flour	Coarse grains	Rice
	<i>Percent</i> .....		
Western Europe ....	12	6	6
Latin America .....	36	62	6
Far East <sup>1</sup> .....	54	26	12
Near East .....	68	91	8
Africa .....	25	44	4

<sup>1</sup> Excluding Mainland China.

TABLE II-18. - VOLUME AND VALUE OF COMMERCIAL AND CONCESSIONAL IMPORTS<sup>1</sup> OF CEREALS<sup>2</sup> IN 1959-61 AS PERCENTAGE OF TOTAL CEREAL IMPORTS IN 1952-53

	Latin America	Far East <sup>3</sup>	Near East	Africa
..... Percent .....				
<b>VOLUME</b>				
Commercial imports	75	76	104	165
Concessional imports <sup>1</sup>	38	44	162	44
Total .....	113	120	266	209
<b>VALUE</b>				
Commercial imports	55	54	60	118
Concessional imports <sup>1</sup>	28	31	93	31
Total .....	83	85	153	149

<sup>1</sup> Imports from the United States under special government programs. - <sup>2</sup> Wheat and flour, coarse grains and rice. - <sup>3</sup> Excluding Mainland China.

#### AGRICULTURAL TRADE OF THE U.S.S.R., EASTERN EUROPE, AND MAINLAND CHINA<sup>6</sup>

Data on the trade of the U.S.S.R., eastern Europe, and Mainland China in 1962 are still far from complete. The available figures, based mainly on the statistics of the trade partners of these countries, indicate, however, that their imports from the rest of the world declined substantially (Table II-19). This decrease, in strong contrast to the rapid rise of agricultural imports in 1961, largely reflected the partial recovery in Mainland China's grain production from the failures of previous years. Another factor may have been Mainland China's balance of payments, although as far as grain imports were concerned, this was aided by the more liberal terms granted to China in 1962 by the main suppliers, Australia, Canada, and France. The country's grain imports were reduced by some 900,000 tons, or 15 percent, in 1962, but it is expected that substantial Chinese grain imports will continue as the need for building up reserves will persist even in the event of further improvement in harvests.

The high level of sugar imports of 1961 was not maintained in 1962. Following a smaller Cuban crop in 1961/62, shipments into the Sino-Soviet area were some 1.3 million tons less than the 4.86 million tons which had been reportedly stipulated under trade agreements. Primarily affected were imports into

<sup>6</sup> No information is available on trade with Mongolia, North Korea, and North Viet-Nam.

the U.S.S.R., which fell by one third, and into Poland, which declined by more than 40 percent.

Imports of natural rubber into the Sino-Soviet area also declined as synthetic capacity in the U.S.S.R. and East Germany increased, and this trend is expected to continue.

TABLE II-19. - GROSS IMPORTS AND EXPORTS OF CERTAIN AGRICULTURAL COMMODITIES: U.S.S.R., EASTERN EUROPE, AND MAINLAND CHINA

	1959	1960	1961	<sup>1</sup> 1962
..... Million metric tons.....				
<b>Gross imports</b>				
GRAINS (excluding rice)				
U.S.S.R. ....	0.2	0.2	0.7	...
of which: wheat.....	0.2	0.1	0.7	...
Eastern Europe.....	6.1	6.9	6.8	...
of which: wheat.....	4.8	5.4	4.7	...
Mainland China .....	—	—	5.6	4.7
of which: wheat and wheat flour.	—	—	4.0	3.9
barley .....	—	—	1.3	0.3
maize .....	—	—	0.1	0.5
SUGAR (raw value)				
U.S.S.R. ....	0.3	1.7	<sup>2</sup> 3.6	2.5
Eastern Europe.....	0.1	0.3	0.5	0.8
Mainland China .....	—	0.5	<sup>2</sup> 1.6	0.9
TOTAL .....	0.4	2.5	<sup>2</sup> 5.2	4.2
NATURAL RUBBER				
U.S.S.R. ....	0.24	0.19	0.36	0.35
Eastern Europe.....	0.12	0.14	0.13	0.09
Mainland China .....	0.15	0.14	0.08	0.11
TOTAL .....	0.51	0.47	0.57	0.55
<b>Gross exports</b>				
GRAINS (excluding rice)				
U.S.S.R. ....	7.1	6.8	7.5	...
of which: wheat.....	6.1	5.6	4.8	...
flour .....	0.1	—	0.3	...
Romania <sup>3</sup> .....	0.2	0.7	1.2	...
RICE				
Mainland China .....	1.7	1.2	0.4	0.4
VEGETABLE OILS AND OILSEEDS				
Mainland China .....	0.51	0.45	0.18	0.15
of which to: U.S.S.R. and eastern Europe .....	0.34	0.25	0.11	0.09
other countries....	0.17	0.20	0.07	0.06
SUGAR (raw value)				
U.S.S.R. ....	0.2	0.3	<sup>4</sup> 1.0	0.9
Eastern Europe.....	1.1	1.1	2.2	1.6
TOTAL .....	1.3	1.4	3.2	2.5

<sup>1</sup> Largely estimated, especially data for Mainland China. - <sup>2</sup> A 500,000 ton shipment of Cuban sugar through the U.S.S.R. to Mainland China has been included for both countries, but is counted only once in the total. - <sup>3</sup> The grain exports are understood to be primarily wheat. - <sup>4</sup> Including 500,000 tons trans-shipment of Cuban sugar to Mainland China.

Imports of all beverage crops increased, although they still account for only a small portion of total world trade in these commodities. Larger imports of coffee and cocoa may be expected as incomes rise, and in line with the import targets of some countries.<sup>7</sup> Brazil has trade agreements with the U.S.S.R., Poland, Bulgaria, and Yugoslavia, all of which include cocoa, as does that between Cameroon and the U.S.S.R. Similarly the five-year trade agreement between Ghana and the U.S.S.R. provides for an increase in Russian purchases to 60,000 tons (equal to almost 15 percent of the 1962/63 crop of Ghana) in 1965/66. Imports of tea into the U.S.S.R., on the other hand, are expected to decline as it is planned to cover all domestic needs as soon as possible.

While complete figures on exports are not yet available for 1962, data on the main export crops indicate that they, like imports, have been affected by the partial recovery of crop production in China and the decline in shipments of sugar from Cuba. Mainland China's exports of rice to countries other than the U.S.S.R. remained small, but the decline ceased. The gap in the world markets was largely filled by other suppliers. Exports of oilseeds (primarily soybeans) from Mainland China also continued to fall, although the reduction was smaller than in the previous year. The gap in supplies was amply filled by exports from the record 1961/62 crop of the United States.

Both eastern European and U.S.S.R. sugar exports fell below the peak level of 1961 reflecting both lower production and in the U.S.S.R. a decline in imports of Cuban sugar and hence in re-exports to Mainland China. These had amounted to 500,000 tons in 1961 and were reported to have been special shipments, U.S.S.R. financed, coming directly from Cuba. Exports of sugar to other destinations almost doubled, as they had between 1960 and 1961; about 70 percent of the total went to new customers, most of them outside the Sino-Soviet area.

Although complete data on U.S.S.R. and eastern European grain trade are not yet available for 1962 at the time of writing, information is now available on trade in 1961. Total U.S.S.R. grain exports increased by almost 10 percent, reflecting larger shipments of rye, barley, maize, and oats. Exports of wheat fell by 800,000 tons while imports rose by almost 600,000 tons, resulting in a decline of 25 per-

cent in net exports of wheat. This decline was compensated to some extent by larger shipments of flour. Increasing amounts of grains went to China and to Cuba, and smaller quantities to eastern Europe. Polish imports from the U.S.S.R., for example, fell to barely a quarter of the 1960 level, and the shortfall was largely made good by larger imports from the United States and Canada, which together accounted for more than three quarters of Polish wheat imports in 1961. Also important in 1961 was a continuation of the increase in Romanian grain exports. These had more than tripled between 1959 and 1960, and in 1961 increased by another 45 percent to 1.2 million tons.

The pattern of all trade within the Sino-Soviet area has been characterized by a continued decline in the volume of trade of the U.S.S.R. and eastern Europe with Mainland China. The total value of all trade between Mainland China and the U.S.S.R., both agricultural and nonagricultural, fell from over \$2,000 million<sup>8</sup> in 1960 to \$900 million in 1961. Although exports of agricultural products from the U.S.S.R. to China increased from \$2.2 million to \$65.5 million between 1960 and 1961, primarily reflecting re-exports of Cuban sugar, agricultural imports from China declined from \$270 million to \$53 million. This fall was only partly offset by imports from other countries. Tobacco, tea, rice, and fats, oils and oilseeds accounted for almost 60 percent of the decline, and only for the last group did the U.S.S.R. imports from other areas increase significantly. For this group supplies from other countries, particularly in Africa, tripled, and agreements with the United Arab Republic, Sudan, Senegal, and other countries provide for further increases. Total imports of rice, tobacco, and tea on the other hand, fell in 1961 by quantities about equal to the fall in imports from Mainland China.

Similar developments occurred in trade between eastern Europe and Mainland China. Total exchanges in 1961 were 50 percent lower than in 1960 and the commodity pattern of the change also appears to have been similar. Shipments of rice and tea from Mainland China to Poland in 1961, for example, were half the size of those in 1960, while the value of soybean imports fell from \$5 million to about \$1 million.

The decline in trade between Mainland China and both the U.S.S.R. and eastern Europe reflected,

<sup>7</sup> For projections of agricultural imports into the U.S.S.R. and eastern European countries, see FAO. *Agricultural commodities: the outlook for 1970 in eastern Europe*. CCP 63/7/1. Rome, January 30, 1963.

<sup>8</sup> These and subsequent values have been converted from roubles at the official rate of 0.9 rouble per U.S. dollar.

TABLE II-20. - TRADE IN AGRICULTURAL PRODUCTS BETWEEN THE U.S.S.R. AND MAINLAND CHINA, 1959-61

	1959	1960	1961
..... Million roubles .....			
U.S.S.R. AGRICULTURAL EXPORTS TO MAINLAND CHINA	3	2	59
of which: sugar .....	1	—	42
grains and flour ....	—	—	16
AGRICULTURAL EXPORTS OF MAINLAND CHINA TO THE U.S.S.R. .....	442	242	44
of which: rice.....	74	50	—
soybeans .....	61	32	1
other oils and oilseeds	33	16	1
livestock and meat ..	40	19	2
cotton .....	47	31	7
wool.....	20	17	9
silk .....	16	11	4
tea .....	27	11	3
tobacco .....	18	12	2

<sup>1</sup> Official exchange rate 0.9 rouble = U.S. \$ 1.

SOURCE: U.S.S.R. Ministry of Foreign Trade. *Foreign Trade Statistics of the U.S.S.R.*, 1959, 1960, 1961.

in part, a drop in China's over-all trade. Of 16 countries for which 1961 trade data are available, Japan is the only one to show a significant increase in trade with Mainland China.

Although statistics of trade in 1962 are scanty, it appears that the decline in the trade of the U.S.S.R. and eastern Europe with Mainland China has continued. Various estimates suggest a decline in total trade, both agricultural and nonagricultural, of the order of 25 percent. Mainland China's imports from outside the area, other than grain, are reported to have dropped to a very low level. Exports have been better maintained and a significant increase in trade with Japan has taken place. Shipments of soybeans have partly recovered from the low level of 1961, and are going increasingly to Japan to pay for larger nonagricultural imports.

#### PRICES IN WORLD MARKETS, AND TERMS OF TRADE

Perhaps the most striking feature of agricultural trade in 1962 was the upturn in a number of commodity prices in the course of the year. The steepest rise took place in the "free market" price of sugar, which by the beginning of the year had fallen to about 2.3 U.S. cents a pound, its lowest level in

nearly a quarter of a century, but which ended the year at twice that level and continued to rise during the first five months of 1963 to a peak, in late May, of some 12.5 cents a pound, unprecedented in peace time. Sisal prices, too, rose steeply. Less spectacular but still significant increases took place in the prices of rice, some coarse grains, butter, robusta coffee, and wool.

The effect of these increases in 1962 on the general index of export unit values was, however, limited (Table II-21 and Figure II-5). Many came too late in the year to affect average returns for the commodities significantly. Moreover, in the case of rice and sugar, only a portion of the trade is directly affected by fluctuations in world market prices; the rest, amounting to one half in the case of rice and as much as two thirds in the case of sugar, moves under government-to-government contracts or long-term agreements under which prices are more stable. The average unit value of all agricultural exports combined was also affected by reductions in prices and unit values of other products, including most vegetable oils and oilseeds, arabica coffee, and cocoa.

The composite effect of these price movements was that the average export unit value of all agricultural products combined showed no change from 1961, although this in itself is in contrast to the almost continuous downward trend since 1951. The United Nations index of unit values of exports of manufactured goods was also relatively stable, the average for 1962 showing an increase of only one half percent over 1961. The "terms of trade" of agricultural exports, i.e., their purchasing power in terms of manufactured goods, therefore remained nearly unchanged, for the first time since 1954.

The commodities whose prices improved during the year belong mainly to the group foods and feedstuffs, and the average export unit value of this group rose by 2 percent. In contrast, the average level for beverages and tobacco fell by a further 3 percent, and for agricultural raw materials by about 2 percent.

The recovery of prices continued through most of the first half of 1963. Sufficient data for the calculation of indices of export unit values are not available at the time of writing, but indices with a roughly comparable coverage based on price quotations showed a rapid rise in the first five months of the year. Thus, in May 1963 (the latest figure available at the time of writing) the agricultural export price index of the National Institute of Economic and Social Research (London) reached its

TABLE II-21. - INDICES OF AVERAGE WORLD EXPORT UNIT VALUES OF AGRICULTURAL AND FOREST PRODUCTS, BY COMMODITY GROUPS AND PRINCIPAL COMMODITIES

	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
..... Indices, average 1952-53 = 100 .....									
ALL AGRICULTURAL PRODUCTS .....	100	94	92	94	87	85	85	83	83
FOOD AND FEEDSTUFFS .....	102	89	89	91	87	87	86	85	87
of which:									
cereals .....	100	79	76	75	74	73	72	72	74
sugar .....	103	91	92	113	95	90	86	93	98
fruit .....	104	102	115	119	118	101	102	104	105
oilseeds and vegetable oils .....	110	87	91	90	90	98	92	86	83
livestock products and cattle .....	98	100	99	97	96	101	101	98	97
BEVERAGES AND TOBACCO .....	87	105	98	98	99	90	83	79	76
of which:									
coffee .....	75	96	93	91	82	68	64	61	55
cocoa .....	93	121	86	83	125	121	88	70	68
tea .....	109	145	129	126	124	123	125	122	122
RAW MATERIALS .....	107	96	91	95	79	78	86	82	80
of which:									
wool .....	103	91	92	106	75	72	78	76	77
cotton .....	105	91	83	84	77	66	71	74	74
rubber .....	110	122	110	105	90	115	129	95	92
FOREST PRODUCTS <sup>1</sup> .....	93	94	95	94	90	88	91	92	90

<sup>1</sup> Not included in indices of agricultural trade.

highest monthly average level since 1957, and was some 18 percent more than a year earlier.

Movements of price indices, which do not take into account government-to-government exchanges, and which are often affected by changes in the supply of the particular grade used for the index rather than of the commodity as a whole, tend to be more extreme than indices of unit values, which cover returns for the whole quantities traded, although both show the same trend.

In general it appears that the factors tending to raise international prices of farm products in 1962-63 have been of a specific nature and are likely to be of short-term duration. Thus, the increase in raw sugar prices reflected shortages in international markets following smaller crops in Cuba, where recent changes in the structure of farming still affect the output, and a reduced output in many western European countries, where weather in 1961/62 had been unfavorable.

Smaller crops in importing countries in 1961/62 also affected prices of wheat and coarse grains, especially maize. World production of rice in 1961/62 remained as high as the year before, but with a steady expansion in demand in importing countries, prices in nongovernmental trade were substantially

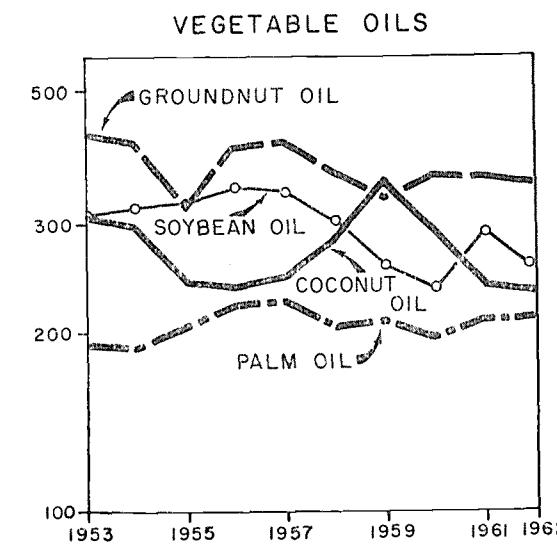
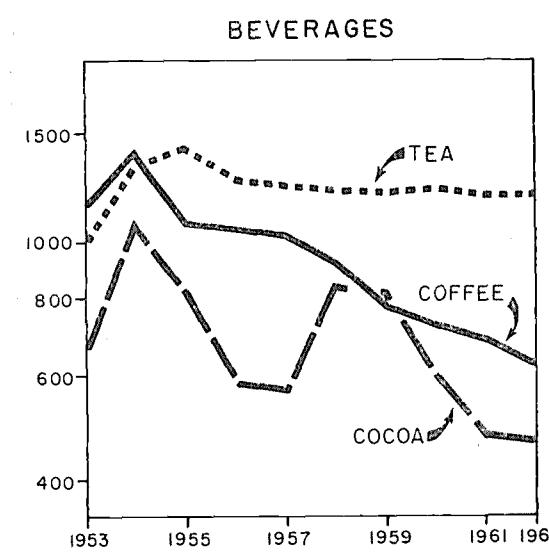
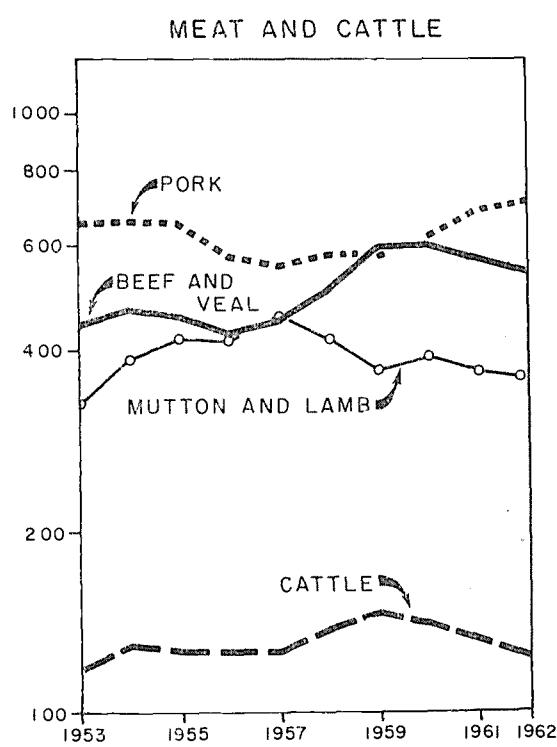
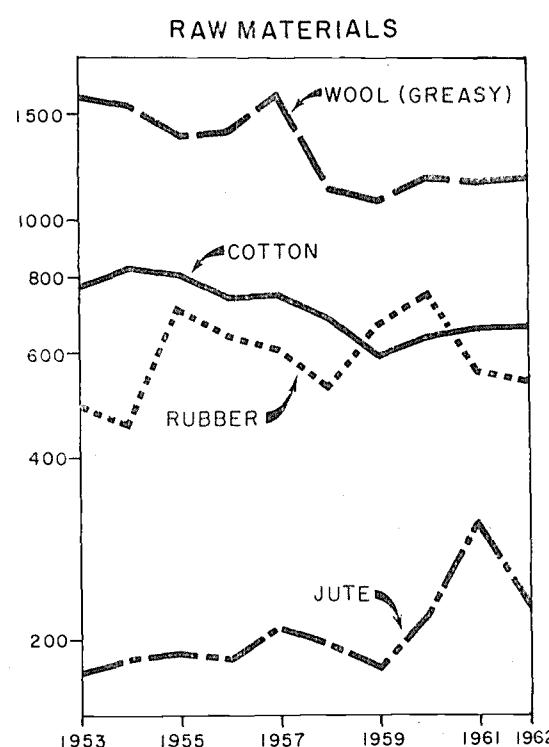
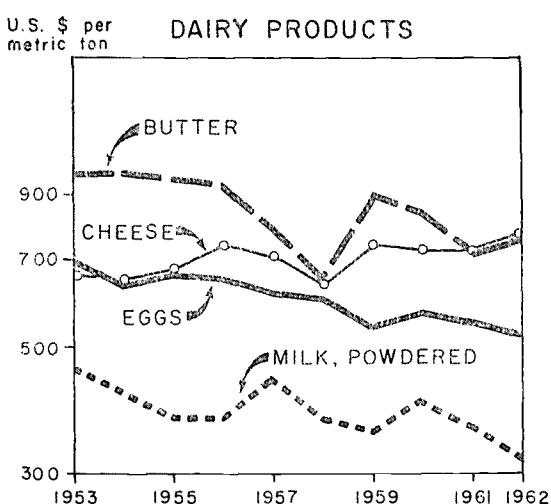
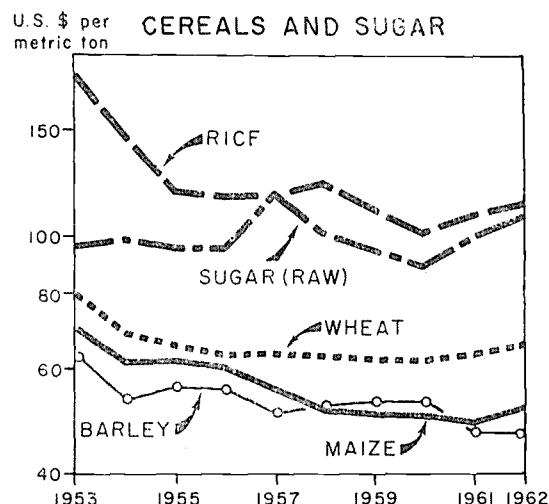
above the 1961 level. Small "off-year" crops in European importing countries led to considerable increases in prices of apples, while international butter prices were strengthened by the imposition of quotas for imports into the United Kingdom.

The fall in prices of most oilseeds and vegetable oils in 1962 reflected both the larger offerings in international markets, particularly of United States soybeans, and the strong demand for oilseed cake, which resulted in heavy crushings and a large oil production. Prices of cattle and beef also were down. So too were those of condensed and powdered milk, and of citrus fruit.

Despite the gradual strengthening of robusta (African) coffees in 1962 and in early 1963, the average export unit value of all coffees fell by another 9 percent, owing to the continued price decline of Latin American coffees under the influence of large surplus stocks. The conclusion of a long-term International Coffee Agreement and the evidence of a gradual narrowing of the gap between consumption and production suggest that 1962 may mark a turning point toward a gradual balancing of the coffee economy. For the time being, however, the market is dominated by the existing surpluses.

Cocoa prices too showed a further fall, although

FIGURE II-5. AVERAGE EXPORT UNIT VALUES (AVERAGE PRICES) OF SELECTED AGRICULTURAL PRODUCTS IN WORLD TRADE  
(SEMILOGARITHMIC SCALE)



a moderate one. Much of the gap between annual production and grindings has now been closed by a steady increase in consumption and some slowing down in the growth of output. Average export unit values of tea remained near the 1961 level. Tobacco prices in 1962 averaged nearly a tenth higher than in 1961.

The fall in average export unit values for the raw material group reflected mainly the fall in the price of rubber during the first three quarters of 1962, and a sharp fall in prices of jute from the high level in 1961, when small crops in Pakistan and India had led to a shortage in international markets. Nonetheless, average jute prices in 1962 were higher than in any year (other than 1961) since the end of the Korean boom.

#### *Fishery products*

The prices of fishery products were generally higher than in 1961. The major exceptions were the prices of fish and whale oil, which fell through most of the year, partly because of the general weakness of fats and oils prices in the international markets, and partly because of the rapid increase in fish oil production consequent on the expansion of the output of fish meal. The price of menhaden oil in the United States was at the end of the year nearly a quarter less than in December 1961, and the average for the year fell in a similar proportion. The price of fish meal, on the other hand, recovered further from the 1960 low, and exceeded the 1961 average by more than 10 percent.

#### *Forest products*

Owing mainly to the reduced import demand in Europe, the average export unit value of forest products declined slightly in 1962. Prices for pulp and pulpwood in international trade were considerably below 1961 levels, and those for coniferous and broad-leaved sawnwood and logs also were generally lower. Plywood and newsprint prices were stable, while prices for other types of paper and paperboard showed some increase. Toward the end of the year European prices of both pulpwood and sawn softwood increased somewhat and the firmer tendency was expected to be maintained through 1963.

In contrast to the European experience, a fairly

strong demand in North America kept prices in 1962 on average slightly higher than in 1961. The majority of commodities participated in the increase, the main exceptions being pulp, plywood, and insulating board, the prices of which were lower, and newsprint and other types of paper, which showed little change. The largest gains were recorded in the prices of sawn softwood and paperboard.

In Latin America there were increases in internal prices for most forest products, but on the whole they merely followed the over-all inflationary trends that persisted in many of the countries in the region. With few exceptions, export and import prices remained relatively stable during the year. In the Far East, too, prices showed only minor fluctuations, although the general tendency was slightly upward. The average unit value of Japanese imports of wood products in 1962 was approximately 6 percent above that of 1961. Teak prices remained very firm. The dependence of African exports on the European market was demonstrated by the general weakness of export prices of hardwood logs and sawnwood.

#### *General*

Although the data show that the falling longer-term trend in the world prices of agricultural products as a whole was interrupted in 1962 and the first half of 1963, it would seem too optimistic to assume that any basic change has taken place in the factors affecting the movement of prices in recent years. From the brief survey above it is clear that the improvement in prices was concentrated on a few individual products, and that the factors responsible for the upturn were in almost all cases on the supply side and likely to be of short-term nature. The price of sugar, the product mainly responsible for the rise, has already turned downward after the May 1963 peak quotations. For some products, such as coffee and cocoa, the end of the current surplus situation may be in sight, though perhaps at some considerable distance, thanks to international arrangements and to a gradual adjustment of consumption and production. However, the more basic factors tending to depress the prices of many agricultural products remain operative, in particular the slow growth of consumption, the rapid increases in productivity, and the strong efforts of exporting countries to increase their foreign exchange earnings. Efforts to compensate for the harmful effects of low and fluctuating world prices on the economies of exporting

countries therefore need to be continued. Recent national and international approaches to the solution of these problems are discussed later.

#### AGRICULTURAL EXPORT EARNINGS

With the volume of exports and the average price level in international markets nearly unaltered, the global value of earnings from agricultural exports showed little change from the preceding year. Not all regions, however, fared the same. In contrast to

the trends of the past decade, the volume of exports from each of the economically advanced regions of the world fell, and the combined exports of these regions were nearly 4 percent less in volume than in 1961. Exports from the less developed regions, on the other hand, were generally larger, except those from the Near East, and the total for the four regions combined increased by 3 percent.

Price movements, however, worked in the contrary direction to the volume of exports. In western Europe and North America somewhat higher prices than in 1961 mitigated the effect of the smaller vol-

TABLE II-22. - INDICES OF THE VOLUME AND VALUE<sup>1</sup> OF AGRICULTURAL EXPORTS, BY REGION AND COMMODITY GROUP

	Average 1948-52	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<i>Indices, average 1952-53 = 100</i>									
WESTERN EUROPE									
volume.....	79	128	126	141	143	145	158	170	165
value .....	83	118	120	136	130	130	144	150	149
<i>.....</i>									
NORTH AMERICA									
volume.....	102	90	126	136	123	128	158	163	155
value .....	102	82	110	117	104	103	124	133	129
<i>.....</i>									
OCEANIA									
volume.....	97	105	110	113	103	125	121	139	137
value .....	95	97	101	113	87	107	104	114	116
<i>.....</i>									
LATIN AMERICA									
volume.....	100	108	117	111	117	126	129	132	137
value .....	92	102	105	105	98	95	98	101	106
<i>.....</i>									
FAR EAST <sup>2</sup>									
volume.....	95	113	113	112	108	113	113	121	123
value .....	102	114	107	106	97	111	112	107	106
<i>.....</i>									
NEAR EAST									
volume.....	86	104	104	113	106	128	127	121	117
value .....	97	100	105	118	99	105	111	106	102
<i>.....</i>									
AFRICA									
volume.....	90	121	128	130	130	138	141	153	160
value .....	86	112	114	116	121	122	117	120	120
<i>.....</i>									
ALL ABOVE REGIONS									
volume.....	95	109	119	122	119	128	136	144	144
value .....	94	103	109	114	105	109	115	119	119
<i>.....</i>									
of which:									
FOOD AND FEEDSTUFFS									
volume.....	93	111	124	127	128	134	143	155	158
value .....	94	99	110	117	112	116	123	132	137
<i>.....</i>									
BEVERAGES AND TOBACCO									
volume.....	95	107	116	115	112	123	127	133	136
value .....	81	111	113	113	112	107	105	104	103
<i>.....</i>									
AGRICULTURAL RAW MATERIALS									
volume.....	98	106	114	120	110	124	130	132	124
value .....	105	102	103	112	87	97	110	106	99

<sup>1</sup> At current prices - <sup>2</sup> Excluding Mainland China.

ume of shipments, while in Oceania earnings increased slightly because of a change in the pattern of trade. In most of the less developed regions, on the other hand, export prices continued to fall, partly offsetting the effect of the increase in volume. Only in Latin America did export prices as a whole move in the favor of exporters, and the total value of that region's shipments rose by about 5 percent. A small gain was registered also for Africa. In aggregate, the export earnings of the developing regions rose by about 2 percent, while those of the economically more developed regions fell by about the same percentage.

From the series of indices of the volume and value of exports in Table II-22, it is evident that over the past decade the growth of the volume and especially of the value of exports has been greater for the economically more developed than the less developed regions, with the exception of Africa. It is also clear that trade in food and animal feedstuffs as a whole has grown a good deal faster than exports in either of the groups "beverages and tobacco" and "agricultural raw materials."

The disparity between the growth of exports from the more and less developed regions as a whole, however, quite largely reflects the rise of shipments under special terms. If commercial shipments only are compared, the differences between the two groups of regions become much smaller. Thus, comparing averages for the two periods 1952-53 and 1960-62 (Table II-23), the total volume of exports of the economically more developed regions has increased by more than one half and those from the less developed regions by about one third. The volume of commercial exports alone, however, has increased in both groups by about 32 percent.<sup>9</sup>

Average unit values of commercial exports have declined rather more over the period in the less developed regions (-18 percent) than in the more developed regions (-14 percent). Total earnings from commercial exports have therefore risen by only about 8 percent from the less developed compared

<sup>9</sup> Available data permit only a deduction for shipments under concessional terms from the United States, but this is overwhelmingly the largest program. A deduction has been made in Tables II-14 and 23 from 1954 onward when Public Law 480 came into operation and such shipments took on the character of surplus disposal. In some of the early postwar years, however, the larger part of United States farm exports (some 60-70 percent of the total) was through government programs, such as the Army Civilian Supply program, UNRRA, and other relief programs. After the cessation of most of these programs, the share fell to around 15 percent in 1951/52 and 1952/53. Since 1954/55 shipments under special terms have usually ranged between 30 and 35 percent of total United States agricultural exports (Table II-16).

TABLE II-23. - PERCENTAGE CHANGE IN AGRICULTURAL EXPORTS, TOTAL AND COMMERCIAL, 1952-53 TO 1960-62.

	Change 1952-53 to 1960-62 in		
	Volume	Unit value	Value at current prices
	..... Percent .....		
Western Europe .....	+ 64	- 10	+ 48
North America			
Total .....	+ 59	- 19	+ 28
Commercial exports only .....	+ 13	- 19	- 8
Oceania .....	+ 32	- 16	+ 11
Three above regions			
Total .....	+ 53	- 15	+ 30
Commercial exports only .....	+ 32	- 14	+ 13
Latin America .....	+ 32	- 23	+ 2
Far East .....	+ 19	- 8	+ 9
Near East .....	+ 22	- 13	+ 6
Africa .....	+ 52	- 22	+ 19
Four above regions .....	+ 32	- 18	+ 8
ALL REGIONS:			
Total .....	+ 41	- 17	+ 18
Commercial exports only .....	+ 32	- 17	+ 10

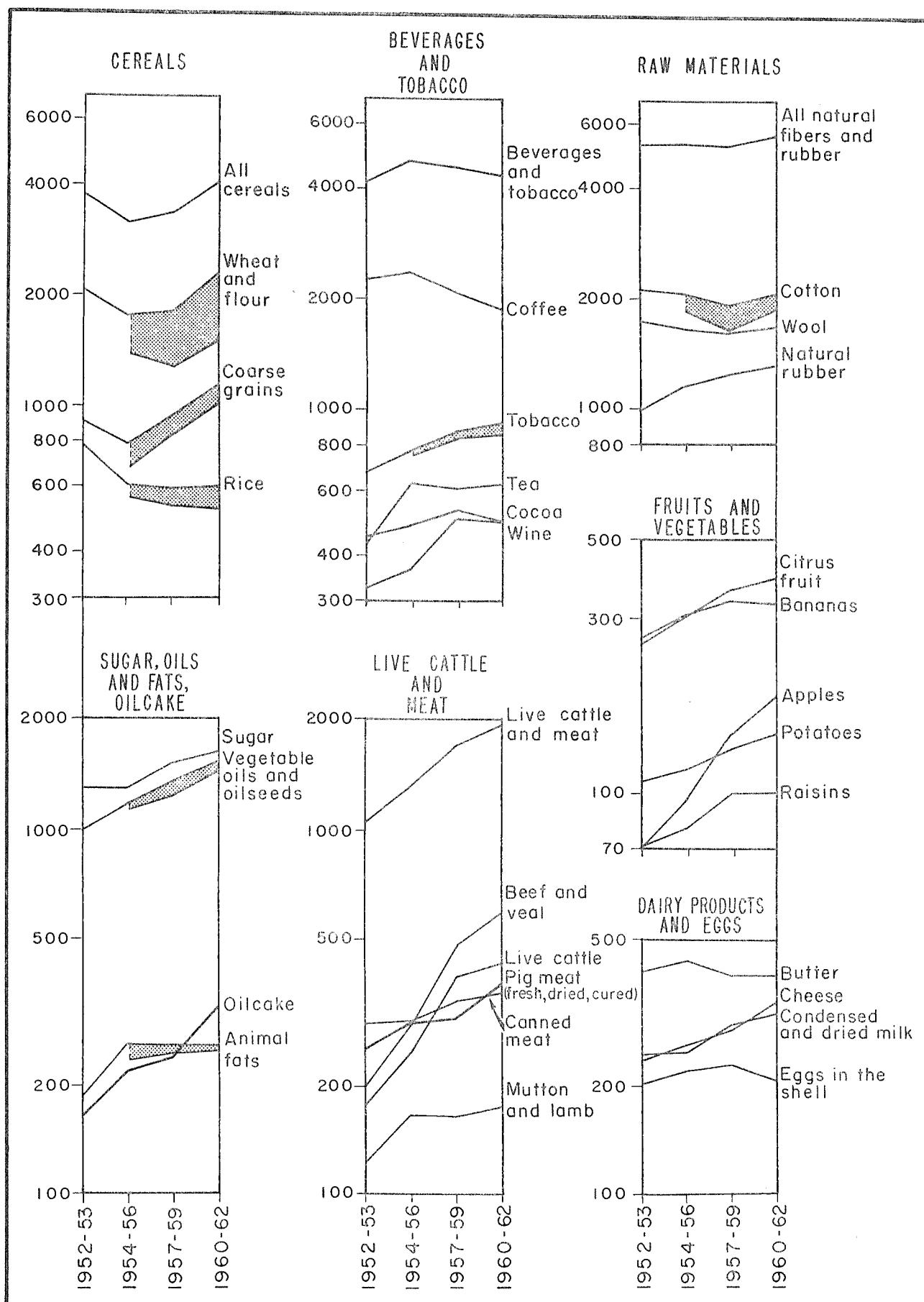
with 13 percent from the economically more developed regions. The total value of exports from the latter group of regions, including also exports under special terms, has, however, risen by no less than 30 percent.

A striking feature of the development of agricultural exports over the past decade has been the very different rates of growth of the various commodities. Several commodities for which market demand has been favorable have shown a very rapid growth in exports and export earnings. For others the fall in prices has largely offset, and for a few commodities more than offset, the rising volume of exports, with the result that total export earnings have declined. Developments during the past decade are summarized in Figure II-6, showing the trend of earnings from the major export commodities in million U.S. dollars at current prices, converted from national currencies at official exchange rates. To eliminate year-to-year fluctuations, the data are presented as 2- or 3-year averages.

It is evident from Figure II-6 that export earnings from live cattle and meat (especially beef) and for certain fruits, including apples and citrus fruits, have increased very rapidly during the past decade. There have also been substantial increases for edible oils and oilseeds, oilcake, sugar, and tobacco. Earnings from exports of natural rubber have increased by nearly one third during the period.

For other commodities, however, the trend is less favorable. For dairy products as a whole export

FIGURE II-6. VALUE OF WORLD<sup>1</sup> EXPORTS OF MAJOR AGRICULTURAL PRODUCTS (MILLION U.S. DOLLARS AT CURRENT PRICES; SEMILOGARITHMIC SCALE)



Note: Shaded areas represent shipments under special terms

<sup>1</sup> Excluding U.S.S.R., eastern Europe, and Mainland China

earnings have increased rather slowly; cheese and processed milk have shown a fair rate of growth, but eggs have lagged and earnings from butter exports have declined. The recovery in the value of cereal shipments since 1954 reflects mainly larger shipments under special terms (shaded areas in Figure II-6). Shipments under special terms were also substantial in the case of cotton, and the value of commercial shipments declined. Earnings from wool exports have shown no growth over the period, even at current values, while earnings of coffee, cocoa, and tea have fallen since the peak in 1954, coffee very heavily.

These data are set out in somewhat greater detail in Annex Table 14, showing the volume, average price, and total value of exports of the main agricultural commodities entering world trade in 1960-62 in comparison with 1952-53. The table shows also the total value of world exports in 1960-62.

For nearly all commodities showing an increase of over 30 percent in the total value of exports, both the volume of exports and the level of prices were higher in 1960-62 than in 1952-53. The main exceptions were fats and oils and oilcake, for which higher earnings came entirely from a larger volume of exports, partly offset by lower prices.

A larger volume of shipments together with lower prices was also the general pattern for the commodities where the rise in export earnings was less than 30 percent during the decade, as well as for those where earnings were lower in 1960-62 than in 1952-53. These two groups, however, included most of the highest earning commodities, with export values in excess of \$1,000 million.

For only two of the commodities included in Annex Table 14, jute and silk, was there a decline in the volume of exports during the decade. Prices of both these commodities were higher on world markets in 1960-62 than in the earlier period, and in the case of jute this more than offset the fall in volume.

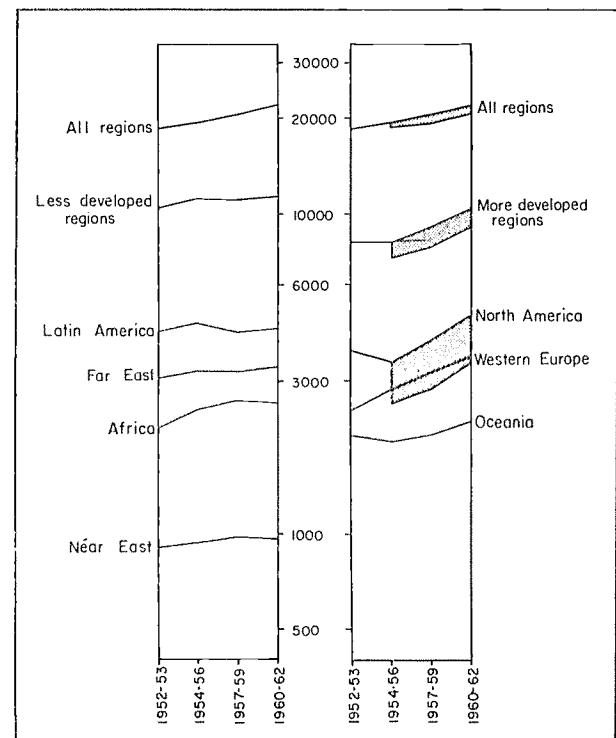
In general, it appears that the only commodities showing a rapid growth of export earnings are those for which there is still a fairly high income elasticity in the economically advanced countries. Much of the trade in these commodities, however, represents exchanges between the economically more developed countries themselves, and especially exchanges within western Europe. For example, two thirds of the increase in exports of livestock products since 1952-53 came from western Europe, and in 1960-62 this region accounted for 55 percent of world ex-

ports and 65 percent of world imports of livestock products. In recent years, however, imports of livestock products into North America have also grown rapidly, though in 1960-62 they were less than one quarter of the value of western European imports. While the less developed regions, notably Latin America and to a smaller extent Africa, shared in the expansion of world exports they are still fairly small exporters of livestock products and obtained only 16 percent of the increased earnings.

Of the main export commodities of the economically less developed regions, only rubber, sugar, and vegetable oils showed any considerable rate of growth in the value of exports. Of these rubber, threatened by the rising tide of synthetic production, has been notably unstable in price. And although sugar prices are currently high the future prospects for the commodity are uncertain. Finally, the main expansion of exports for edible oils and oilseeds has come from soybeans and oil from North America, aided to a limited extent by shipments under special terms.

The composite result of these various trends is set out in Figure II-7, showing for each region the total value of exports (at current prices) of all

FIGURE II-7. VALUE OF EXPORTS OF MAJOR AGRICULTURAL PRODUCTS, BY REGION (MILLION U.S. DOLLARS AT CURRENT PRICES; SEMILOGARITHMIC SCALE)



NOTE: Shaded areas represent shipments under special terms

commodities included in Annex Table 15B. Even without allowing for the change in the terms of trade for farm products it is clear that there has been little growth in export earnings of the less developed regions as a whole. Africa made substantial gains during the 1950s, but the curve has since flattened out, while the export earnings of Latin America have declined since the collapse of the coffee boom of 1954.

Of the economically more developed regions, western Europe shows the most substantial progress, though as already noted this largely represents intraregional exchanges. Export earnings from Aus-

tralia and New Zealand would show little real gain if allowance were made for the worsening of the terms of trade for agricultural products. In North America the sharp rise since 1954 is due mainly to shipments under special terms; commercial shipments alone in 1960-62 have scarcely more than regained the level of 1952-53.

The distribution between the more and the less economically developed regions of the growth of earnings from exports of each major commodity over the period 1952-53 to 1960-62, together with the contribution of shipments under special terms, is set out in Table II-24.

TABLE II - 24. - CHANGES IN EXPORT EARNINGS FROM MAJOR AGRICULTURAL PRODUCTS OF LESS AND MORE DEVELOPED REGIONS:  
1952-53 TO 1960-62

	World <sup>1</sup>	Less developed regions	More developed regions			
			Commercial shipments	Shipments under special terms	Total	
	Million U.S. \$ <sup>2</sup>	Percent	.....	Million U.S. \$ <sup>2</sup> .....	.....	
Wheat and flour .....	+267	+ 13	(- 133)	(- 387)	+787	+400
Coarse grains .....	+256	+ 28	+ 78	+ 31	+147	+178
Rice .....	(-179)	(- 23)	(- 111)	(-147)	+ 79	(- 68)
Sugar (raw and refined) .....	+335	+ 26	+360	(- 25)	—	(- 25)
Edible oils and oilseeds .....	+515	+ 52	+ 94	+344	+ 77	+421
Oilcake and meal .....	+168	+102	+ 68	+100	—	+100
Apples .....	+107	+144	+ 25	+ 82	—	+ 82
Bananas .....	+ 60	+ 23	+ 58	+ 2	—	+ 2
Citrus fruit .....	+130	+ 51	+ 86	+ 44	—	+ 44
Dried raisins .....	+ 25	+ 34	+ 12	+ 13	—	+ 13
Potatoes .....	+ 36	+ 34	+ 10	+ 26	—	+ 26
Live cattle .....	+253	+142	+ 64	+189	—	+189
Beef and veal .....	+389	+193	+112	+277	—	+277
Mutton and lamb .....	+ 52	+ 41	(- 8)	+ 60	—	+ 60
Pork .....	+ 68	+133	(- 1)	+ 69	—	+ 69
Bacon and ham .....	+ 58	+ 28	(- 3)	+ 61	—	+ 61
Canned meat .....	+ 63	+ 21	+ 39	+ 24	—	+ 24
Lard and animal fats .....	+ 69	+ 37	(- 1)	+ 60	+ 10	+ 70
Condensed and dried milk .....	+ 74	+ 30	(- 1)	+ 66	+ 9	+ 75
Butter .....	(- 12)	(- 3)	+ 11	(- 23)	—	(- 23)
Cheese .....	+106	+ 45	+ 2	+104	—	+104
Eggs (in shell) .....	+ 7	+ 3	+ 12	(- 5)	—	(- 5)
Coffee .....	(-455)	(- 20)	(-458)	+ 3	—	+ 3
Cocoa .....	+ 34	+ 7	+ 30	+ 4	—	+ 4
Tea .....	+189	+ 44	+189	—	—	—
Tobacco .....	+237	+ 35	+ 95	+ 76	+ 66	+142
Wine .....	+162	+ 50	+ 72	+ 90	—	+ 90
Wool .....	(- 46)	(- 3)	(- 53)	+ 7	—	+ 7
Silk .....	(- 2)	(- 3)	+ 5	(- 7)	—	(- 7)
Cotton .....	(- 57)	(- 3)	(-182)	(- 71)	+196	+125
Jute .....	+ 12	+ 6	+ 12	—	—	—
Sisal .....	+ 6	+ 6	+ 3	+ 3	—	+ 3
Natural rubber .....	+310	+ 31	+309	+ 1	—	+ 1
Linseed and oil .....	+ 46	+ 46	+ 20	+ 26	—	+ 26
ALL ABOVE PRODUCTS .....	+3283	+ 18	+815	+1097	+1371	+2468

<sup>1</sup> Excluding eastern Europe, the U.S.S.R., and Mainland China. <sup>2</sup> At current prices.

The foregoing analysis gives some indications of the commodities for which further export development may be profitable, and those for which any substantial increase in the volume of exports would be likely to lead to a sharp fall in prices. It suggests also that there are few prospects of any major increase in the rate of growth of the value of agricultural exports in the near future, especially in the economically less developed regions. This is in line with the findings of the projections of future import demand published in 1962 by FAO.<sup>10</sup> On a per caput basis the recent trend of earnings from agricultural exports of the developing countries is still more disquieting. Thus the increase of 8 percent at current prices from 1952-53 to 1960-62 (or 2 percent in real terms) for the developing countries as a whole represents a decline of 16 percent in per caput earnings in real terms, if allowance is made for the growth of population over the period. This decline must be set against the growing needs of foreign exchange of the developing countries as a means of achieving a more satisfactory rate of economic growth.

#### INTERNATIONAL TRADE POLICIES

Although the falling trend of agricultural prices in international markets was halted in 1962, there was nothing in the trend of agricultural or general exports of the underdeveloped countries as a whole to reduce their concern at the slow growth of their export earnings in relation to their development requirements. At the same time in the economically more developed countries there was increasing awareness of the persistent nature of the tendency toward surplus agricultural production, and rising concern over the costs of agricultural price supports. Attempts to mitigate the effects of these two problems, different but with a number of common factors, have resulted in unusually active consideration of international trade and commodity problems in 1962 and 1963.

Examination continued during 1962 of the suggestions for compensatory financing of short-term fluctuations in export earnings, in particular the "development insurance fund" originally proposed by a United Nations group of experts, and a scheme of compensatory loans from a rotating fund, propos-

ed by the Organization of American States. Little headway appears to have been made in overcoming a number of objections to both of these schemes, particularly among the major potential contributors. A step forward was, however, the adoption in February 1963 of a new policy by the International Monetary Fund (IMF), which permits countries suffering temporary balance of payments difficulties, due to shortfalls in export earnings from factors beyond their control, to draw on the Fund beyond the limit set under previous practice.

The new IMF policy has been welcomed as a step in the right direction, although doubts have also been expressed about its adequacy relative to the needs of the less developed countries. All of the schemes mentioned, moreover, have been criticized on the grounds that they make little contribution to the solution of the longer-term problem of insufficient export earnings which, even more than short-term fluctuations is the real cause of concern to the less developed countries.

In the meantime progress has continued in the more traditional approaches to export problems. Reference to commodity agreements is made in the section below dealing with agricultural policies. A looser form of international co-operation in the commodity field continues to be carried out through the various commodity study groups, including those established by FAO for grains, rice, coconut and coconut products, citrus fruit, and cocoa. Recent decisions in FAO's Committee on Commodity Problems have led to the establishment of a new study group for jute and allied fibers, while *ad hoc* meetings are to be held on the problems of bananas.

The break in the negotiations for the entry of the United Kingdom into the European Common Market in February 1963 resulted in reduced attention to the proposals for more comprehensive international commodity agreements as a means, *inter alia*, of taking into account the interests of the Commonwealth producers of temperate zone products in the event of the United Kingdom's entry. More recently, however, such plans have again been more in the forefront of international discussion, e.g., at the Cereals Group established by the General Agreement on Tariffs and Trade (GATT) in 1961, and in a very broad manner also in the Preparatory Committee of the United Nations Conference on Trade and Development.

Such schemes are still far from having taken a definite shape. Nonetheless, it is of interest that some of the major countries likely to be involved

<sup>10</sup> FAO. *Agricultural commodities: projections for 1960*. Rome, 1962.

in any future arrangements, including the United States and the United Kingdom, have recently made moves toward changing their domestic price support policies in a manner which may give greater flexibility in negotiation. In both countries, it should be added, a major motive has been to reduce the cost to the government of the present systems of farm income support. Thus, the proposals of the United States Administration for a wheat program for 1964 and the subsequent years, embodied in the Food and Agriculture Act of 1962, was aimed at gradually reducing surplus stocks, and bringing production more closely into line with domestic and international outlets, including requirements for food aid. Although the proposals under the Act were rejected by wheat farmers in a referendum in May 1963, these are understood to remain the aims of the Administration. These proposals, and also the reappraisal of the present support policies of the United Kingdom are discussed in a later section on policies.

At the GATT Meeting of Ministers in May 1963, a majority of the ministers approved a program of action aiming at the elimination within a stated period of customs tariffs, fiscal charges and revenue duties, and quantitative restrictions (except where GATT provisions permit them) on imports of primary products from the less developed countries. The European Common Market countries, who have special preferential responsibilities under the Convention of Association, did not subscribe to this agreement. Secondly, the Ministers agreed on the principle of the "linear" method of tariff cuts (i.e., the negotiation of reductions for large groups of products, instead of individual items, which became possible after the passage of the United States Trade Expansion Act of 1962) as the principal working method for the forthcoming ("Kennedy") round of tariff negotiations, and on the inclusion of primary products, as well as manufactured goods, in the negotiations.

Exceptions to the "linear" approach would be made where there are wide differences in tariff levels, in which case special reductions would come into effect to even out these differences. For countries which would be unable to benefit from "linear" reductions, because they depend on the export of a narrow range of primary products or for other reasons, the principle of reciprocity would be applied. Less developed, as well as economically more developed countries stand to benefit from the results of the tariff negotiations, under the application of the most-favored-nation clause which is the governing principle of GATT.

Despite these various approaches, it is becoming widely recognized that no likely increase in earnings from the export of primary products will meet the needs of the less developed countries for foreign exchange if their economies are to grow at what are now considered as acceptable rates. Steps are therefore also under consideration to enlarge these countries' markets for processed goods and manufactures. It has become widely accepted that the traditional principles of trade reciprocity need modification, in the changed economic and political climate of world trade, in favor of the developing nations.

These and other problems of international trade in relation to the development of the "new" nations, will be taken up at the United Nations Conference on Trade and Development, which will open in March 1964. The provisional agenda of the Conference deals with the whole gamut of trade and development problems, including those of primary products and of manufactures or semimanufactures, problems of trade between countries at different levels of economic development and with different economic and social systems, implications of regional economic groupings, methods of financing an expansion of international trade, and the institutional and other measures implied.

## Farm prices and incomes

In most of the 23 countries which published an index of prices received by farmers, these prices tended to be somewhat higher in 1962 than in 1961, rising more rapidly in the second half of the year and in the early months of 1963. These developments were in some cases due to government price

support measures, in others to lower output resulting from bad weather.

In the European Economic Community (EEC), prices received by farmers showed varying increases in 1962. Prices averaged 2 percent more than in 1961 in Belgium, 3 percent more in the Federal

Republic of Germany and in the Netherlands, and 6 percent more in France and in Italy, where largely because of bad weather the prices of fruit, vegetables, beef, veal, and wine rose appreciably. For cereals, EEC decided as a temporary measure not to change the widely differing support prices prevailing in the member countries in the previous year.

In several other western European countries producer prices were raised in order to realize the income objectives of agricultural policies. Thus in Finland milk and meat prices were raised, and the over-all index of producer prices rose by 2 percent. The Cereals Trade Association in Sweden raised redemption prices of rye and wheat by 12-13 percent in September 1962, and in the first nine months of the year the crop price index rose by 16 percent, but prices of animal products rose only slightly, so that the increase in the over-all index was limited to 4 percent. In Norway support prices of cereals, milk, meat, and eggs were raised and the over-all index rose by 5 percent. In Denmark, where income objectives are not expressly a part of agricultural policies, levies were introduced on domestic sales of pigmeat, beef, veal, poultry meat, and eggs, and contributed to a rise of 3 percent in the farm price index. In Switzerland the index showed a rise of 5 percent in the first half of 1962; in the second half of the year support prices of milk, wheat, meslin, spelt, sugar beets, potatoes, and rapeseed were raised, in order to sustain farm income. More striking price increases were authorized in several countries to redress the farm income situation; in Portugal farm prices were raised by an average of 8 percent, in Iceland 12 percent, and in Yugoslavia 17 percent. In the United Kingdom, on the other hand, support prices of wheat, milk, and eggs were lowered for 1962/63, though farmers received higher prices for potatoes and cattle.

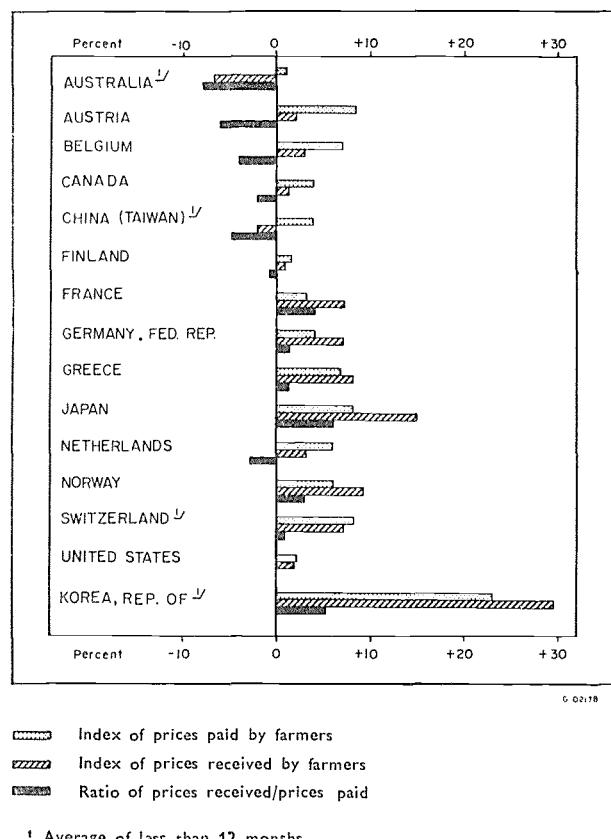
In Canada the index of prices received by farmers hardly changed between 1961 and 1962; prices for most of the supported commodities remained the same, but the wheat price in western Canada was raised by 7 percent because of favorable market conditions. In the United States higher prices for some livestock products, horticultural crops and cereals were partly offset by lower prices for other products, so that the index moved upward only slightly. The price decline which began in the second half of 1961 in Australia continued through the first half of 1962, but in the second half of the year prices of wool, meat, and dairy products began to rise again. In China (Taiwan), in the first nine

months of 1962 the index of farm prices declined by about 5 percent as a result of the large harvests; the downward trend in the rice price continued throughout most of the year, but prices for rice and some other crops began to strengthen in the early months of 1963.

The persistent increase in the prices farmers pay for production requisites, wages, interest, taxes, and other farm expenses continued in 1962. Fifteen countries publish indices of these expenses, and for these countries it is therefore possible to study trends in the ratio between prices received and paid by farmers. In Figure II-8 the position in 1962 is compared with that in 1960 in these countries. The indices on which the figure is based are nationally calculated indices with varying components, especially the indices of prices paid, and they are thus not strictly comparable between countries. They are useful, however, in showing the trend in price relationships within a country.

In seven of the fifteen countries shown, the ratio between prices received and prices paid has moved to the disadvantage of farmers between 1960 and

FIGURE II-8. CHANGES IN INDICES OF PRICES PAID AND RECEIVED BY FARMERS, AND IN THE RELATIONSHIP BETWEEN THE TWO INDICES, 1962 IN RELATION TO 1960



1962. This trend has been continuous since 1952 in five of these countries: Australia, Canada, Austria, Belgium, and the Netherlands. In the case of Australia only partial data are available for 1962, and because prices received strengthened in the latter part of the year the deterioration in the ratio for the whole year may have been somewhat less than is shown in the figure. The upward adjustment in prices received in the Netherlands in 1962 was insufficient to offset the increases in prices paid that have taken place since 1960. In Austria and Belgium, both importing countries, the moderate rise in prices received did not keep pace with the rise of 7-8 percent in prices of inputs since 1960. The two indices in Finland, on the other hand, have tended to move rather closely together, though since 1960 the index of prices paid has gained a slight edge. In China (Taiwan) the ratio declined in 1962 for the first time since 1954.

In six other countries shown in Figure II-8 (France, Federal Republic of Germany, Greece, Norway, Japan, and Republic of Korea) prices received have moved well ahead of prices paid. The increases have been very rapid in the Republic of Korea, where inflation has prevailed and where agricultural prices rose sharply following unfavorable harvests. In Japan prices of agricultural products rose sharply in the second half of 1961 and continued to rise throughout 1962; for the first time in some years the index of prices received moved ahead of prices paid and the ratio was in favor of farmers. Finally, in both Switzerland and the United States the relationship over the longer term has been against farmers, though since 1960 the movement in the two indices has been fairly close and the ratio stable.

#### FARM INCOMES

While these price relationships influence the returns from farming, gross incomes will also depend on the volume of farm sales and on any grants or subsidies farmers may receive, and net incomes will be affected by the total cost of farm operations, i.e., by the volume as well as the price of inputs. A rise in prices received, for example, may be accompanied by increased efficiency and more economic production, thus limiting the increase in farm expenses.

Preliminary information on income developments in 1962 or 1962/63 is available for some fifteen countries, though the coverage varies. For some countries only the gross value of agricultural output is available.

In several countries total farm expenses, taxes, interest, and other costs rose more rapidly than gains in gross receipts from farm sales and government payments in 1962. Thus farm income fell slightly in Norway and there were reductions of 2 percent in Spain, of 4 percent in the United Kingdom, and of 7 percent in Austria. In the United States in 1962 the increase in farm production expenses was only slightly less than the increase in gross receipts. Agricultural production in Greece fell by 6 percent and national income from farming by 5 percent.

A higher volume of sales, sometimes accompanied by higher prices or larger government payments, more than offset the rise in farm expenses in a number of countries. Net returns thus increased by 5 percent in Australia and 9 percent in Japan. Gross returns to farmers rose by 8 percent in Italy in 1962, though production rose only 2 percent, and while farm costs rose by 17 percent, net returns averaged 8 percent more than in 1961. Higher farm prices in Belgium were responsible for an 11 percent increase in the net income of agriculture. The increase in net returns was as much as 17 percent in the Federal Republic of Germany, where in the previous year farmers had suffered considerable losses, and similarly in Canada a 43 percent rise in net income more than compensated for the previous year's losses. In Syria in 1962 agricultural production recovered substantially from several years of drought, and the income of the agricultural sector was 82 percent above the low average of the three previous years and 63 percent more than in 1961. The value of the gross output of agriculture in Switzerland was 5 percent higher in 1962 than the year before, the value of crop production increasing by 11 percent and of livestock production by 3 percent. In France gross receipts were forecast as 6 percent higher than in 1961.

The trend in the more developed countries is toward a reduction in the total number of farms and a movement of labor out of agriculture into other occupations. This has resulted in these countries in a faster rate of growth in income per farm, or income per head of farming population, than in the farm sector as a whole. Complete data for 1962 are not available on income per farm or per caput income in farming, except for the United States. In spite of the negligible gain in the net income of the farming sector as a whole in the United States in 1962, income per farm rose by 4 percent, and the income per head of the farm population was slightly above

the 1961 level. It should be noted, however, that in the less developed countries the tendency is still for the absolute size of the farm population to continue to grow, even though as a percentage of the total population it is generally slowly falling.

The limited available information indicates that the disparity between per caput incomes in agriculture and those in nonagricultural occupations may have grown in a number of western European countries as a result of the rapid rise in industrial wages. In Sweden, where income parity is an explicit objective of agricultural policy, the disparity in 1962 was twice that in 1959, and average income from farming was 50 percent of nonfarm income. In the Federal Republic of Germany the income gap has widened considerably; per caput farm income was 76 percent of nonfarm income in 1958/59 and 62 percent in 1961/62, and the situation in 1962/63 is not expected to have improved in view of the rapidly rising wages in industry. In the United States the disparity remained about the same in 1962 as in the previous year, with average farm incomes just under 60 percent of nonagricultural incomes.

More detailed information follows on the farm income situation in 1962 or 1962/63 in the few countries for which fairly complete data are available.

In Canada gross farm income reached the record level of Can \$3,570 million in 1962, nearly one fifth more than the \$3,009 million of the previous year. There were significantly higher receipts from marketings of wheat, oats, cattle and calves, poultry and dairy products, as well as larger participation payments by the Wheat Board on the previous year's grain crop, and higher net advances on farm-stored grain in western Canada. Farm-operating expenses rose by \$104 million or 6 percent to \$1,803 million. However, taking into account depreciation, changes in year-end inventories of farm-held grain stocks, and other adjustments, the net income of farm operators amounted to \$1,391 million, which was \$416 million, or 43 percent, higher than in 1961.

As a result of larger gross receipts from marketings and larger government payments under the wheat and feed-grain programs, gross farm income in the United States in 1962 rose by \$731 million, to total \$37,485 million. Prices of cattle and calves, sheep and lambs, poultry meat and horticultural products were higher, and marketings of most of these commodities increased. For dairy products prices declined by about 3 percent, and total receipts by about 2 percent; marketings of food grains fell by about 13 percent, but because of more favorable

prices the decline in returns was only 5 percent, while returns from feed grains were slightly higher despite a 3 percent drop in the volume marketed. Government payments to farmers rose from \$1,484 million in 1961 to \$1,736 million in 1962. Farm production expenses rose by \$634 million, or 2 percent, to \$27,743 million. Net realized income of farmers was thus about \$12,900 million, or about \$100 million higher than in 1961. Because of the continued decline in the number of farms, net income per farm rose by about 4 percent to \$3,500, while on a per caput basis net farm income from both farm and nonfarm sources rose slightly and totaled \$2,440 in 1962.

A forecast for 1963 indicates that net farm income in the United States will probably be about the same as in 1962. This takes into account the recent price decline in cattle and hogs, lower payment rates on diverted feed-grain acreage but higher support payments for feed grains than in 1962, and a continued substantial rise in production costs.

According to preliminary estimates, the gross value of agricultural output in Australia rose by 7 percent in 1962/63 to £A 1,465 million. A favorable trend in prices began in the latter part of 1962, and provisional estimates indicate a rise of about 22 percent in the gross value of cereals output, of 16 percent for livestock slaughterings, and of more than one quarter for sugar cane; the gross value of wool and dairy products increased only slightly. Farm costs did not rise much and the net income from farming in 1962/63 is provisionally estimated to have risen by about 5 percent, or £A 33 million, to £A 505 million. In the previous year net farm income had declined by 2.5 percent, and 1962/63 marks the first substantial rise in many years.

Farm income in the Federal Republic of Germany partially recovered from the slump of the previous year, but according to preliminary estimates net receipts did not recoup the level of 1958/59-1960/61, and the income gap between farm and nonfarm occupations has widened considerably since that period. For this reason substantially larger funds were injected into the farm economy in the 1963 Green Plan budget. Gross receipts from sales of farm products, which during the 10-year period to 1960/61 had increased by an annual average of DM 900 million, increased by only DM 300 million in 1961/62, but in 1962/63 they rose by about DM 1,300 million, and sales amounted to a total of DM 21,900 million. Operating expenses and capital replacements were again higher in 1962/63, and net returns

from farming for personal cash expenses, payment of interest and taxes, investment and reserves amounted to DM 6,800 million, compared to DM 5,900 million in 1961/62 and around DM 7,000 million in each of the three previous years. Income per farm has improved, however, owing to the decline in the number of farms, and the per caput income in farming has also increased gradually, except for the crop failures of 1961/62. From 1949 to 1961 the number of farm units fell by 364,000 to 1.56 million, with the greatest decline in small farms. During the same period the farm labor force fell from 3.9 million to 2.4 million, and as a percentage of the total labor force from 20 percent to 10 percent. Nevertheless, as noted above, the income disparity with nonfarm occupations has widened, as wages in industry have continued to rise.

The gross national product in farming in France was forecast for 1962 at nearly fr 47,500 million at 1961 prices, or about 5.5 percent more than in 1961. In 1961, the latest year for which full data are available, gross receipts increased by 6 percent, while farm costs rose by over 7 percent. Net returns from farming came to fr 26,400 million, or almost 6 percent above those of 1960. A survey of income per head of population in various occupation groups indicated that in the period 1956-61 farm owners had increased their income by nearly 55 percent and farm workers by 48 percent, compared with 56 percent for salary and wage earners. Allowing for

the 33 percent rise in consumer prices during this period, the real increase would be 16 percent for farm owners and 11 percent for agricultural labor, compared with 17 percent for wage and salary earners. Per caput income in farming in 1961 was estimated at fr 3,820 for farm owners and fr 2,540 for farm workers, compared with fr 4,690 for wage and salary earners (excluding managerial and professional salary earners).

Although gross returns from the sale of farm products, production grants, and other farm receipts in the United Kingdom in 1962/63 were estimated to be nearly 2 percent higher than the year before, farm expenses had increased by nearly 4 percent, and net income from farming was forecast at £408 million, or 4 percent, less than in 1961/62. If adjusted to normal weather conditions, the decline would be of the order of 2 percent. Sales of farm products reached £1,632 million, compared with £1,606 million in the previous year. Production grants, sundry receipts, and other farm credits amounted to an estimated £126.5 million, against £120.5 million in 1961/62. Gross income from farming totalled £1,792.5 million, a rise of £29.5 million over the previous year. The cost of goods and services used in agriculture, however, continued to rise, especially the cost of labor and rents, though there were substantial reductions in fertilizer costs and interests charges, and total production expenses increased by £45 million to £1,384.5 million.

### Agricultural credit

Especially in the less developed countries, where the need is greatest, the supply of agricultural credit is still far from sufficient. Loans from private sources, which still represent much the larger part of the total farm credit available, are both costly and ill-adapted to meet the needs of the cultivators. The credit granted rarely produces an increase in productive power and hence in income, since loans are generally on a short-term basis and go mainly toward the payment of living expenses. Credit available from official institutions, although at reasonable rates of interest, is still very inadequate in relation to needs, often hedged round with regulations that limit its usefulness to farmers, and with a tendency in some countries to go primarily to the larger and more influential farmers.

In the developed countries the problems of agricul-

tural credit are less acute. Specialized institutions for agricultural credit are well organized and the supply of loan capital is generally adequate, although specific needs often remain unfulfilled, such as the credit needs of new farmers, of those working under particularly bad natural conditions, and of tenants and very small owner-operators.

Although comparatively few data are available, all of the evidence seems to indicate that a substantial portion of credit needs is still supplied by such noninstitutional sources as moneylenders, retailers of farm production items, agricultural produce brokers, and friends and relatives. The burden of such debt is particularly heavy in the less developed countries, where the cultivators' cash needs are few but can only be met through high-interest loans which generally involve the pledging of the entire crop to the lender

at unfavorable terms well before harvest time. In India, for example, in 6 out of 12 districts sampled in 1959-60, the proportion of loans financed by moneylenders exceeded 70 percent, and in 5 of them almost 45 percent of the loans carried interest at rates exceeding 18 percent per annum.<sup>11</sup> In the developed countries, on the other hand, the existence of noninstitutional credit is due less to the lack of proper institutions than to the competitive terms offered by produce brokers, suppliers of production requisites, or friends and relatives looking for safe investments. In Denmark and Switzerland, such noninstitutional credit constituted less than 15 percent of the total in 1960, while in Austria it was over 40 percent, and in the United States slightly more than one third.

Data on institutional credit, which have been collected by means of the biennial FAO questionnaire on agricultural credit, are now available for the period 1951-61 and are presented in Annex Table 17. Because of the absence of information on noninstitutional credit they do not, of course, indicate the total amounts of credit available. They are of particular interest for the less developed countries, however, where increases in institutional agricultural credit are so necessary. The data are of less significance in the total credit picture of the developed countries, since in these countries loans from noninstitutional sources are in most instances not very much different from those granted by financial institutions.

The table shows, where possible, data for both loans advanced and loans outstanding. Trends in agricultural credit outstanding tend to underestimate the total amount of agricultural credit made available, to the extent that seasonal loans, granted and repaid during a single year, are important. Figures of loans advanced, on the other hand, give equal weight to both seasonal and long-term loans. Bearing in mind these limitations, however, data on loans outstanding can serve as a useful indicator for the developed countries, where long-term credit predominates, and on loans granted for the less developed countries, where the great majority of loans are on a short-term basis. It should also be borne in mind that the data in the table are in current prices.

The table shows a strikingly rapid growth of credit in the developed countries. In the Federal Republic of Germany, where the increase has been most rapid, total loans outstanding in 1961 were thirteen times the 1951 level. The increasing need for cash for

the purchase of machinery and other capital investment has been reflected in a rapid expansion of long-term credit, particularly that granted by mortgage banks, and such credit now accounts for over 82 percent of total loans outstanding in that country as compared with 66 percent in 1952. Similar long-term cash needs in Italy caused the debt incurred to finance capital projects (excluding purchases of farm machinery) to rise from 28 percent to 55 percent of the total in the same period.

In Japan, on the other hand, the different agricultural structure has generated comparatively little expansion in the need for long-term credit. Thus short-term loans still account for half of the total, only a fractionally smaller proportion than in 1951. More than 66 percent of this financing is handled by co-operatives, which are the most important single source of credit. Commercial banks grant almost a quarter of the remainder, demonstrating the extent to which commercial institutions can participate even where small holdings and nonmechanized methods of cultivation prevail, provided the borrower's capacity for repayment is assured through such measures as price stabilization and crop and livestock insurance. Long-term credit is granted primarily by government lending agencies, which account for almost half of the total outstanding. During the period under review, these three major sources of credit in Japan have all contributed more or less equally to the notable expansion which has taken place.

The total amount of loans advanced in most of the developing countries has also increased during this period, although in general the growth neither began as early nor was as steady as in the more developed countries. Series on loans advanced are likely to be more unstable than those on loans outstanding. Yet the fluctuations have been so large as to suggest that agricultural credit supplies may actually be less stable in the less developed countries, and this in fact tends to be confirmed by the available data on loans outstanding in these countries.

In the less developed countries for which data are available on the breakdown between short-term and long-term credit, there is little evidence of a shift to longer-term financing similar to that in the more developed countries. To a great extent the agricultural producers in these countries are not yet ready to engage in longer-term investment financed on credit. Production credit of a short and medium-term nature to cover purchase of fertilizer, seed, agricultural implements and the like is still the most useful. Yet the extension of land reform programs,

<sup>11</sup> Reserve Bank of India. *Rural Credit Follow-up Survey, 1959-60*. Bombay, 1962.

in particular, necessitates increasing expenditure on land improvement and production requisites for which the required long-term financing is generally not yet obtainable.

In almost all of the less developed countries the government, through central banks, development banks, and a wide variety of government lending agencies, or indirectly through the encouragement, subsidizing, and financing of credit co-operatives, is the main stimulus behind the expansion of institutional agricultural credit. The Dominican Republic is one of the few countries where the proportion of agricultural credit supplied by private funds has increased; commercial banks provided over 35 percent of the total in 1959, the last year reported, compared with 5 percent in 1953. In the Philippines, although commercial banks account for over 80 percent of total agricultural credit outstanding, more than half of this comes from the government-financed and controlled Philippines National Bank.

In Cambodia, India, and the United Arab Republic, for example, government sponsored co-operatives provide the bulk of the institutional credit, and are responsible for the significant expansion which has taken place in the last few years. In India the agricultural credit granted by co-operatives in 1959 was five times larger than in 1951, compared with a fourfold expansion in total agricultural credit. In the United Arab Republic the capital comes from the government-financed Agricultural Credit and Co-operative Bank, which in 1961 channeled more than 96 percent of the total through co-operatives, compared with 40 percent in 1957; in this way funds are increasingly going to small and medium-sized farms, and since 1961 the loans have been extended free of interest.

Some details of developments concerning agricultural credit schemes in 1962/63 are included in the discussion of agricultural policies and development plans later in this chapter.

### Consumer prices

Of the 89 countries for which indices of retail food prices and of the cost of living are available, it appears that both indices went up in all but 24 countries in 1962. The increases in the indices were of the order of 1 to 2 percent in 14 countries (including some of the less developed countries of Africa and Asia), 3 to 5 percent in 26 countries (several in western Europe and a number in Africa, Latin America, and Asia), and 6 to 10 percent in 19 countries (including most of northwestern Europe and several African and Asian countries). In 7 countries the rise was over 10 percent, reaching nearly 30 percent in Argentina, 40 percent in Laos, nearly 60 percent in Brazil, and more than 100 percent in Indonesia.

Of the 24 countries which did not show a rise in both indices in 1962, they remained the same or both declined in 10 countries, all of them countries in Asia, Africa, and Latin America where food supplies were relatively plentiful and where the pace of economic development has been fairly slow. Generally where both indices moved downward the decline was relatively small, but in the Ivory Coast food prices declined by 7 percent and in Uganda by 20 percent. In 9 countries the cost of living went up while food prices remained the same or declined, indicating the general pressure on prices of nonfood consumer goods of increasing urban employment.

Taking the five-year period 1958-62, the rise in the cost of living has been fairly moderate in about half of the 89 countries, averaging one to two percent per year, and totaling no more than 10 percent over the whole period (Table II-25). Somewhat faster increases of 4-5 percent per year were recorded in 24 countries, and in all the remaining countries except three, the cost of living rose rapidly as a result of inflationary pressures. In only three countries (El Salvador, Nicaragua, and Uganda) was there a decline in the cost of living between 1958 and 1962.

The movement in the food price index was for the most part rather similar, though in seven countries where the cost of living rose over the five-year period food prices declined. The group of 45 countries where the cost of living did not rise more than 10 percent over the five-year period includes most of the main exporters of agricultural products, and in nearly all of these countries food prices rose more slowly than the over-all cost of living, except in the Netherlands and Burma, where food prices rose somewhat more rapidly. Food prices in most of the European, Latin American, and African countries in this group rose at about the same rate or somewhat more slowly than the cost of living. About half of the countries where food prices rose more rapidly than the cost of living are in Asia and

TABLE II-25. - RELATION BETWEEN CHANGES IN THE INDICES OF THE COST OF LIVING AND OF RETAIL FOOD PRICES IN 89 COUNTRIES, 1958-62

Cost-of-living index 1962 (1958 = 100)	Number of countries				
	Total	Food prices rose faster than over-all cost of living	Food prices and cost of living rose at about the same rate	Food prices rose more slowly than over-all cost of living	Food prices declined
100 and under..	3	—	—	—	3
101 - 110.....	45	14	8	16	7
111 - 120.....	24	7	6	11	—
121 - 150.....	13	7	—	6	—
151 - 200.....	1	1	—	—	—
Over 200 .....	3	2	1	—	—
TOTAL ....	89	31	15	33	10

the Far East, where food shortages have persisted, though government policies have helped to bring about a better supply and distribution of foodstuffs, and the rise in food prices over the last five years has not been more than 4 percent greater than the rise in the cost of living.

In the group of countries where the cost of living rose between 11 and 20 percent since 1958, more than one third were in Europe, including two agricultural exporters, namely Denmark and France; in Denmark food prices rose faster than the cost of living. In this group of countries wage increases, in some cases tied to the rise in the cost of living, have been frequent, and the increase in prices clearly reflects the rising demand for consumer goods. In the northern European countries and in Austria, where the pressure on prices has been greatest, various anti-inflationary measures have been taken to curb the disproportion between production and consumption. In Japan, an importing country and the only other developed country in the group, food prices rose somewhat more than the over-all cost of living. Where the cost of living rose by more than 20 percent since 1958, inflationary pressures have persisted; in a number of these countries a potent factor has been the lag in agricultural production, and food prices have moved ahead more rapidly than the cost of living.

### Agricultural policies and development plans

While the past year has seen, in comparison with other recent years, rather few major changes in agricultural policies, it has been characterized by particularly intensive negotiations in the sphere of international trade. The forthcoming round of tariff negotiations in the General Agreement on Tariffs and Trade (GATT) and the preparations for the United Nations Conference on Trade and Development which is to begin in March 1964 were discussed in the part of this chapter dealing with trade in agricultural products.

Attention has also been focused on developments in the European Economic Community (EEC), and in particular on the negotiations concerning United Kingdom membership that were broken off in February 1963, the new Convention of Association, and the common agricultural policy. The new Convention of Association between the EEC and the 18 African Associated States was initiated, after prolonged negotiation, in December 1962. It provides for a considerably larger amount of aid than in the previous five-year period. The trade provisions are based on the reciprocal dismantling of trade barriers, with the Associated States permitted to adopt protective measures where necessary to safe-

guard their economic development. Coffee, cocoa, tea, and certain other tropical crops from the Associated States have free entry into the EEC, but because this has caused concern in other countries producing these crops, especially in Africa, the convention also provides for reductions in the common tariff of the Community on these items.

The common agricultural policy of the EEC went into force in 1962 for those products (grains, live and slaughtered pigs, poultry, eggs, wine, fruit, and vegetables) for which regulations had been agreed. For the remaining products progress has been much slower than scheduled, but in May 1963 it was agreed that regulations for beef and veal, dairy products, and rice should be finalized by the end of the year.

In other regions schemes of regional economic co-operation continue to make progress, though there has been no major new development during the past year. In Latin America the Central American Integration Scheme and the Latin American Free Trade Area have been further consolidated. The Conference of African Heads of State, held at Addis Ababa in May 1963, agreed to set up an Organization for African Unity. Negotiations are

under way concerning the arrangements for establishing an East African Federation, comprising Kenya, Tanganyika, and Uganda, and possibly other countries as well. The Association of Southeast Asia has agreed on a number of measures of economic and technical co-operation, and the federation of Malaysia is about to be established. While there have been no new developments concerning the proposed Arab common market, the proposed federal union of Iraq, Syria, and the United Arab Republic lays considerable emphasis on policies aiming at economic integration.

There have also been some examples of economic co-operation on a more limited scale. Australia and New Zealand have agreed to sell their major dairy products at the same prices on all markets outside the United Kingdom. Nigeria and Senegal have agreed on a common marketing policy for groundnuts, and Brazil, Cameroon, Ghana, Ivory Coast, and Nigeria have decided to take collective action in matters affecting the cocoa industry.

Progress has also been made with international agreements for certain commodities. A five-year International Coffee Agreement was concluded in August 1962, in place of the series of annual agreements under which the major exporters had previously sought to regulate the coffee market by means of export quotas. The new agreement brings together exporting and importing countries responsible for about 95 percent of the world coffee trade, and will also operate through export quotas. The new three-year International Wheat Agreement, which became effective on 1 August 1962, is on the same lines as the previous agreement but on this occasion includes the U.S.S.R. and covers about 80 percent of the world wheat trade. A second International Olive Oil Agreement was negotiated in April 1963, which it is hoped will go into force in October 1963 when the present agreement expires. The draft international agreement for cocoa is to be placed before a United Nations Negotiating Conference in September 1963. The International Sugar Agreement remains in existence, and will be extended for a further two years after its expiry at the end of 1963, although the quota provisions will for the time being remain inoperative.

Concerning domestic agricultural policies, in the United States the main preoccupation continues to be the achievement of a better balance between supplies and requirements of surplus commodities, while at the same time increasing farm incomes and rural welfare. While no spectacular success has yet been achieved, recent programs, particularly

those in respect of grains, have been more successful than those employed earlier and for the current period have been continued more or less unchanged. For wheat, however, following the producers' referendum of May 1963, no restrictions on acreage will be in effect and price supports will be drastically reduced for the 1964 crop, if no new legislation is enacted in the meantime.

As regards the utilization of the surplus stocks, the multilateral World Food Program, under the aegis of FAO and the United Nations, went into operation at the beginning of 1963. Aid has already been provided in a number of emergency situations, and projects have been initiated to assist development projects through the use of surplus foods. The program is supported by \$88 million in commodities and cash pledged by participating countries, and is to be carried out for an initial period of three years. Though small compared with the bilateral programs of surplus utilization, it is primarily experimental and it is hoped that it will have a valuable influence on the future orientation of these programs.

Outside the United States, the problem of surplus production has chiefly concerned the major coffee producers and some countries of western Europe, where dairy products in particular have tended to outrun demand. In western Europe, however, most of the changes in price supports during the last year have been upward rather than downward. The main agricultural policy measures in western European countries, both inside and outside the EEC, have been intended to promote improvements in the structure of the agricultural industry in order to increase the efficiency of production, especially through the development of an economic size of farm and assisting the movement of farm labor into other occupations. The latter has been aided by the booming economic situation that has prevailed in much of western Europe until recently.

Elsewhere, however, the main objective remains to increase production, especially of foodstuffs for local consumption. In eastern Europe and the U.S.S.R. the agricultural sector has lagged in recent years. Measures have been taken in the U.S.S.R. to reinforce the control of the state and party over agricultural production and to appeal to the conscience of the agricultural worker, as well as to increase the supply of the physical means of production.

In the less developed countries reliance on planning as a major tool in the struggle to emerge from poverty and underdevelopment is now nearly uni-

versal. The year under review saw the formulation or initiation of relatively few new development plans (most of the current round began in the two or three previous years) except in Latin America, where most countries are now formulating plans as a condition of aid under the Alliance for Progress. Outside Latin America, the implementation of new development plans has been begun in Ethiopia, Libya, Nepal, the Philippines, Sierra Leone, the Republic of Viet-Nam, and Turkey. In Mainland China 1963 is reported to be the first year of the third five-year plan. No details are yet available, though a long-term program for the mechanization of agriculture has been announced.

Interim plans have been begun in Gabon and Upper Volta. Such plans, designed to help lay the basis for future development during a sort of "pre-planning" phase, are quite frequent in African countries. In Upper Volta the interim plan has replaced the five-year plan that should have gone into operation in 1963 but was rejected largely, it appears, because its targets were thought to be set too high and the people were not consulted in its formulation. In Morocco the existing five-year plan is to be replaced by an interim plan, after which a series of three-year plans is to be prepared. In Burma a change of government was the chief reason for the abandonment of the previous plan; in Iran there have been substantial reductions in the plan as originally proposed, because of financial difficulties and inflation; revisions are also expected in the plans in Iraq and Syria. A number of countries have further strengthened the machinery for planning.

Some of the main features of the current development plans are shown in Table II-26. About 40 percent of the plans for which data are available in the table are comprehensive, in that they include estimates for the private as well as the public sector of the economy. Among the comprehensive plans, the expected share of private investment is comparatively large in most of the Latin American countries, but in most other countries the main reliance is on public investment.

Generally speaking, in a comprehensive plan covering the whole economy the agricultural sector is more likely to be accorded its proper place in relation to what it can contribute to and what it needs from the rest of the economy. It is seen from the table that the share of total planned public investment devoted to agriculture varies very considerably in the different countries, from about 5 percent to

about 50 percent, in fact, in the examples shown in the table, though most often it seems to be around 15-25 percent. Too much, however, should not be read into these comparisons. What is included under "agriculture" may differ appreciably from country to country. Moreover, the percentage in a particular country is very much influenced by whatever large-scale project, agricultural or nonagricultural, happens to be under way during the period in question.

The rates of growth anticipated in most of the plans are a good deal more than has actually been achieved in the recent past. Generally they somewhat exceed the 5 percent annual rate of growth called for under the United Nations Development Decade. In most cases agricultural production, which has to provide the bulk not only of the food supply for the rapidly growing and rapidly urbanizing population but also of foreign exchange earnings, is expected to grow almost as fast as the economy as a whole.

In line with the rapidly growing interest in economic planning in the less developed countries, institutes for economic development and planning have been set up, with financial assistance from the United Nations Special Fund, in Latin America and the Far East, while preparatory work is under way for a similar institute in Africa, and one is also being considered for the Near East countries. These institutes are to be devoted primarily to the training of planning technicians, but also to research and advisory work.

The better formulation of plans, however, is not in itself sufficient for the achievement of agricultural and economic development. As FAO has always sought to emphasize, careful attention to the detailed policies and measures required for the attainment of planned objectives and targets is particularly necessary in respect of the agricultural sector, where success depends on the reactions of millions of individual farmers. Information on the actual course of implementation of agricultural plans continues to be lacking in most cases. It is, however, encouraging to note that many new measures, especially in the institutional field, designed to remove obstacles to, and provide greater incentives for increased production, have been taken during the period under review.

Measures to improve land tenure conditions continue to receive special prominence. Agrarian reform is one of the main aims of the Alliance for Progress, and toward the end of 1962 new agrarian reform laws were passed in at least six countries of Latin America. In this connection, however, it is

TABLE II-26. - MAIN FEATURES OF CURRENT DEVELOPMENT PLANS IN LESS DEVELOPED COUNTRIES

	Scope	Duration	Currency	Total investment	Total public investment	Share of agriculture <sup>1</sup> in total public investment	Planned annual increase							
							GNP	Agricultural production						
..... Million .....														
..... Percent .....														
<b>LATIN AMERICA</b>														
Barbados .....	Public Sector	1960-65	£	...	11.1	...	...	...						
Bolivia .....	Comprehensive	1962-71	Bolivianos <sup>2</sup>	12,289,324	...	<sup>3</sup> 11	7	6.3						
Brazil .....	"	1963-65	Cruzeiros <sup>4</sup>	3,500,000	1,170,000	<sup>3</sup> 7	7	5.7						
British Guiana .....	Public Sector	1960-64	£	...	23.0	...	...	...						
Chile .....	Comprehensive	1961-70	Escudos <sup>5</sup>	10,149	5,074	6	5.5	5						
Colombia .....	"	1961-70	Pesos	72,500	25,900	<sup>3</sup> 12	5.6	4.3						
Ecuador .....	"	1960-62 <sup>6</sup>	Sucre <sup>7</sup>	7,075	2,591	...	4.8	...						
Guatemala .....	Public Sector	1960-64	U.S.\$	...	171	17	...	...						
Honduras .....	"	1962-65	Lampiras	...	280	19	<sup>8</sup> 3	5.3						
Mexico .....	Comprehensive	1962-64	Pesos	80,000	40,000	...	5.4	5.5						
Panama .....	Public Sector	1962-66	Balboas	...	213	...	...	...						
Peru .....	Comprehensive	1962-71	Soles	184,586	99,676	...	5.9	<sup>9</sup> 7.7						
Venezuela .....	"	1963-66	Bolivares	28,041	9,433	...	8	8						
<b>FAR EAST</b>														
Cambodia .....	Public Sector	1960-64	Riels	...	8,000	12	<sup>10</sup> 3.1	...						
Ceylon .....	Comprehensive	1961/62-1963/64	C Rs	2,270,204	...	<sup>3</sup> 25	...	...						
China (Taiwan) .....	"	1961-64	NT \$	50,190	34,129	<sup>3</sup> 17	...	4.4						
Federation of Malaya .....	"	1961-65	Mal \$	5,050	2,150	25	<sup>10</sup> 4.1	2.8						
India .....	"	1961/62-1965/66	Rs	104,000	63,000	20	5.4	5.4						
Indonesia .....	Public Sector	1961-68	Rupiahs	...	240,000	11	<sup>10</sup> 1.4	...						
Japan .....	Comprehensive	1961/62-1969/70	Yen	20,930	16,130	16	7.8	2.9						
Korea, North .....	Centrally planned economy	1961-67	Won <sup>8</sup>	...	7,000	...	15.2	13.2						
Korea, Rep. of .....	Comprehensive	1962-66	Hwan	3,214,500	1,118,646	<sup>3</sup> 17	<sup>10</sup> 4.9	5.2						
Laos .....	Public Sector	1959/60-1963/64	Kip	...	2,578	11	...	...						
Nepal .....	"	1962/63-1964/65	N Rs	...	670	18	...	...						
North Borneo .....	"	1959-64	Mal \$	...	109	4	...	...						
Pakistan .....	Comprehensive	1960/61-1964/65	Pak Rs	23,300	14,620	24	<sup>10</sup> 4.4	2.7						
Philippines .....	"	1962/63-1966/67	Pesos	12,056	2,809	<sup>3</sup> 7	<sup>10</sup> 6.0	...						
Sarawak .....	Public Sector	1959-63	Mal \$	...	154	...	...	...						
Thailand .....	"	1961/62-1966/67	Bahts	...	13,888	29	<sup>10</sup> 4-5	3						
Viet-Nam, North .....	Centrally planned economy	1961-65	Dong	...	...	...	5	...						
Viet-Nam, Rep. of .....	Comprehensive	1962-66	V Piastres	...	42,000	...	5	9						
<b>NEAR EAST</b>														
Afghanistan .....	Public Sector	1962/63-1966/67	Afghanis	...	44,500 <sup>11</sup>	25	7	...						
Cyprus .....	"	1961-65	Cyprus £	...	62	34	6.7	...						
Iran .....	Comprehensive	1962/63-1967/68 <sup>12</sup>	Rials	250,000	140,000	22	6.2	4.1						
Iraq .....	Public Sector	1961/62-1965/66	I Dinars	...	556 <sup>11</sup>	20	7	...						
Jordan .....	Comprehensive	1962/63-1966/67	J Dinars	127	67	43	10.7	9.7						
Libya .....	Public Sector	1963/64-1967/68	£L	...	169	...	...	...						
Sudan .....	Comprehensive	1961/62-1970/71	£	565	337	27	<sup>13</sup> 4.3	4						
Syria .....	"	1960/61-1964/65	£	2,700	1,700	52	<sup>14</sup> 7	5.8						
Turkey .....	"	1963-67	T Lire	59,600	35,600	18	7	4.1						
United Arab Republic .....	"	1960/61-1964/65	£E	...	1,577	25	<sup>14</sup> 7	5.1						
<b>AFRICA</b>														
Basutoland .....	Public Sector	1960-63	£	...	1.6	...	...	...						
Bechuanaland .....	"	1960-63	£	...	1.8	...	...	...						
Cameroon .....	Comprehensive	1961-65	CFA fr	53,182	...	<sup>3</sup> 22	<sup>10</sup> 4.6	...						
Congo (Brazzaville) .....	Public Sector	1961-63	"	...	16,630	14	...	...						
Dahomey .....	"	1962-65	"	...	35,505	24	6.5	...						
Ethiopia .....	Comprehensive	1962/63-1966/67	Eth \$	2,656	...	...	4	...						
Gabon .....	Public Sector	1963-65 <sup>13</sup>	CFA fr	...	4,500	...	...	...						
Gambia .....	"	1962-64	£	...	2.7	...	...	...						
Guinea .....	"	1960-63	G fr	...	38,912	26	...	4						
Ivory Coast .....	"	1962-63 <sup>13</sup>	CFA fr	...	43,170	15	<sup>10</sup> 7	...						
Kenya .....	"	1960-63	£	...	27.4	39	5	...						

TABLE II-26. - MAIN FEATURES OF CURRENT DEVELOPMENT PLANS IN LESS DEVELOPED COUNTRIES (concluded)

	Scope	Duration	Currency	Total investment	Total public investment	Share of agriculture <sup>1</sup> in total public investment	Planned annual increase	
							GNP	Agricultural production
..... Million .....								
Mali .....	Comprehensive	1961-65	CFA fr	...	64,000	20	13 7	9
Mauritius .....	Public Sector	1962-65	M Rs	...	212	24	...	...
Morocco .....	Comprehensive	1960-64	Dirhams	6,600	2,580	32	6	5.5
Niger .....	"	1961-63 <sup>15</sup>	CFA fr	22,614	15,811	23	4	...
Nigeria								
Federal Government.....	Public Sector	1962-68	£ Nig	...	412.5	14 5	4	...
Eastern Region .....	"	1962-68	"	...	75.2	40	...	17 3
Northern Region .....	"	1962-68	"	...	98.8	22	...	...
Western Region .....	"	1962-68	"	...	90.3	20	4.5-5.0	...
Portuguese territories .....	"	1959-64	Contos	...	8,181	33	...	...
Rhodesia and Nyasaland								
Federal Government.....	"	1962/63-1964/65	£	...	55.7	13	4.5	..
Northern Rhodesia .....	"	1961/62-1964/65	"	...	30	21	...	...
Nyasaland .....	"	1962-65	"	...	12.9	22	14 6	...
Senegal.....	Comprehensive	1961-64	CFA fr	92,067	50,561	19	8	5
Sierra Leone.....	"	1962/63-1971/72	£	150.0	125.0	18	...	...
Swaziland.....	Public Sector	1960-63	"	...	5.4	...	...	...
Tanganyika .....	"	1961/62-1963/64	"	...	23.9	29	...	...
Tunisia .....	Comprehensive	1962-64	Dinars	270	140	16	6	5.5
Uganda.....	Public Sector	1961/62-1965/66	£	...	54.2	19 14	5	...
Zanzibar .....	"	1961-64	"	...	1.2	...	...	...
OCEANIA								
Fiji .....	"	1960/61-1964/65	£ F	...	12.2	19	...	...

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.

<sup>1</sup> Including animal production, fisheries, forestry, irrigation, land reclamation, community development, agricultural extension, etc. -

<sup>2</sup> Of 1958. - <sup>3</sup> Percentage of total investment, public and private. - <sup>4</sup> Of 1962. - <sup>5</sup> Of 1960. - <sup>6</sup> Implementation delayed to 1962-63. - <sup>7</sup> Of 1959. - <sup>8</sup> Per caput. - <sup>9</sup> 7.7 percent for domestic consumption, 6.6 percent for exports. - <sup>10</sup> At constant prices. - <sup>11</sup> Including some private investment. - <sup>12</sup> 5½ years. - <sup>13</sup> Gross domestic product. - <sup>14</sup> Net domestic product. - <sup>15</sup> Interim plan. - <sup>16</sup> Agriculture is primarily the responsibility of the Regional Governments. - <sup>17</sup> Food production. - <sup>18</sup> First five-year period only. - <sup>19</sup> Excluding investment by Uganda Development Corporation.

worth noting that in most parts of the world there has been an exceedingly slow realization of land tenure reforms, even where sweeping legislation has been adopted. Increasing attention is being paid to the need to increase agricultural credit facilities, particularly in some countries of the Far East. Agricultural price support policies are generally difficult to administer in less developed countries, and are costly unless carefully tailored to the circumstances of these countries, with the emphasis on limiting price fluctuations rather than raising the general price level. There is evidence, however, that such systems are increasingly being adopted in the less developed countries. Many new agricultural marketing organizations have also been set up, especially in African countries, in some cases covering foodstuffs for domestic consumption as well as the export crops to which organized marketing facilities have often been mainly confined in the past.

The above are some of the main trends in agricultural policies and development plans during 1962/63. They are discussed in more detail below, region by region. Recent developments in fishery and forestry policies are also briefly described.

#### NORTH AMERICA

##### United States

The Food and Agriculture Act of 1962 passed by the United States Congress in September is intended to give new force to the administration's farm policy and to strengthen the role of government in improving rural welfare, increasing farm income, and bringing about a better balance between production, supplies, and requirements of surplus agricultural commodities. The Act amends and extends programs already under way to take

excess land out of production, to promote conservation and new land uses, to facilitate credits to farmers for such purposes, and to control the production and promote the distribution of surplus agricultural commodities, both at home and abroad. Under the programs of the last two years there has been a significant drop in harvested acreage (7 percent between 1960 and 1962), mainly because of the reduced acreage allotted to price-supported commodities and voluntary acreage diversion.

Title I of the 1962 Act gives the Secretary of Agriculture new authority to enter into agreements for up to ten years with farm owners to take cropland out of production for the conservation and development of soil, water, forest, wildlife, and recreation resources. A sum of \$10 million a year is to be appropriated for this purpose. Conservation reserve contracts covering some 1.3 million acres that would have expired at the end of 1962 can be extended for another year, for which a sum of \$15 million has been authorized, and the opportunity given to farm owners to put this land under new land-use adjustment programs. Title IV supplements these provisions by authorizing the granting of credit at favorable interest and repayment rates for recreational and other new income-producing developments, and more than doubles the fund for real estate loans previously authorized.

Title II of the Act is designed to increase opportunities for sales of agricultural commodities abroad and to expand distribution through school lunch programs. Under the amended Agricultural Trade Development and Assistance Act of 1954 (Public Law 480) the Secretary of Agriculture may now enter into long-term dollar credit programs with private firms (in addition to government-to-government agreements), and with foreign banks and financial institutions acting on behalf of foreign governments. More flexible terms of repayment are also permitted. The distribution of surplus food through school lunch programs can now be expanded under an amendment to Public Law 480 authorizing donations of such commodities to nonprofit school lunch programs outside the United States.

The changes in feed-grain and wheat programs for 1963, embodied in Title III of the Food and Agriculture Act, provide for voluntary diversion of land with payments up to 50 percent of the support rate on normal production on the diverted land. A new feature, designed to promote on-farm use of cereals and reduce the accumulation of national stocks, is

additional payments in kind for participants in acreage diversion. For feed grains (maize, barley, and sorghum) the 1963 program is similar to those of the previous two years. Participation is voluntary, but is conditional on the diversion of at least 20 percent of the grower's grain acreage; the maximum diversion has been fixed at 40 percent. Additional payments in kind for participants amount to the equivalent of 18 cents per bushel on maize in addition to the price support loan. Rye and oats are not covered by payments in kind, and no acreage diversion is required for eligibility for price support. The Feed Grain Act of 1963, passed by Congress in May, extends the provisions concerning diversion payments and price supports to 1964.

Amendments to the permanent wheat program were passed after growers had already approved marketing quotas based on the 55-million acre national allotment, and thus price support eligibility for 1963 was not made contingent on diversion. However, payments were provided to divert to other uses from 20 percent up to a maximum of 50 percent of the acreage allotted. An additional payment in kind equivalent to 18 cents per bushel of normal production on the acreage of wheat is provided to producers who divert at least 20 percent of their acreage allotment from wheat.

The Food and Agriculture Act of 1962 also provided for a wheat program for 1964 and subsequent crops, subject to approval by at least two thirds of the producers, but this was rejected in the National Wheat Referendum on 21 May 1963. The program would have eliminated the 55-million acre (22 million hectares) national allotment and authorized the Secretary of Agriculture to determine acreage allotment for each year, based on estimates of national consumption, export and stock requirements, including a reduction in stocks. A two-price system was proposed, which would have established a support price between 65 and 90 percent of parity on wheat for domestic consumption and a share of exports, while all additional wheat produced would have received a lower price in line with world prices and the feed value of wheat.

The rejection of this proposed wheat program in the referendum, and the consequent absence of acreage restrictions is likely to bring a sharp increase in wheat production in 1964 and a drop in domestic prices to the level of support established for feed grains. Wheat acreage, which under the proposed program would have been cut back to about 45 million acres (18 million hectares), is now expected to go up to 65

million acres (26 million hectares), and production is likely to reach about 41 million tons instead of about 30 million tons. Price support for wheat in 1964 will fall to 50 percent of parity for growers planting within their allotment. Since the referendum, the Administration has been studying various courses of action under present law, mainly under the Feed Grain Act, to help strengthen the income of wheat farmers while further reducing grain surpluses and the costs they place on the taxpayer.

Concerning crops other than grains, in his Farm Message to Congress in January 1963 the President referred to the necessity for new legislation for cotton and dairy products. Although no change was envisaged in the support price for cotton, it was proposed that subsidies should be provided to reduce the price to domestic mills to the level at which foreign mills are able to purchase subsidized exported cotton, taking into account transportation and other costs. It was also proposed that growers be permitted to increase their area by 20 percent over the acreage allotment, in order to grow cotton for export at the world price. For dairy products it was proposed that the continued accumulation of surplus stocks could be halted by a voluntary program, whereby co-operating dairies which reduced their marketings would receive, through market prices and payments, a substantially greater return than non-co-operators. At the same time domestic butter prices could be reduced to stimulate consumption.

#### *Canada*

No basic changes in farm income support and price stabilization policies were introduced in Canada in 1962/63. Under the Agricultural Stabilization Act of 1959 the support price for wheat grown in Ontario remained unchanged and for Ontario oats and barley was reduced by 2 percent. For the bulk of Canadian wheat the initial price paid by the Wheat Board was increased by 10 cents to \$1.50 a bushel on account of improved market conditions; initial prices for oats and barley remained unchanged.

Support prices for cattle were reduced slightly, while those for pigs were raised by about 5 percent to take care of the increased cost of feed due to the drought in the previous year. The price support for lamb was changed to a deficiency payment, yielding an increase of approximately 5 percent in prices received by farmers.

The 12-cent reduction of the wholesale price for butter introduced in May 1962 led to a significant increase in per caput consumption and a simultaneous reduction in the rate of stock accumulation. Under the 1963/64 dairy program introduced in May 1963 the Agricultural Stabilization Board will buy and sell butter at 52 cents per pound. All producers, other than those with a fluid milk contract, who sell milk for the manufacture of creamery butter will receive a compensatory payment of 14½ cents per pound of butterfat. This will maintain their returns at 64 cents per pound of butter. The price of skimmed milk powder will be stabilized through government purchase. The previous supplementary payment of 25 cents for milk for manufacturing is discontinued, except for cheese milk, for which it has been increased to 30 cents per cwt. The cheese support price is maintained at last year's level.

The net cost of price support programs in 1961/62, at Can \$22 million (U.S. \$20 million), was the lowest for three years.

#### WESTERN EUROPE

In western Europe attention has centered on developments in the European Economic Community. For much of the period under review the outcome of the negotiations concerning United Kingdom membership remained in doubt, with consequent uncertainty not only for the United Kingdom's domestic agricultural industry but also for producers in Commonwealth countries. With the breakdown of these negotiations the question of the common agricultural policy has once again become the major issue.

At the same time, however, important developments are under way in the domestic agricultures of many European countries, members and non-members alike of the EEC. In addition to policies to maintain or increase producer prices, most governments are paying increasing attention to the promotion of structural improvements to increase the efficiency of production, in particular the development of a more economic size of farm and facilitating the movement of labor into nonagricultural occupations. The first results of the agricultural censuses held around 1960 indicate in fact that in some countries the decline in the farm labor force and in the number of farms has been greater than expected.

Disagreements on agricultural policies played a considerable role in the breakdown of the negotiations between the European Economic Community and the United Kingdom. Problems which remained unsolved included transitional regulations and prices for grain imports, as well as the position of New Zealand as a supplier of butter to the United Kingdom.

In the meantime, the first parts of the common agricultural policy of the present members have gone into operation, covering grains, live and slaughtered pigs, poultry, eggs, wine, fruit, and vegetables. The market regulations which came into force on 30 July 1962 have started to function, and most of the initial administrative difficulties of the complicated systems have been overcome. The technical bodies to administer the systems, including the consultative committees, have been set up. Further progress, however, has been slow, though in May 1963 it was agreed that the regulations affecting beef and veal, dairy products and rice should be finalized by the end of 1963 and brought into force in the first quarter of 1964.

Major attention has recently focused on the more general problem of the criteria to be used in selecting target prices. A regulation was submitted by the Commission in November 1962, and in February 1963 the European Parliament gave its opinion on the proposal. Three series of criteria would be taken into account, relating to farm income, to the orientation of production according to demand, and to general economic development. One of the main problems is the extent to which the requirements of international trade policy will be balanced against the income objective. The proposals also include provision for a yearly report on the situation of agriculture in the Community as a basis for the price decisions.

Concerning grain prices, the different price levels and ratios between the various types of grain are the major problem in the creation of a common market for grain. While a relatively high wheat price would almost certainly encourage production so far as to create a problem of surpluses, a lowering of the price would create serious income problems and political difficulties in the higher-price countries. Moreover, these countries contend that the maintenance of their present nominal prices would mean a sufficient decline in real prices over the transitional period for real prices to meet on a medium

level. For the price relationship between wheat and coarse grains, a ratio is sought which would encourage the production of coarse grains, for which demand has been growing continuously.

In March 1963 the Commission submitted proposals to the Council which would have changed the relationship between wheat and coarse grain prices as well as narrowing the range within which national prices would be set, basing them on common Community standards instead of differing national ones. Although these proposals were not adopted, a slight narrowing in the price range for coarse grains was agreed upon for 1963/64, with the result that Italian prices of barley will move up somewhat, while in the Federal Republic of Germany, as a result of the changes in quality standards, barley prices will be reduced. The question of a narrowing of the price relationship between wheat and coarse grains is likely to be discussed again in the near future, since it was decided to arrive at a decision regarding the harmonization of the different national threshold prices during the course of the 1963/64 crop year.

Concerning agricultural trade with state-trading countries, new arrangements relating to grain, pigmeat, poultry meat, and eggs came into force in February 1963 and will continue until the end of 1964. In principle the general import regulations for trade with nonmember states apply to this trade as well. The fixed quantities used so far are replaced by indicative amounts (*montant évaluatif*), not to exceed the average of imports in 1960 and 1961 from the country in question. If actual imports exceed the indicative amounts by 20 percent, and if the market in a member state is seriously upset or in danger of being upset, the Commission can, on its own initiative or on application by a member country, decide that further imports should be suspended.

The new Convention of Association between the Community and the Associated States is discussed in detail below in the section devoted to Africa.

Although the other main western European trade grouping, the European Free Trade Area (EFTA), does not cover agricultural products, its recent agreement on the principle of achieving free trade in industrial products by the end of 1966 was linked with freer access for Danish farm products to the United Kingdom market. The United Kingdom agreed to the suspension of the tariff on butter, the abolition of tariffs on several smaller items,

and further consultations on Danish bacon. These concessions will amount to a gain of £3.5 million per year for Denmark, which is EFTA's only major agricultural exporter.

#### *Price policies*

In spite of growing surpluses of some commodities, price policies in western European countries mostly aim at raising and stabilizing producer prices and incomes. In Finland a Marketing Fund for Agricultural Products, derived partly from import levies, was established in August 1962 to develop and promote the market so that target prices can be realized. Some target prices were raised at that time, though a limit has been placed on the quantities eligible for the target price. Norway increased support prices for bread grains and dairy products in line with the two-year agreement made in 1961 between the government and the agricultural organizations. In Portugal the price of hard wheat was raised to encourage production for domestic consumption. Sweden has adjusted import levies on farm products to make up for wage increases, and raised redemption prices of wheat by 13 percent and rye by 12 percent. Yugoslavia raised guaranteed prices and premiums so that the average farm price level in 1962 was 35 percent higher than in 1960.

Denmark has increased the equalization duty on imported feed grains to help growers of feed grain and to reduce the production of bread grain and pigmeat; at the same time a further step was taken in dissociating domestic prices and world market prices by introducing import levies on pigmeat, beef, veal, poultry, and eggs, with the aim of raising gross farm income by 4 percent above the previous year. Switzerland has raised the price of wheat, sugar beet, rapeseed, cattle, and milk, but at the same time took steps to increase the use of whole milk for feeding calves by introducing a levy on all feedstuffs competing with milk.

In spite of the oversupply in the milk market a number of countries have increased the milk price in order to contribute to farm income. In France the milk price was raised by 4 percent in March 1963, and one price is now to apply throughout the year, instead of different prices in summer and winter. In the Netherlands the system was changed from a guaranteed price for a specific quantity to a target price set in advance to cover the total milk production; the target price is below the guaranteed

price, but higher than the average price actually received last year for the whole output.

Reductions in guaranteed prices took place in very few cases. In Belgium prices for feed grains were lowered because price developments had considerably increased the costs of livestock production. In the United Kingdom the 1963 Price Review lowered guaranteed prices for wheat and barley, but increased them for milk and potatoes.

#### *Other support policies and subsidies*

Subsidies to support farm income directly or indirectly continue to play an important and sometimes increasing part. Existing subsidies were increased in a number of countries. In France the cost of supporting agricultural markets in 1962 was estimated at fr 1,930 million (\$400 million), compared with fr 1,796 million (\$365 million) in 1961, and the budget provides in addition for fr 450 million (\$90 million) to subsidize grain exports. Switzerland increased payments to mountain farmers producing wheat, and considerably expanded state aid for the marketing of livestock bred in mountain areas; agricultural subsidies in 1962 were slightly reduced to Sw fr 335 million (\$80 million), but they have been increased for 1963 to 392 million (\$90 million). In the United Kingdom the cost of supporting agriculture fell slightly to £321 million (\$900 million) for 1962/63, but is expected to go up to £364 million (\$1020 million) in 1963/64.

Several countries have introduced additional subsidies. Austria may spend sch 180 million (\$7 million) to decrease the costs of gasoline used in agriculture. In Belgium a premium of B fr 450 million (\$9 million) is to be distributed to all farms with more than one hectare of agricultural land, to help offset the high cost of feed grains. Greece will subsidize milk delivered to dairies. In Portugal subsidies totaling esc 160 million (\$5.6 million) were granted to wheat farmers in 1962, to offset losses in 1961 and previous years. Sweden, which has so far pursued a policy aiming almost exclusively at increasing the size of farms, has decided to distribute S kr 105 million (\$20 million) to small farms and to subsidize small milk producers. The government granted an additional S kr 400 million (\$77 million) early in 1963 to supplement commitments up to mid-1965.

On the other hand, with the financial load growing heavier and heavier, there have also been moves in

some countries to reduce or limit the growth of farm subsidies. In Denmark and the Netherlands the government has turned down requests for additional farm subsidies. In the Netherlands the government's contribution to the Agricultural Equalization Fund has been lowered by one third for 1963 in the expectation of much higher proceeds from levies on grain imports. Yugoslavia, while increasing prices, lowered and partly abolished the subsidies on industrial products used in agriculture, though subsidies on other inputs have continued to increase. In the Federal Republic of Germany it is planned to discontinue the fertilizer subsidies. The United Kingdom has again lowered the fertilizer subsidy, and the government is planning to bring the amount of Exchequer support under greater control. In May 1963 it was announced that the government will impose restrictions on imports of grains and meat, and will limit the quantities of domestic production eligible for deficiency payments; this represents a major new departure in United Kingdom agricultural policy.

#### *Agricultural structure*

Parallel with price and income supports and various kinds of protective measures, almost all countries continue their attempts to improve the basic organization and structure of agriculture. In France structural measures account for almost half the expenditure on agriculture under the fourth plan. In Belgium in the ordinary budget for 1963 expenses for structural improvements are more than double the amount spent in 1960.

Austria and the Federal Republic of Germany continue to work with Green Plans fixed for each year, but following a long-term aim of structural improvements and some kind of income parity. Austria spent sch 180 million (\$7 million) in 1961 in grants for farm improvement, and the industry has requested funds up to sch 700 million (\$27 million) for 1963; total credits under the Green Plan amounted to around sch 700 million (\$27 million) in 1961, and will be increased to over sch 850 million (\$33 million) in 1963. In Germany the Green Plan for 1963 will cost nearly DM 2,400 million (\$600 million), of which about DM 1,000 (\$250 million) will be for structural improvements; in 1962 total expenditures under the plan amounted to about DM 2,100 million (\$525 million).

In France the basic laws of 1960 have been built

up systematically, and farmers are given the possibility of combining land in *groupements agricoles fonciers* or proceeding to common exploitation (with limits as to the maximum number of members and the area covered). Additional efforts are also to be made to put unused land (estimated at 4 million hectares) into production. All unused land is to be registered and can be attributed to the state if the owner is unknown; if he is known he can be forced to lease it or it can be expropriated. This land can be used to set up new farms or to enlarge existing farms. The Sociétés d'aménagement foncier et d'établissement rural (SAFER) can buy land offered in the market; they now have a right of pre-emption under certain conditions and can contest exaggerated demands in court. In response to pressure from small operators limits have been put on the accumulation of land and on industrial production of pigs, poultry, and eggs. To speed up structural improvements, France established a Fund for Social Action in 1962, which can give additional old-age pensions to farmers on retirement, indemnification for equipment, loans to farmers moving out of overpopulated areas, grants for setting up new farms, credits for giving up nonviable farms, grants for retraining for other professions and for the training of sons taking over the farm, and aid for areas with unfavorable conditions.

In Ireland the government aims at farms of a size that will provide full-time employment for the occupier plus one adult male worker, and in its land distribution policy has adopted a standard of 16-18 hectares of good farm land as the minimum size of holdings.

In Italy a general bill has been approved for the reorganization and development of the agricultural sector; 5,000 million lire (\$8 million) have been budgeted for 1962/63, and the amount will gradually be increased to 60,000 million lire (\$100 million) by 1966/67; 32,000 million lire (\$50 million) will be spent within the next five years to purchase land, to indemnify expropriated owners, and to carry out investments of general interest. Loans running for 40 years at 1 percent interest are available for the purchase or extension of farms and the purchase of machinery, equipment, and livestock.

Luxembourg is preparing a ten-year plan for the improvement of agriculture. A new Development Fund in the Netherlands has received an initial capital of fl 50 million (\$15 million), half of which is intended for loans. Long-term financial assistance will be directed toward strengthening the

farming structure, through consolidation, the improvement of the equipment of viable holdings, and the retirement of marginal farms with poor economic prospects. In Sweden the government has granted a further S kr 80 million (\$15 million) for rationalization measures. A new Swiss law that came into force in November 1962 puts the emphasis on credit for the rationalization of holdings, for which Sw fr 40 million (\$10 million) have been budgeted for 1963.

New land tenure measures have been introduced in Belgium, Italy, and Portugal. In Belgium, where two thirds of the agricultural land is farmed by tenants, the tenants now have the right of pre-emption. In Italy, tenants, sharecroppers, and other persons cultivating land which is not their property have also received the right of pre-emption. Persons continuing as sharecroppers must receive wages of 53-60 percent of the wages paid to agricultural workers. In Portugal the nine-year agricultural plan begun in 1962 includes provisions for land reform as well as the improvement of farm structures. Several decrees were passed late in 1962 concerning land redistribution and the integration of scattered holdings; the government will also render technical and financial assistance for setting up and equipping commercial farms, for the purchase by tenants of farms they have cultivated, and for the distribution of uninhabited farms.

The improvement of marketing is receiving increased emphasis. In the United Kingdom grants have been available since 1962 for market research and development. In the Federal Republic of Germany an increase in the Green Plan funds for marketing is under discussion. Greece has considerably expanded plans for large-scale investments in the development of processing industries. In Italy an Institute for Market Research and Market Information has been set up by the Ministry of Agriculture and Forestry. France has taken additional steps in respect of regional producer groups. The first stage is the formulation of *groupements de producteurs*, covering one product in a specific region. If such a group fulfills certain conditions it becomes eligible for additional state aid, and at the same time liable to supervision. Several *groupements* can combine to form a *comité économique agricole*, which has a relatively free hand in drawing up rules and regulations. The committee can propose to the Ministry that these rules be made obligatory for all producers in the region; they can be put into effect if they are approved by two thirds

of the votes supplying 50 percent of the quantity marketed (or vice versa). If prices still threaten to collapse, and if the group enforces certain regulations of production, minimum prices can be fixed.

#### EASTERN EUROPE AND THE U.S.S.R.

Since 1961 a principal aim of policy in the U.S.S.R. has been to speed up agricultural development through structural reorganization. During the period under review further measures have been taken to strengthen the control of the state and the party over agricultural production. At the same time appeals have been made to the conscience and honor of the farm worker. The supply of means of production has been sharply increased, in particular irrigation and drainage facilities, machinery, and fertilizers, while the financial resources of the collective farms (*kolkhozes*) and state farms (*sovkhозes*) have been raised through higher prices for some commodities.

In a number of countries of eastern Europe there have been further increases in the size of the co-operative farms. Several countries have also increased prices and other benefits to co-operative members.

#### *Agricultural organization*

Further measures have been taken in the U.S.S.R. to reinforce the control of the state and the party over agricultural production. In March 1962 the agricultural inspectors appointed in 1961 had been replaced by "inspector-organizers," who were supervised by new agricultural boards set up to control and guide the activities of the kolkhozes and sovkhozes, which were thus brought under unified control. Since November 1962, in addition to the "inspector-organizers" of the boards, there has also been a second group of "inspector-organizers" responsible to the party. At the beginning of 1963 the central control of the state and the party was reorganized, with regional committees responsible for the supervision of the administration and of productive enterprises (kolkhozes and sovkhozes in the case of agriculture). These committees are assisted by groups of workers from the enterprises concerned.

The party apparatus is from now on to be divided into agricultural and industrial groups. In the rural areas the party offices have been moved to the same places as the agricultural boards, so that along-

side each board there is a party office, or *partkom*, consisting of about 20 officials, supervising the same group of farms as the board, with the difference, however, that the board is concerned mainly with the managers and technicians of the farms, and the *partkom* with the party members both on the farms and on the board.

In a number of countries of eastern Europe there have been further increases in the size of agricultural enterprises. The average size of collective farms has reached 1,400 hectares in Romania, though with considerable differences among regions. In Hungary state farms averaged 3,220 hectares and co-operative farms averaged about 4,000 hectares by the end of 1962. The increasing size of agricultural enterprises in Czechoslovakia is linked with greater specialization.

In Poland, where 87 percent of the agricultural land is owned by small farmers and most farms consist of small strips scattered around the village, new regulations have been announced to stop the growing subdivision. The division of small and medium-sized holdings is to be prohibited, and the right of inheritance will be recognized only for those for whom agriculture is the main source of livelihood. These measures should create better conditions for the mechanization of agriculture; the number of machines possessed by the agricultural circles are to be increased, and state machinery centers are likely to become of considerable importance. In Bulgaria, on the other hand, it was decided, as in the U.S.S.R. in 1958, to sell tractors and other agricultural machinery to the collective farms, and by the end of 1962 more than half of these had bought them from the machinery and tractor stations.

#### *Development plans*

The planning machinery has also been reorganized in the U.S.S.R. Henceforth the *Gosplan* will be responsible only for long-term planning, and the National Economic Council will be concerned with the annual plans. These two offices will co-ordinate the plans proposed at the level of the federated republics, where the powers of the planning organs have been increased. In addition, the Supreme Council of National Economy was established in March 1963, with wide powers including the control of *Gosplan* and the National Economic Council.

Annual plans for 1964-65, the two remaining years of the current U.S.S.R. seven-year plan for 1959-65, are being prepared. Studies are also under way for the formulation of a new five-year plan for 1966-70. The Czechoslovakian plan was suspended in 1963 and a new plan announced for 1964-67.

#### *Policies to increase agricultural productivity*

In order to accelerate the tempo of agricultural development in the U.S.S.R., considerable emphasis is being laid on the need for greater discipline and efficiency in agricultural work. Side by side with the measures for increased control and supervision noted above, appeals are being made to the conscience of the agricultural worker.

Attention has also been paid to the manpower problem. Additional urban workers have been promised to assist in the agricultural work in the spring, but a warning was given in July 1962 against too great recruitment from the towns, calling on farm enterprises to make better use of their own human and technical resources. An exception was made for remote, newly developing regions like Kazakhstan, where mechanics have been sent from other parts of the country and also 10,000 students to carry out rural construction work; subsequently in January 1963 it was decided to train on the spot the mechanics needed for the virgin lands.

State investment in agriculture is scheduled to be 18 percent higher in 1963 than in 1962, and appreciably larger than the previous target under the seven-year plan. The greatest increases in investment will be for irrigation and drainage, which will receive 32 percent more than in 1962. In 1963, 301,000 hectares will be irrigated and 692,000 hectares drained. The supply of agricultural machinery will also be sharply stepped up. The production of chemical fertilizers, which reached 17.3 million tons in 1962, is planned to rise to 20 million tons in 1963 and 35 million tons in 1965.

The financial resources of the agricultural enterprises have been augmented by increases in the prices paid by the state of 35 percent for cattle and 10 percent for butter. For cotton, prices for purchases of medium staple qualities from kolkhozes have been raised by 20 percent and from sovkhozes by 12 percent, while in irrigated and newly planted areas an additional premium of 20 percent will be paid for three years.

In Bulgaria further increases have been made in

procurement prices for animal products, and prices of fertilizers and taxes on collective farms have been significantly reduced. A minimum income has been guaranteed to the members of the co-operative farms per man-day worked and also per day of illness. In Czechoslovakia a new system of social security for collective farmers was introduced in 1962, giving particular privileges to those who fill their commitments regularly and who have no private land. In Poland pensions for members of co-operative farms were introduced in June 1962, differentiated according to the degree of socialization.

#### AUSTRALIA AND NEW ZEALAND

Interest in closer co-operation between Australia and New Zealand is growing. A proposal for the establishment of a customs union between the two countries has been accepted in principle, but further studies have to be made before its possible implementation. Agreement has been reached between Australian and New Zealand marketing boards to sell their major dairy products at the same prices on all markets outside the United Kingdom.

##### *Australia*

A special committee has been appointed to inquire into the Australian economy. Its wide terms of reference include physical resources, import substitution, export production and outlets, and the effects of tariffs and other forms of protection.

The further development of Australia's agricultural resources has received much attention during the past year. A new phase has started in the development of the "brigalow" lands of central Queensland, which have a large grazing potential, and the Federal Government is providing a special loan of £A 7.25 million (\$15 million) over the next five years. After a long period of experiment, work has commenced on the large Ord River irrigation scheme in northwest Australia. In order to make better use of the continent's limited water resources, a Water Resources Council has been formed.

The proposals of the Wool Marketing Committee of Enquiry have resulted in the setting up of the Australian Wool Conference and the Australian Wool Board. The Board brings under central control all activities of major importance to the industry,

and takes over the functions of the former Australian Wool Bureau, and of its Wool Research Committee and Wool Testing Authority.

A new five-year dairy stabilization scheme came into force on 1 July 1962, under which, while the industry assumes responsibility for local price policy, the government will continue to subsidize the industry to the amount of £A 13.5 million (\$30 million) per year, and to underwrite producers' returns. Provision has also been made for a subsidy of up to £A 350,000 (\$785,000) on the export of processed milk products for the year 1962/63.

The Australian Wheat Stabilization Scheme, which in 1962/63 is in its fifth and last year of operation, guarantees a minimum price for all domestically consumed wheat and for 100 million bushels (2.72 million tons) of exports. The Stabilization Fund is now exhausted, as guaranteed prices have since 1957/58 constantly been above the world price (about 17 percent above in 1962/63), and in 1962/63 the £A 7.7 million (\$17 million) expected to be needed for wheat subsidies will have to come from government revenue. A new scheme is under discussion, and the wheat growers are asking for an increase in the subsidized export quantity to 150 million bushels (4.08 million tons).

##### *New Zealand*

In spite of the failure of the United Kingdom to gain admission to the EEC, the need continues to be recognized for some adjustments in New Zealand's economy. The New Zealand Monetary and Economic Council suggested in its second report the setting up of an independent authority responsible for the formulation of a national plan. While the government has not accepted this proposal, it will in future prepare forecasts of its expenditure for two years ahead of the current year.

A commission has been appointed to inquire into the price of butterfat sold for consumption in New Zealand.

#### LATIN AMERICA

The Alliance for Progress has given rise to a wave of development planning in Latin America. It has also resulted in numerous agrarian reform laws. The implementation of the program, however, remains

slow. The institutional reforms that are called for concern complex social and administrative problems, and cannot be accomplished overnight. The rate of spending lags far behind the amounts committed in loans and grants, owing to delays in the processing of applications and because the detailed elaboration of sound projects takes a considerable time.

Good progress has continued in respect of the Central American Integration Scheme and the Latin American Free Trade Area.

#### *Development plans*

At the close of the second year since the Alliance for Progress was announced in spring 1961, almost every country in Latin America now has a central planning organization, and has prepared or is preparing a development plan. The committee of nine experts set up by the Organization of American States (OAS) to review national development plans has now approved three plans, those of Bolivia, Chile, and Colombia, as eligible for Alliance for Progress funds, and the plans of several other countries have been submitted to the committee. In the case of Chile's plan, the committee recommended an increase in the allocations to agriculture.

A substantial share of the Alliance for Progress aid is channeled through the Inter-American Development Bank (IADB), the resources of which are to be increased by \$200 million which the United States will contribute toward the Social Progress Trust Fund administered by the Bank, and by \$75 million for the Special Operations Fund. The Bank has also issued bonds on the Italian and United States capital markets, and increases of \$300 million in its own authorized capital and of \$1,000 million in its capital on call have been approved by the Assembly of Governors. Special emphasis is placed in IADB loans on raising productivity levels, particularly in agriculture. Of the total of \$626.1 million of loans committed as of the end of January 1963, \$137.7 million, or about 22 percent, have been allocated for agricultural purposes, of which \$23.9 million are for Mexico, mainly for irrigation projects; \$19.7 million for Chile, mainly for credit and settlement; \$15.1 million for Ecuador for credit, settlement, and imports of machinery and pedigree cattle; \$12.9 million for Brazil, mainly for credit and mechanization; \$12.7 million for Venezuela for land consolidation; \$12.1 million for Bolivia, mainly for resettlement; and \$10 million for Argentina,

mainly for settlement. Effective disbursements have lagged very far behind, however, and stood at only 12 percent of total commitments (6 percent in the case of commitments for agricultural projects).

Among the new plans, Bolivia's ten-year plan (1962-71) allocates to agriculture 11 percent of the total investment, public and private, of 12,300 million bolivianos of 1958 (\$1,295 million). The plan provides for a decrease in food imports from \$20 to \$2 million, and an increase in agricultural exports from \$4 to \$40 million by 1971. The Inter-American Development Bank has already approved loans of \$9.1 million to the Bolivian Development Corporation to finance the resettlement of some 8,000 low-income farmers from the overpopulated highlands in subtropical east-central areas. For many of the projects included in the plan, engineering and feasibility studies are still to be undertaken, and in view of the delay which will necessarily attach to most of the expenditure a \$3 million crash program of public works is provided for within the larger program.

In Brazil a three-year development plan (1963-65) was published at the end of 1962. The two principal objectives are to maintain the rate of growth of national income at about 7 percent per year (3.9 percent per caput) and to slow down inflation to a rate of about 10 percent a year by 1965. It calls for total investment of 3,500,000 million cruzeiros (\$8,900 million), of which two thirds will have to come from private sources. Agriculture has been allocated some 7 percent of the total investment, and the rate of growth of this sector is expected to reach 5.7 percent a year. Foreign contributions are expected to amount to \$1,500 million, but the bulk of the United States and other foreign assistance is conditional on the control of inflation and general economic stabilization.

A recommendation for the establishment of a Ministry of Planning and Development is under consideration; in the meantime, a minister without portfolio has been placed in charge of planning. He is to take responsibility for the National Planning Commission, and to co-ordinate the activities of the four regional development agencies (for the northeast, the southwest frontier, the Amazon region, and the São Francisco Valley). With regard to the northeast region, the United States has approved a loan to SUDENE, the development agency for northeast Brazil, of \$131 million against a Brazilian contribution of \$145 million. In the present, second phase of the general development plan for this region, the share of transport and energy has been reduced

from three quarters to less than half of total investments, while greater emphasis is put on directly productive investment and improving living conditions.

In Jamaica a new agricultural development program to promote the establishment of medium-sized farms, the growing of food for domestic consumption, and the development of dairy farming has been prepared. It is also planned to reorganize the Agricultural Development Corporation so that it can concentrate on the organization of large-scale production, the introduction of new crops, the distribution of dairy cattle to farmers, the provision of seeds, and pilot projects in processing, preserving, and canning methods.

Mexico's Immediate Action Plan (1962-64) provides for an annual increase of 5.4 percent in gross national product and total investments of 80,000 million pesos (\$6,400 million) for the three-year period, equally divided between the public and the private sectors. Public investment would be directed mainly to irrigation, electric power, mineral oil, and highways.

Peru's ten-year plan (1962-71) gives priority to the agricultural sector. The rate of growth envisaged for the gross domestic product is 5.9 percent a year. The annual increase in agricultural production for domestic consumption will have to rise from the 1.3 percent of the 1950s to 7.7 percent, and for export from 5.8 percent to 6.6 percent. In October 1962 the following planning machinery was established: (a) the National Council of Economic Development, an executive council presided over by the President of the Republic; (b) the National Planning Institute, as technical body; and (c) the Advisory Planning Council, which will be formed by representatives of business, labor, and professional organizations throughout the country.

Also in Peru a scheme for the irrigation of 137,000 hectares of coastal land north and south of Trujillo is ready for implementation, and discussions are being held to obtain foreign financing. Another scheme in the Tacna Province includes the reclamation of 25-35,000 hectares. Foreign financing is also expected after the preliminary studies are completed for the Tinajones Reservoir Project, which will involve the irrigation of 60,000 hectares of cultivated and semicultivated land and the reclamation of 15,000 hectares of desert land. The Pampas de Olmas project calls initially for the reclamation of 150,000 hectares.

Venezuela's four-year plan (1963-66) envisages an annual growth rate of 8 percent for the gross national product and 5 percent for per caput income, and

the creation of half a million new jobs. The plan will necessitate total investments of 28,041 million bolivares (\$8,370 million), of which two thirds would come from the private sector. The plan aims at diversifying the economy from overdependence on mineral oil. For the agricultural sector, the plan provides, under the agrarian reform program, for the settlement of 100,000 families, while the area under irrigation is to be expanded by 230,000 hectares. It is expected that maize and rice production will increase at a rate double that of the growth of population.

Development plans are in preparation in a number of other countries. In Argentina, the National Development Council and the Federal Investments Council are to establish a joint national and regional planning group to formulate and co-ordinate development plans. Investment projects to be presented to the Alliance for Progress include the expenditure of \$225 million on silos and terminal elevators for the bulk movement of crops, and \$25 million (to which the Argentine Government would add a contribution of \$10 million) for agricultural credit to promote and finance the use of fertilizers, improved seeds, insecticides, and equipment.

In Ecuador work is proceeding on the preparation of a ten-year perspective plan and a five-year medium-term plan. The Organization of American States (oas) has contracted with an Italian development agency for assistance in drawing up the broad lines of a long-term agricultural development program. The emergency public investment program now in operation involves a total expenditure of \$160 million. It includes road construction, to the amount of \$71 million, to open up new regions suitable for banana production, which it is expected may double within a decade from the completion of the roads. Irrigation receives \$22 million under the emergency program. The government plans also to increase wheat production through special finance for wheat sowing and the purchase of fertilizers.

Advisory groups, including representatives of oas, the Inter-American Development Bank and the United Nations Economic Commission for Latin America (ecla), are assisting Haiti and Uruguay in the preparation of development plans. A five-year plan involving public investment of WI \$303 million (U.S. \$177 million) is under consideration in Trinidad and Tobago. Priority is given to the reduction of unemployment and to the domestic production of foodstuffs at present imported. Agriculture would receive 8 percent of the total investment.

It is planned to double the irrigated area in the next three years in Cuba, where last year's drought emphasized the need for a large-scale program of irrigation to render agricultural production less dependent on climatic hazards.

#### *Land tenure*

Under the stimulus of the Alliance for Progress a large number of agrarian reform laws have been enacted in recent months. A law to regulate the expropriation of land "in the social interest" was promulgated in Brazil in December 1962. Expropriation can be authorized, among other reasons, for intensive cultivation in areas that are not being developed in accordance with official plans, for the establishment of agricultural settlements or co-operatives, for the protection of soil, water, and forest resources, and where land and water not already used for social purposes are likely to increase greatly in value as a result of the completion of public works. The Superintendencia da Política Agrária has been established for formulating and executing agrarian reform policy.

The Agrarian Reform Law passed in Chile in November 1962 established a council to plan and direct agrarian reform and agricultural development. Abandoned or badly managed farms, and up to half the area of land benefiting from public irrigation works, may be expropriated. Large estates which may be subject to expropriation are defined as those with a value of over 20 economic units. Compensation will be 20 percent in cash and the balance in annual payments over at least 10 years and at a rate of interest of 4 percent.

In Colombia the Instituto Colombiano de Reforma Agraria has proposed additional land taxes. It has also recommended the expropriation of 20,000 hectares in the region of Beltran. The Agrarian Reform Law passed in Guatemala in October 1962 established the Instituto Nacional de Transformación Agraria to take charge of agricultural planning and development. Progressive rates of taxation will be applied to uncultivated agricultural land and if, after two years, such land is still unused, the Instituto may expropriate it subject to the payment of a fair price.

In Honduras the Agrarian Reform Law became effective in November 1962. A National Agrarian Institute will be the main agency in charge of agrarian reform. Under the new law, privately owned rural

lands may be expropriated if they are not cultivated or are underutilized. The law also established a progressive tax on unused land to become effective after two years; the landowner may avoid the tax by putting the land to use, selling it, or turning it over to the Agrarian Reform Institute in return for government bonds.

In Mexico 3.37 million hectares were redistributed in the year ending September 1962. The draft of the new Agricultural Code provides for a maximum limit of 15,000 hectares for livestock estates in the more arid zones. In Panama a law of September 1962 embodies a comprehensive Agrarian Code, to be administered by a semiautonomous Agrarian Reform Commission under the chairmanship of the Minister of Agriculture.

A Basic Agrarian Reform Law, promulgated in Peru in November 1962, lays down the general principles for further legislation implementing the reform. Such legislation should aim at correcting excessive concentration or fragmentation of land; the distribution of small and medium-sized farms to farm workers; abolishing all personal services linked to the use of the land; ensuring adequate conservation and use of natural resources; ensuring technical, economic, and social assistance to small and medium-sized farmers by means of an adequate system of agricultural credit; and promoting agricultural development to secure both increased agricultural production and a better farm income distribution. Land subject to expropriation includes land indirectly worked through tenant farmers, *colonos*, etc., unutilized or underutilized land, and land representing an excessive concentration of agricultural property in the zone in which it is located. The Institute of Agrarian Reform and Colonization (Instituto de la Reforma Agraria y Colonización) is the executive agency. To discourage the concentration of property a progressive tax is established on land in excess of a certain maximum, the revenue of which shall be employed preferably in the provinces from which it originates and in works related to agrarian reform.

An Agrarian Reform Bill is under consideration in Uruguay, proposing a more rational development of agricultural land, a reform of terms of ownership and tenancy, the limitation of estates to between 600 and 2,500 hectares, the exclusion from agricultural activities of limited companies or limited partnerships, and the improvement of technical skills and standards of living of agricultural workers.

In Argentina minimum support prices for 1962/63 for wheat, rye, barley, oats, and linseed were raised in August and November on the basis of a rise in the cost of production items, and there was a further rise in January 1963 in respect of wheat. Minimum prices for maize, millets, sorghum, groundnuts, and sunflower seed were also raised substantially in September 1962. In May higher minimum prices, around 95 percent of world prices, were announced for the 1963/64 grain crops; wheat prices are to be raised 10-15 percent according to variety, rye 40 percent, and barley and oats nearly one third over the 1962/63 prices. Export taxes on livestock and livestock products, coarse grains, oilseeds, and by-products were abolished in July 1962 in order to stimulate exports, but a new export duty on wheat was introduced in April 1963. To help reduce the budgetary deficit a production tax of 5 percent on grains, wool, meat, hides, and by-products was introduced in November 1962.

To stimulate banana exports in Ecuador the tax liability has been removed for quantities exceeding the 1960-62 average. To encourage the domestic production of edible fats and oils, a levy is to be paid on imported crude oils and the revenue used to promote local production.

In Mexico a rice guarantee program has been established in the state of Sinaloa, which produces half of the domestic crop. In return for guaranteed purchases of milled rice at a minimum price of \$148.6 per ton, rice millers are committed to buy unlimited amounts of paddy from producers at a minimum price of \$72 per ton. In Nicaragua cotton-seed exports have been restricted to 62.5 percent of production in order to avert a possible shortage on the domestic market. In Peru purchase of the rice harvest by a public agency was established in July 1962.

Cotton production in Uruguay is to be encouraged by a subsidy to be financed through an increase in the premium payable on imports. The subsidy for cattle on the hoof delivered to frigorificos which had been in force in the summer of 1962 was reintroduced in November, because of shortage of fodder due to persistent drought. In addition the government will bear 75 percent of the railway freight charges for transporting cattle to pasture. In Venezuela the Corporación Venezolana de Fomento and the Banco Agrícola Pecuario have formed a new company for the storage of produce in silos, warehouses, and cold storage depots.

In August 1962 Honduras formally ratified the Central American Tariff Agreement, which is part of the General Treaty of Central American Economic Integration, thus bringing its customs duties in line with those of El Salvador, Guatemala, and Nicaragua. Although Costa Rica announced its decision to join the General Treaty, it has still to ratify the Agreement; Panama has also requested associate membership in the Central American Integration Scheme.

The central banks of El Salvador, Guatemala, Honduras, and Nicaragua have also agreed to use a new accounting monetary unit, the *peso centro-americano*, for settling transactions among themselves. To forward the efforts toward integration, El Salvador has terminated the concessions under the 1937 Trade Pact with the United States. Various credits have been granted by the Central American Bank for Economic Integration to private companies for the creation of industrial enterprises to service the whole Central American market. Negotiations are also under way for the establishment of a credit bank to assist coffee growers throughout Central America, possibly to be financed by a tax of 2 cents per bag on all coffee produced in Central America. In Nicaragua a powdered milk factory and a vegetable and fruit cannery are to be established to supply the whole Central American market.

At the second conference of the Latin American Free Trade Association in August-November 1962, further reciprocal tariff concessions were agreed upon for incorporation into the national tariff lists within the next few months. These concessions are higher than the 8 percent called for under the Treaty. Recommendations were made concerning a joint examination by member countries of their national development plans and the harmonization of commercial policies.

#### FAR EAST

A few new development plans have gone into operation in the Far East. In Mainland China a long-term program for the mechanization of farming has been announced. Price support programs have been strengthened in several countries. There have also been some further measures of land reform and some improvements in agricultural credit facilities.

Concerning regional economic co-operation, the Association of Southeast Asia (ASA), inaugurated in 1961 and comprising the Federation of Malaya, the Philippines, and Thailand, have agreed on a number of measures of economic and technical co-operation, including the establishment of the ASA Fund for financing joint projects.

#### *Development plans*

Nepal's second three-year plan, initiated in July 1962, aims at preparing a basis for further development, and concentrates efforts mainly on training, transport, communications, and power. It is planned to increase food grain production by about 75,000 tons annually. Of the total public investment of N rs 670 million (\$88 million), 18 percent is for agricultural development.

The Philippines' proposed five-year plan for 1962/63-1966/67, in the face of a population growth of more than 3 percent a year, calls for the rate of growth of the gross domestic product to rise from 5.5 percent in 1962/63 to 7.0 percent in 1966/67. Of the total planned investment of 12,056 million pesos (\$3,099 million), only 2,809 million pesos (\$722 million) is in the public sector. Agriculture is allocated 7 percent of total investment, as compared with 36 percent for industry. Among the agricultural projects proposed under the plan are the construction of more irrigation facilities, feeder roads as well as national roads, and increased output and use of fertilizer.

In the Republic of Viet-Nam the second five-year plan was launched in 1962. Its long-term objectives are the same as under the first plan, and as far as agriculture is concerned, call for increased rice production and diversification of crop patterns. Ambitious targets include an annual increase of 200,000 tons in rice production and a fivefold rise in the volume of rice exports. Better breeds of animals are to be introduced, and exports of pigs and ducks are to be multiplied by 10 and 7, respectively.

In North Viet-Nam a ten-year plan is in preparation, aiming at a "fundamental change in the national economy" by shifting the emphasis from agriculture to heavy industry.

The new Government of Burma, which took over in March 1962, called for complete reorientation of priorities in the second four-year plan (1961/62-1964/65), with top priority for agriculture. Two

main aims in the current program are to restore paddy production to prewar levels and to diversify agriculture in order to increase the production of deficit commodities. The Agrarian Revolution Committee, formed in October 1962, is making plans for land reform, the establishment of co-operatives, the mechanization and modernization of agriculture, and the promotion of animal husbandry.

In Ceylon, although the objectives of the ten-year plan (1959-68) remain unchanged, a Short-Term Implementation Program (1961/62-1963/64), was announced in 1962, under which priority is given to projects which need relatively less capital and make the best use of existing resources. The program calls for closer screening of projects and better co-ordination of the efforts of the various departments. Now as before, great importance is attached to the development of agriculture, to which nearly 25 percent of the total investment of rs 2,270 million (\$476 million) is devoted. The plan envisages an increase of 36 percent in paddy production, a 5-percent advance in foreign exchange earnings from export crops, and foreign exchange savings of rs 30.1 million (\$6.3 million) a year through the reduction of imports of subsidiary food crops.

In India, with the emergency situation arising from the Sino-Indian conflict, a number of schemes under the third five-year plan have been modified. In the field of agriculture, since foreign exchange is scarce and increases in agricultural production are urgent, the rupee-intensive parts of some agricultural programs, such as soil conservation, dry farming, and minor irrigation programs, have been revised upwards by as much as 50 percent.

In Pakistan, an outline of the third plan (1965-70) gives high priority to industry, power generation, and technical education. Total investment is set at rs 47,000 million (\$9,870 million), with 68 percent in the public sector. The plan aims to increase the national income by 30 percent and to reduce the disparity in per caput incomes between West and East Pakistan from 25 to 20 percent. Work under the desalinization and antiwaterlogging plan is included in the new plan, but not the investments to be made under the Indus Basin program. Tentative allocations for agriculture (excluding water and power) amount to 14 percent of public expenditure as against 20 percent under the revised second plan (1960-65). However, the absolute size of investment in agriculture would be rs 4,500 million (\$955 million), compared with rs 2,520 million (\$535 million) in the revised second plan.

### *Price and marketing policies*

Burma has decided to extend guaranteed minimum prices, established for paddy, sugar cane, and jute, to nine other basic agricultural products, including various pulses, soybeans, maize, tobacco, and castor beans. A government fund has been established to support the prices of groundnuts through market operations whenever necessary. By 1964, the government proposes to have complete and exclusive control over the purchasing, domestic distribution, and export of rice.

In contrast to India's first and second plan periods, the agricultural price policy set forth in the third five-year plan that began in 1961 was oriented toward encouraging production rather than stabilizing prices to consumers. For the first time, the need for fixing guaranteed minimum prices for important crops was stressed as a regular policy measure. A beginning was made in March 1962 by fixing a minimum price for average quality wheat. In December 1962 the government decided to intensify the procurement of rice throughout the country, and procurement prices for rice, depending on states and varieties, were announced for the 1962/63 season. Minimum producer prices have been fixed for sugar cane since 1949/50, but in November 1962, for the first time, the minimum price was linked with the sugar content, thus presenting a stimulus toward producing better quality. In April 1963 guaranteed minimum prices were increased for wheat and rice, and were introduced for the first time for jowar (sorghum); minimum sugar-cane prices were raised in the following month. A Jute Buffer Stock Agency, constituted by mills representing 90 percent of the Indian jute textile industry, to effect purchases in the market whenever prices tend to fall to uneconomic levels, began operations in April 1962, and in late 1962 the State Trading Corporation entered the market and purchased raw jute through the apex co-operatives. In Pakistan, area control and minimum internal prices for loose jute were reintroduced, and minimum export prices, in force since 1958, were increased.

In Japan, the official purchase prices were raised by 10 percent for rice and 5 percent for wheat, barley, and naked barley in the 1962/63 season. In the face of some overproduction of hogs, the Livestock Development Corporation succeeded in supporting producer prices through buying pork in several districts at locally fixed floor prices in 1962. In the Republic of Korea, the fixed purchasing prices

for voluntary sales of rice and barley to the government have been somewhat increased for the 1962/63 season, and cash advances offered to farmers. In the Philippines, the government Rice and Corn Administration (RCA) took the place of the National Rice and Corn Corporation (NARIC) in June 1962. The Administration has been established to stabilize prices for these commodities and provide incentives for their production.

In some countries, special measures have been taken concerning foreign trade, with a view to safeguarding producer prices. Exports of Indian sugar have been heavily subsidized in order to earn foreign exchange as well as relieve the domestic market of a large carry-over from the previous crop, while maintaining sugar-cane prices at a remunerative and stable level. Export taxes on Indian tea were removed in the 1963/64 budget. In Japan, where mutton imports have been liberalized, the government requested meat processing industries voluntarily to control mutton imports, because their sharp rise in recent years had become one of the causes of large drops in pig prices.

As for consumer price policies, the emergency situation arising from the Sino-Indian conflict in November 1962 necessitated new regulations on prices and distribution of essential commodities in India. Stockpiles were considerably augmented by state purchases of rice and imports of wheat and rice. Steps are to be taken to popularize the consumption of wheat in rice-consuming areas and discourage the consumption of rice in wheat areas. A program has been sanctioned for building up a large network of consumer co-operatives and other stores for the supply of essential commodities. A Price Stabilization Committee was formed in the Department of Economic Affairs.

The drought in the Republic of Korea in 1962 led to an upward surge in noncontrolled prices, and so in August 1962 prices of flour, beans, beef, pork, and lumber were frozen at their June 1962 levels. In view of rising food prices since the beginning of the year in the Philippines, due at least in part to the uneven flow of supplies of cereals, the government introduced a short-term scheme in August 1962 designed to import and distribute at reasonable prices adequate supplies of canned foods such as milk, fish, and meat through the National Marketing Corporation. Any losses incurred by the corporation are to be reimbursed by a special government appropriation for which legislation is to be submitted.

### *Land tenure*

In Nepal the Royal Land Reforms Commission submitted its report in late 1962. Recommendations included the establishment of an agricultural credit bank and the encouragement of the co-operative movement. It was stressed that any progress in Nepal would depend on a reform of its archaic land laws. The Birta (freeholdings) Abolition Act passed by the previous government had paved the way for bringing about improvements in the land system.

In the Republic of Korea the government established the Agricultural Structure Policy Committee in June 1962 to draw up and study basic policies such as co-operative farming for the improvement of the agricultural structure, which is characterized by small and often submarginal holdings. In August, regulations were adopted concerning the payment of subsidies under the Land Reclamation Encouragement Act of February 1962, in order to stimulate farmers to expand their holdings.

The Agricultural Land Law and the Agricultural Co-operative Association Law in Japan were revised in May 1962 so as to make possible the enlargement of holdings or the development of co-operative farm management.

The Burmese government has drawn up plans for the nationalization of agricultural land belonging to absentee landlords.

### *Agricultural credit*

There is increased recognition of the urgency of improved agricultural credit facilities in the region. Burma has begun a new system of granting loans based on crops sown rather than on the repayment capacity of the borrower. Under the new system the peasants receive, e.g., 8 kyats for one acre (\$4.15 per hectare) of paddy and K 40 for one acre (\$20.76 per hectare) of groundnuts. Advances to cultivators amounting to K 8.45 million (\$1.77 million) outstanding on 30 September 1962, were written off, as had been done in 1961. In the Republic of Viet-Nam, although progress concerning agricultural credit has been slowed down by the unstable situation, the government has made available 156 million piastres (\$4.5 million) in 1962 for short-term loans to agricultural co-operatives.

The Republic of Korea has significantly expanded agricultural production credits released through agricultural co-operatives. The Usurious Loan Liquid-

ation Act, enacted in 1961 to relieve the farmers from debts on which usurious interest rates were paid, was modified in 1962 to permit small creditors to be repaid by the government-appointed agency in a single lump sum rather than over a five-year period. In the Philippines, conditions of credit for agricultural production were relaxed, with the rediscount rate reduced from 6 to 3 percent.

### *Mainland China*

Although the Prime Minister recently referred to 1963 as the first year of China's third five-year plan, information on this plan has not yet been published. A far-reaching program for the mechanization of farming, which would take 20 to 25 years, has, however, been announced. Several agricultural experts have been appointed as members of the State Planning Commission, and the program given top priority in economic planning. It would include a considerable expansion of powerlift irrigation in areas where gravity irrigation is not possible, increased power supplies in rural areas, and an increase in tractor numbers from 100,000 to 1 million. Efforts would be concentrated in the main grain and cotton-producing areas. Mechanization is declared to be the second stage in the planned transformation of the countryside. The first phase, the social reorganization, is deemed to have been satisfactorily achieved. However, further consolidation of the communes has been officially advocated, perhaps in order to tighten up the collection of grains and cotton. The production teams have been urged to co-ordinate their own needs with the state plans when drawing up their production plans.

Official policy statements continue to admonish industry to supply the rural areas with more transport machinery, farm machinery, fertilizers, and other means of agricultural production. Adoption of the necessary policies "concerning loans, taxes, purchase and supply and prices" to promote the mechanization program has also been advocated. In the third quarter of 1962, over 300 million yuan (about \$123 million) have been extended to production teams by the People's Bank under a new type of interest-free loan, repayable in two to five years, or longer if necessary. These loans are exclusively for "productive investment," such as purchasing production means or covering the costs of land reclamation and irrigation, and party authorities are instructed strictly to control their utilization.

Special measures for the encouragement of cotton-growing include the advance purchase of cotton prior to sowing under government agreements with production teams, which are to receive interest-free loans both for buying equipment and for "urgent livelihood needs" of team members.

#### NEAR EAST

New development plans have been launched in Turkey and Libya. There have also been substantial revisions in the plans of Iran and Sudan, and the plans being implemented in Iraq and Syria are also likely to be revised. Public investment programs are in preparation in most of the countries where plans are not yet in operation.

A more far-reaching agrarian reform law has been adopted in Iran. The United Arab Republic has nationalized cotton ginning and exporting enterprises, and is considering the establishment of price stabilization funds for agricultural products.

There have been no fresh developments in connection with the proposed Arab common market. In the proposed federal union between the United Arab Republic, Iraq, and Syria, however, considerable emphasis has been given to policies aiming at economic integration. A customs union has been established among the 14 members of the South Arabian Federation. The possibility of establishing a free trade area between Iran, Pakistan, and Turkey is being studied by the Central Treaty Organization (CENTO). An increasingly important source of development financing is the Kuwait Fund for Arab Economic Development, which has so far provided loans of \$97 million to three Arab states (Algeria, Jordan, and Sudan).

#### *Development plans*

The implementation of Turkey's first five-year plan (1963-67), the first phase of a fifteen-year perspective plan, began in January. The plan aims at an annual rate of growth over the five-year period of 7 percent, or 4 percent on a per caput basis. This growth rate entails raising the rate of investment to 18.3 percent of gross national product from the 14.8 percent averaged in the past five years. The total investment envisaged during the five years is LT 59,600 million (\$6,600 million), of which about 60 percent is in the public sector. LT 11,300 million (\$1,260 million) of the planned investment

is dependent on external resources, and the Aid-to-Turkey Consortium has reached a preliminary understanding for the provision of \$250 million toward the first year of the plan. Domestic resources will not be sufficient without additional taxation, possibly including a tax on agricultural income.

Agriculture is to receive LT 10,500 million (\$1,170 million), or 18 percent of total planned investment under the Turkish plan, which is more than any other sector except housing. Of the agricultural investment 47 percent is for irrigation, 15 percent for machinery, 8 percent for forestry, 6 percent for land improvement, and 4 percent for livestock improvement. Annual investment in agriculture is to be more than doubled during the course of the plan. It is planned to increase agricultural production at an average annual rate of 4.7 percent, and production targets include increases of 15 percent for cereals, 30 percent for livestock products, 25 percent for fruit and vegetables, and 75 percent for pulses. Contrary to the policy of recent years, increased production is to be sought not from further extension of area but from higher yields through increasing the irrigated area from 1.1 million hectares in 1962 to 1.6 million in 1967, providing essential equipment and fertilizers, and educating farmers in modern techniques. It is aimed to raise the value of agricultural exports from an expected \$270 million in 1963 to \$350 million in 1967, the largest increases being in fruit and vegetables, industrial crops, forest products, and livestock. It is anticipated that the proportion of the active population on farms will fall from 77 to 71 percent.

In Libya a five-year development plan (1963/64-1967/68) has been announced, calling for total public expenditure of £L 169 million (\$475 million). Priority is given to the development of agriculture, with emphasis on land reclamation, farm settlement, afforestation and water development, while projects concerning industry, transport, and electricity are also geared to the promotion of agricultural development. The plan will be assigned 70 percent of the country's expanding oil revenues. The National Planning Council, replacing the former Development Board, will supervise the execution of the plan, and a Ministry of Development has also been set up.

In July 1962 the new seven-year plan of Sudan was extended into a ten-year plan (1961/62-1970/71), mainly so as to allow for a better balance between projects of social and economic development. The principal aim remains the expansion and diversification of the modern sector of the economy, and

gross domestic product in this sector is expected to grow by 91 percent over the 1960/61 level, as compared with 38 percent in the traditional sector and 64 percent in the economy as a whole. Gross development expenditure is planned to reach £S 565 million (\$1,582 million), of which 59 percent is in the public sector; 26 percent of the total expenditure is expected to be covered by external assistance.

Agriculture is assigned 21 percent of gross development expenditure in Sudan and 27 percent of total public investment. Of £S 90 million (\$260 million) of public investment for agriculture, £S 66 million (\$190 million) is devoted to irrigation, £S 36 million (\$100 million) for the Roseires Dam alone. It is roughly estimated that the irrigated area will rise by some 50 percent to about 1.5 million hectares in 1970/71, though its full utilization is likely to take longer. With the availability of additional water it will be possible to reduce the proportion of fallow in the Gezira from 50 to 30 percent. £S 20 million (\$60 million) is allocated to resettlement in Khashm El Girba. Agricultural production targets include increases of 70 percent for long-staple and 168 percent for short-staple cotton, 68 percent for durra (sorghum), the main food crop, and 109 percent for groundnuts, which are rapidly becoming an important export. The plan also places considerable emphasis on import saving, through increased production of such crops as rice, wheat, sugar, and coffee. It is hoped to raise the value of agricultural exports from £S 66 million (\$190 million) in 1961/62 to £S 98 million (\$280 million) in 1970/71, of cotton exports from £S 42 million (\$120 million) to £S 60 million (\$170 million), and of import substitutes from £S 5.1 million (\$15 million) to £S 31 million (\$90 million).

Expenditure under the third plan of Iran, which began in September 1962, has been drastically reduced because of financial strains and inflationary pressure. The share of oil revenues set aside for development is to be increased from 55 percent in 1962/63 to 80 percent in 1967/68, and an annual increase of 6 percent in tax revenue is expected, but there is still a gap of 37,500 million rials (\$500 million) to be met from external resources. The original planned public expenditure in the five and a half years to March 1968 has been reduced by about a quarter to 145,000 million rials (\$1,936 million). Planned expenditure on agriculture and irrigation was first reduced by about the same proportion but has since been raised to 35,300 million rials (\$466 million), or 24 percent of total public investment, a

larger share than any other sector. Details of the main projects and measures envisaged in the plan were included in last year's issue of this report.

Even with the reduction noted above, the tempo of development in Iran is expected to be more rapid than under the previous plan, and the planning machinery has been reorganized to take account of this. A High Planning Council has been established under the direct supervision of the Prime Minister, and a Plan Director's Committee, headed by the Managing Director of the Plan Organization, set up to translate the Council's policy decisions into plans and projects and to supervise the implementation of the plan.

Also in Iran the Mohammed Reza Shah Pahlevi Dam on the Dez River in Khuzistan, for which IBRD loaned part of the finance, has been completed. It will ultimately irrigate 146,000 hectares, generate 520,000 kilowatts of electric power, and control floods that in the past have caused considerable damage to crops.

The Government of Iraq intends to revise the five-year plan (1961/62-1965/66) and raise the share of the private sector; some reductions in planned public investment are therefore expected. In Syria also revisions are expected in the five-year plan (1960/61-1964/65). The Federal Republic of Germany has advanced a loan of DM 350 million (\$87.5 million) to meet the foreign-exchange cost of the first phase of the Euphrates Dam. The project, which is expected to be completed in six years at a total cost of \$260 million will irrigate 200,000 hectares and provide 200,000 kilowatts of electric power. In the face of balance-of-payments pressure, the United Arab Republic has established strict priorities for the use of convertible currency, and projects in agriculture and industry, especially the High Dam and related projects, are to be given preference.

Lebanon's five-year public investment program is in the final stages of preparation, with the assistance of the consultant firm of IRFED. Meanwhile work on the Litani Water Development Project is being accelerated, and the proposed 1963 expenditure is \$21 million, as compared with the actual expenditure of \$11 million in 1962. In addition the government has submitted to Parliament the "Plan vert" to improve productivity on 100,000 hectares of poor land; of the total cost of £L 317 million (\$100 million), £L 73 million (\$25 million) would come from public funds, and the activities of the Agricultural Credit Bank would be expanded to finance part of the remainder.

In Kuwait a Planning Council and a Planning Division have been set up to formulate and implement a five-year plan. In Yemen, the framework of a planning organization has been established for the preparation of the country's first development plan. In Saudi Arabia the establishment of an Agricultural Bank with a capital of 30 million rials (\$7 million) was authorized in April 1963.

#### *Land tenure*

The amended version of the 1961 Agrarian Reform Law of Iran received final sanction in the national referendum of January 1963. The share-cropping system is abolished and all agricultural laborers are to receive wages. The compensation period is reduced from 15 to 10 years, and maximum land ownership has been further reduced, for example to 30 hectares in the rice-growing areas and 500 hectares for mechanized cereal cultivation under dry farming. The law also provides for the distribution of waqf, the land of religious institutions, and for the nationalization of forests. The distribution of land is proceeding rapidly, and by November 1962 459,000 hectares had been distributed to 35,000 families, and 200 co-operatives had been established, as well as a Central Co-operatives Union.

In Iraq, where the distribution of land to cultivators under the land reform has been slow, the new government has announced that it will expedite redistribution, encourage the growth of co-operatives, accelerate the construction of modern villages, and increase the number of tractor-hiring stations. Measures are under consideration in Turkey for the consolidation of small holdings. In the United Arab Republic agricultural land owned by aliens is to be expropriated.

#### *Price and marketing policies*

Following the devaluation of the currency in February 1962, control over the marketing of wheat, flour, and bread has been lifted in Israel, though wheat imports are still in the hands of the government. Bread prices have risen very sharply, and low-income consumers are being compensated through special grants. Subsidies are being paid to traders in dairy products, vegetables, and fertilizers, to prevent rises in prices.

In Afghanistan, as a result of the revaluation of

the currency in March 1963, export producers will be able to receive prices 20-25 percent higher than before. From the 1963 harvest the Government of Lebanon will purchase wheat and barley directly from cultivators at fixed prices. The price for wheat has been fixed 21 percent above current market prices and that for barley 39 percent above. The program will be administered by the Wheat Bureau, a semiautonomous government organization created for the purpose. It is expected that half of the country's wheat production will pass through the Bureau. Produce will be sold at market prices, and any losses will be met from taxes on imported wheat and flour. Also in Lebanon, the Fruit Office is considering the payment of a bonus for exports of choice citrus fruit in order to encourage improved quality.

Libya has abolished all import duties on agricultural machinery and fertilizers. Guaranteed producer prices have been raised by 63 percent for hard wheat and 9 percent for barley. In Syria, on the other hand, government buying prices for the different varieties of wheat were 17-29 percent lower in 1962/63 than the year before, as a result of the abundant harvest.

In Sudan the Gezira Board has abolished its reserve price system for cotton, and instead will adjust the supply sent for auction in order to influence the price. A minimum price is now paid for gum arabic, the principal export item after cotton.

In the United Arab Republic all cotton exporting firms, which were previously 50 percent owned by the state, were nationalized in April 1963. Cotton ginning companies were nationalized at the same time. The Egyptian Cotton Commission slightly raised its purchase price for extra long-staple cotton in September 1962 but reduced by 3 percent the price of cotton classified as only "fair staple," in order to encourage improved quality. Further small increases in prices for extra long-staple cotton have been announced for the 1963/64 season. The government is considering the revision of agricultural marketing policies and the establishment of stabilization funds to insulate domestic prices from fluctuations on international markets.

#### **AFRICA**

New development plans have gone into operation in Ethiopia and Sierra Leone, and interim plans in Gabon and Upper Volta. New plans are in the

course of formulation in several countries, including newly independent Algeria and also Ghana.

A number of state farms are being established in Ghana and Somalia, and new settlement schemes are under way in Kenya and Nigeria. New government marketing organizations have been set up in several countries. World market conditions have necessitated the lowering of guaranteed producer prices in some cases.

The Conference of African Heads of State, held at Addis Ababa in May 1963, agreed to set up an Organization for African Unity. Another important event was the initialing in December 1962 of the new Convention of Association between the European Economic Community and the 18 Associated States, which will replace the original convention dating from 1958 before the latter states were independent. The new convention determines the amount of aid to be provided by the Six over the next five years, as well as regulating trade between the Six and the Associated States.

#### *Development plans*

The second five-year plan of Ethiopia, which began in September 1962, aims at raising the national product by 4 percent a year. Total investment, public and private, over the five years is estimated at Eth \$2,656 million (U.S.\$1,070 million) of which Eth \$1,451 million (\$580 million) constitutes fixed investment; about one third is expected to be financed from external sources. The plan gives priority to agriculture, including irrigation in the Awash Valley, and to the further expansion of infrastructure. Coffee production and marketing, and also livestock and cotton, are to receive special attention. A National Livestock Board has been established to promote production and increase exports, especially through the reduction or abolition of export duties on livestock and livestock products. It is planned to raise cotton production from the current 2,000 tons to 14,000 tons by 1967. The Ministry of Agriculture has been reorganized to cope with the rapid development activities envisaged in the plan.

In Gabon a Planning Commission was established in July 1962, and a three-year interim plan of public investment (1963-65) has been adopted. Total public expenditure is set at CFA fr 4.5 million (\$18.2 million). The interim plan is to be followed by a five-year plan for 1966-70. The plans aim at the better integration of the economy, especially by the im-

provement of communications with outlying districts.

In Nigeria, where the first national plan was launched in 1962, a team of FAO experts is advising on the development possibilities for agriculture. Details of the Federal and Western Region plans were described in last year's issue of this report, but those of the Eastern and Northern Regions were not yet available. The Eastern Nigeria plan (1962-68) envisages a total public investment of £Nig 75.2 million (\$210 million), of which 40 percent will be spent on primary production. Priority is given to the expansion of tree crops, in order to bring a rapid increase in cash farm incomes and government revenue. In Northern Nigeria public investment for the period 1962-68 is set at £Nig 98.8 million (\$280 million). Agriculture, animal resources, and forestry are to receive about £Nig 21.4 million (\$60 million), or 22 percent of the total, including over £Nig 12 million (\$35 million) through the Agricultural Development Corporation.

Sierra Leone's ten-year plan (1962/63-1971/72) involves a total public and private expenditure (capital and recurrent) of £150 million (\$420 million). £124 million (\$350 million) is to be spent during the first five years, but the plan for the second five years is still tentative and incomplete. Agriculture is to receive 8 percent of the total capital expenditure in the public sector during the first five years. Increased food production and the replacement of imports are major objectives.

The five-year plan that was to be put into operation in Upper Volta in 1963 has been suspended and replaced by a two-year interim plan, consisting of the projects in the five-year plan that can be carried out immediately. The five-year plan was criticized chiefly because the people were not consulted in drawing it up, because it did not give priority to the solution of the serious unemployment problem, and because it was based on the assumption that agricultural production could be doubled in 15 years, which is now considered impossible in view of the shortage of funds and trained personnel.

New development plans are in preparation in a number of other countries. In Algeria since independence the government has been continuing most of the projects that had already been initiated under the preindependence Constantine Plan, but very few new projects have since been started under this plan. The first national plan is in preparation.

The preliminary draft of Ghana's new seven-year plan, which is expected to come into operation in October 1963, has been submitted to a group of

international experts. A revised draft was to be submitted to the government in June and made available for public discussion. The preliminary draft of the plan involves a total investment of £G 841 million (\$2,355 million) of which £G 486 million (\$1,360 million) is in the public sector. It is envisaged that gross domestic product would rise by 5.5 percent a year. Approximately 14 percent of total public investment would be devoted to agriculture, and agricultural production targets include increases of 100 percent for grains, 50 percent for animal products, 40 percent for cocoa, and fivefold increases for fish, legumes, and vegetable oils. While the bulk of the increase in agricultural production, including all the cocoa, would be in the small-scale private farming sector, it is noteworthy that 27 percent of total public investment in agriculture would be for state farms, the Workers' Brigade, and the United Ghana Farmers' Council Co-operatives. Large-scale sugar-cane production is to be introduced for the first time.

In Morocco it has been decided that the five-year plan (1960-64) is to be replaced by an interim plan, to be prepared by October 1963, after which there will be a series of three-year plans.

In Nyasaland, where a three-year plan was published in early 1962 for the period 1962-65, a United Nations mission has recently surveyed development possibilities. In Southern Rhodesia the report of the Phillips Committee on the Development of the Economic Resources of Southern Rhodesia with particular reference to the role of African agriculture advocates additional expenditure over a five-year period of £33.5 million (\$90 million), of which over half would be for agriculture and irrigation.

The new development plan in preparation in the Congo (Brazzaville) will consist of a two-year interim plan to lay the foundation for a five-year plan. In Liberia a National Planning Council has been set up, with the president as chairman, to provide policy guidance, and an Office of National Planning, which is making preparatory studies for a development plan.

A draft five-year plan is under consideration in Mauritania which would call for a total investment of CFA fr 27,761 million, of which 13,573 million is in the public sector.

In Madagascar a draft four-year plan (1963-67) is in preparation. In Somalia an investment program which will fit existing and forthcoming projects into a consistent framework is in preparation. In South West Africa a committee has been appointed to make the necessary preparatory studies for a five-year plan.

A Ministry of Development has been established in Tanganyika, and also the Tanganyika Development Corporation to promote economic development.

#### *Land tenure*

In Algeria the farms formerly owned by French settlers and left unattended after independence are a pressing problem, and according to some estimates up to 1 million hectares of wheat land and vineyards may fall into this category. As a short-term measure a concerted effort was made to sow the wheat crop, as part of *Opération labour* to make the best use of the available tractors. It was announced in April 1963 that all farms of more than 50 hectares would be nationalized.

In March 1963 it was agreed that the Tunisian Government would during 1963 purchase 150,000 hectares of French-owned farmland in Tunisia. The government also guaranteed that French settlers in Tunisia who are unwilling to sell their lands, estimated at about 120,000 hectares, could continue to manage them for at least five years.

The Ghana State Farms Corporation is planning to set up 100 state farms in the northern region by the end of 1963, mainly for livestock production. In the same part of the country the United Ghana Farmers' Council is establishing 40 farm settlements during the next five years to provide employment opportunities for youth.

The United Kingdom Government is to provide about 70 percent of the estimated cost of £27.5 million (\$80 million) of resettling farmers on 1 million acres (0.40 million hectares) of the former Scheduled Areas of Kenya. Settlement is to be mainly on mixed farms to be repurchased from European settlers; plantations are to be largely left intact in order to maintain export income. Up to now, because of the difficult unemployment situation, attempts have been made to settle as many families as possible and the farms have therefore often been uneconomically small, but it is expected that the farm size will be increased in the future. Good progress is now being made, and it is hoped to complete the project in three years instead of the five years originally expected.

A committee appointed two years ago in Morocco to work out a land reform program has now completed its report. It makes recommendations concerning the consolidation of holdings and land redistribution, and proposes the limitation of ownership to

50 hectares of irrigated land and 100-300 hectares of dry land. It is expected that the implementation of the land reform will begin in the irrigated areas, of which the necessary surveys should be completed by 1964.

In Somalia the U.S.S.R. is assisting in the establishment of two state farms of 5,000 hectares each, one for cotton and one for oilseeds, along the Juba River. A Land Use Advisory Council and Land Use and Protection Committees are being set up in Nyasaland, with the power to direct landowners to carry out works necessary for the protection of land and water resources.

#### *Price and marketing policies*

New government marketing organizations have been set up in a number of countries, many of them covering a wider range of crops than in the past. In Cameroon the newly established Office national de commercialisation des produits agricoles d'exportation is intended to limit surpluses, regulate prices, and use the profits of state marketing to aid development. In Dahomey the Office de commercialisation agricole dahoméen controls the purchase and storage of agricultural products. In Guinea the Office de commercialisation des produits agricoles divers has been set up to organize and develop production for export. The Office malgache d'exportation has been established in Madagascar to supplement the village co-operatives in the marketing of the main crops, supervise quality, and take stabilization measures. The Tanganyika Coffee Board is now responsible for marketing all coffee delivered to it by the co-operatives, which previously handled export marketing themselves; a National Agricultural Products Board is to be established, which would initially cover maize and oilseeds and later a wider range of products. An Office national de l'huile has been set up in Tunisia, with wide responsibilities, including the control of exports of olive oil. The Agricultural Produce Marketing Board of Ghana has been replaced by three new bodies: the Food Marketing Board, the Timber Marketing Board, and the Cocoa Marketing Board, the latter covering coffee, palm kernels and oil, copra and coconut oil, shea nuts and shea butter, groundnuts and bananas, as well as cocoa.

In Mauritius a commission of inquiry into the sugar industry has completed its investigations, largely concerning the apportionment of returns between planters and millers. Food crops and also cattle

are to be handled through an official marketing organization, in the hope of stimulating the production of food which is at present largely imported.

Under long-term price agreements farmers in Northern and Southern Rhodesia were guaranteed fixed prices and market facilities for milk, maize, and cattle for the domestic market, while exports were sold at world market prices and any losses carried by the producers. As this would have involved sharp reductions in average returns to producers in 1962, it was decided to terminate the agreements and draw up a simplified agreement for implementation in 1964. In the interim, however, guaranteed prices in 1962 were maintained at the previous year's level.

There have been a number of changes in the prices guaranteed to farmers. Although the price for groundnuts was decreased substantially in Nigeria in 1962/63, further reductions were necessary for 1963/64 in order to stem continued heavy drains on the funds of the marketing board. In Sierra Leone also the cocoa price has been lowered for 1963/64 because of the running down of stabilization funds. In Uganda, on the other hand, the minimum coffee price has been raised slightly to enable farmers to share in the improvement in world prices for Uganda robusta, though the export duty was also raised at the same time. The price increase follows a considerable reduction that had been necessitated by heavy withdrawals from the Coffee Price Assistance Fund, and the smuggling in of Congo and Tanganyika coffee to take advantage of the price differential. Cotton prices have been fixed at a relatively high level to increase cotton acreages and maintain farm incomes.

In order to reduce the risk of further accumulation of surpluses the producer price of maize has been lowered in South Africa for the 1962/63 crop, while the government will assist in the amalgamation of farms that have become uneconomic as a result of the surplus situation. For the 1963/64 selling season, however, prices have again been increased, in view of the expectation of a smaller crop. Dairy product prices were slightly raised for 1962/63 in view of the decline in production and stocks of cheese and condensed milk.

#### *Regional economic co-ordination*

The draft charter agreed by the Conference of African Heads of State, held at Addis Ababa in May 1963, will come into force when ratified by two thirds of the signatory states. It provides for

the establishment of an Organization for African Unity, with a permanent secretariat and five specialized commissions for co-operation in economic and social, educational and cultural, health, defense, and scientific matters.

Among the various subregional groupings in Africa, the draft charter of the "Monrovia group," the largest of these groups, was signed in December 1962, providing for technical and diplomatic co-operation. Algeria, Morocco, and Tunisia decided in February 1963 to co-ordinate their trade policies and development plans. In April 1963 a common market grouping the "Casablanca" countries (Algeria, Ghana, Guinea, Mali, Morocco, United Arab Republic) was initiated; all import duties between the member countries are to be lifted within five years, with a reduction of 25 percent in the first year. Negotiations are under way concerning the arrangements for establishing an East African Federation, comprising initially Kenya, Tanganyika, and Uganda.

Good progress has been made toward the establishment of the proposed African Development Bank, a draft charter for which is to be placed before a meeting of African Finance Ministers at Khartoum in July.

A joint committee of experts from Cameroon, Chad, and Niger has been set up to study the development of the Lake Chad area, in particular concerning agriculture, irrigation, fishing, and livestock. Nigeria and Senegal, which account for nearly two thirds of world exports of groundnuts, have initialed the terms of an agreement for a common marketing policy for this commodity. Ghana, Nigeria, Cameroon, and Ivory Coast have joined with Brazil to take collective action in matters affecting the cocoa industry, including the exchange of technical information, the discussion of problems of mutual interest, and the promotion of increased consumption.

The new Convention of Association between the 18 Associated States<sup>12</sup> and the European Economic Community was initialed in December 1962. The convention provides for free entry into the markets of the Six for certain products of the Associated States, namely pineapple, coconut, coffee (not roasted or decaffeinated), tea (not packaged), pepper (unground), vanilla, cloves (unground), nutmeg, and cocoa beans. At the same time third countries will benefit from reductions in the common tariff of the

Six on most tropical products, namely a reduction of 25 percent and a suspension of an additional 15 percent for coffee and cocoa, and reductions of 15 percent for pepper, 20 percent for shredded coconut, and 25 percent for cloves, vanilla, and nutmeg. Subsequently it was agreed that duties on tea and tropical hardwoods would be completely abolished as from 1 January 1964.

Each Associated State will apply the same tariff on the products of each of the Six, and will progressively eliminate tariffs on these imports by annual reductions of 15 percent, or at a faster rate if its economic situation permits. However, the Associated States may maintain or establish such duties and taxes as are necessary for their economic development for their industrialization, or for budgetary revenue. The Six will eliminate quantitative restrictions on products from the Associated States, and the latter will within four years lift all such restrictions on imports from the Six. The Associated States may, however, maintain or establish quotas if necessary for their industrialization or their economic development, for balance-of-payments reasons, and (for agricultural products) if compliance with the provisions of regional organizations calls for their maintenance.

The convention also provides that the Six will take into consideration the interests of the Associated States in determining their common agricultural policy. The two groups will also consult one another concerning their commercial policies with regard to third countries, though retaining complete freedom in this respect.

Export prices will gradually be brought in line with world market prices. For shredded coconut, pepper, palm oil, cotton, and gum arabic, this will be from the beginning of the 1963/64 season; for rice and sugar, from the coming into force of the common agricultural policy concerning these commodities; for fats and oils, from the coming into force of the common policy, or at the latest from the beginning of the 1964/65 season; and for coffee prices will gradually be made competitive by 1967 at the latest.

Concerning aid, the new convention stipulates that over the next five years the Six will provide the Associated States with \$620 million in grants, \$46 million in special loans, and \$64 million in interest-bearing loans from the European Investment Bank. Of the total, \$500 million will be used for economic and social investment, and technical assistance and co-operation. The remaining \$230 million is for production and its diversification, divided as

<sup>12</sup> Burundi, Cameroon, Central African Republic, Chad, Congo (Brazzaville), Congo (Leopoldville), Dahomey, Gabon, Ivory Coast, Madagascar, Mali, Mauritania, Niger, Rwanda, Senegal, Somalia, Togo, Upper Volta.

follows: \$32 million for Burundi, Congo (Leopoldville), Rwanda, and Somalia, which already export at competitive prices; \$15 million for Gabon, Mauritania, and Upper Volta, which have undertaken to export at competitive prices from the date of application of the new convention; and \$183 million for the 11 remaining Associated States. An additional \$70 million is set aside for aid to nonindependent countries, making a total of \$800 million, as compared with \$581 million in the preceding five years.

#### FISHERY POLICIES

Problems related to regional economic integration have recently been the major influence on national fishery policies. The EEC countries were planning to take up fishery matters, and nonmember countries were closely following developments within the Community and studying ways of adjusting their policies to anticipated changes in the position of their industries. When it became clear early in 1963 that the EEC would not expand in the near future, some countries announced their intention to extend off-shore fishing limits, including Denmark and the United Kingdom among the countries that had expected to join the Community.

Present difficulties have their roots in large measure in the failure of the two United Nations Conferences on the Law of the Sea, and in the delay in the taking up of fishery problems by the EEC. When the Ministers of Agriculture of the EEC countries met in Stresa to consider the basis for a common agricultural policy, the problems of the fishery industry were not touched upon, although fish and canned fish were defined in the Treaty of Rome as agricultural products. The Council of Ministers agreed late in 1962 to call a conference on fishery problems early in 1963, the provisional agenda of which covered a wide range, including access to fishing grounds, the extent of the territorial sea, the conservation of marine resources, and the harmonization of the social status of the fishermen.

On the breakdown of the EEC negotiations with the United Kingdom, the fishery conference was postponed. Denmark, one of the countries which had anticipated joining the Community, thereupon declared its intention of instituting 12-mile limits off the Faroe Islands and Greenland. The extension of fishing limits off the Faroes would affect, in particular, the United Kingdom fishing fleet, since under the Danish-United Kingdom Agree-

ment which expired in the spring of 1963 United Kingdom vessels enjoyed specific concessions for fishing in Faroese waters. The extension of the limits off Greenland from 3 to 12 miles was to go into effect on 1 June 1963, but countries which traditionally had fished in these waters (Norway, Federal Republic of Germany, Iceland, United Kingdom, France, and Portugal) were to be accorded certain rights until 1970.

Pressure was also high on the United Kingdom authorities to protect domestic fishery interests. Under the international conventions to which it was a party, the government was prevented from taking immediate steps to extend fishing limits, but it gave notice of its intention to terminate its membership in the conventions so as to be free to change limits in a year's time. Simultaneously with this announcement, the United Kingdom Government called a conference of all European fishing nations in London in the autumn of 1963. In calling this conference, the government referred to the increasing seriousness of questions relating to access to fishing grounds and markets; it was stressed that the increasing size, speed, and catching power of fishing fleets, together with the extension of competition to new waters and the steadily worsening overcrowding on traditional grounds, made it necessary to continue to search for a basis for international agreement.

Other countries considering an extension of their fishing limits included Ireland, Turkey, South Africa, Uruguay, Canada, and the United States. South Africa actually extended limits to 12 miles and Uruguay to 6 miles. In all the discussion of the extension of fishing limits, however, the economic evaluation of net gains from a change in national laws has been comparatively neglected. Mention has occasionally been made of the additional cost of patrolling a larger expanse of water, but nowhere does there appear to have been a systematic enquiry to assess the net effects on trade against the hoped-for increases in domestic catches.

Outside Europe, in the countries with developed fisheries, such as Japan, the U.S.S.R., and the United States, government policy has been directed mainly toward opening up new raw material sources, rationalizing methods of production, and developing internal and external markets. The fishing fleets of Japan and the U.S.S.R. have ranged over an ever-widening area. Under the latest recommendations of the International North Pacific Commission, Japan would no longer be required to

abstain from fishing for halibut in the eastern Bering Sea and for herring west of Queen Charlotte Island. A further meeting of the three countries, Canada, Japan, and the United States, convened in Washington in June 1963, failed to reach agreement on additional concessions sought by Japan. The Japanese Government has continued to provide financial assistance for the promotion of exports of marine products. Prospects are being studied for increased marketing of tuna products in Europe and in other markets that are not yet fully exploited. In the U.S.S.R. further emphasis has been placed on the construction of new craft, mechanization of the fleet, improvements in handling, preservation and processing equipment and methods, and continuation of the policy of exploring new waters. In spite of rapid progress in recent years, fish supplies are still considered inadequate to meet domestic demand.

In the United States, the Advisory Committee assisting the government in formulating fishery policies under the Saltonstall-Kennedy Act has drawn up five proposals for government action aiming at: (1) increased scientific and economic research; (2) more authority for international commissions in fish management and harvesting; (3) modernization of fishing craft and shore installations to equal those of competing nations, and the extension of vessel loans, grants, and mortgage insurance; (4) improvement of production and marketing techniques to obtain a better knowledge of fishery products and better markets; (5) development of untapped resources existing in quantities large enough for commercial exploitation. Pending legislation seeks to include domestically produced fishery products in the Food for Peace Program.

Nowhere in the world are fisheries developing faster than on the west coast of Latin America. In Peru the industry, based on the exploitation of industrial fish species for fish meal production, has continued to grow at the phenomenal pace of the last five years. Some concern has developed over the long-run effects of this growth rate on fishery resources and also on the international market for fish meal. Late in 1962 the Peruvian Government instituted a tax on anchoveta catches, payable by the boat owners; the tax was opposed by independent fishing enterprises, on the grounds that it discriminated in favor of vertically integrated companies, and led to a strike early in 1963. The government was urged to go slow in granting licences for the expansion of fish meal-processing facilities.

In northern Chile also the fish meal industry has developed very rapidly. Policies to help the industry have included: (1) substantial reductions in taxes and other fees, including duty-free imports of necessary equipment and materials; (2) a subsidy for fish meal plants located in specific areas which have reinvested a certain proportion of profits; (3) technical advice and assistance to industrial enterprises and co-operatives, and various provisions for the promotion of distribution in domestic markets; (4) credits for the installation of processing enterprises and for the acquisition of craft from domestic shipyards; (5) measures for the improvement of harbor installations.

In Brazil, government measures have been designed above all to improve the regulation of the distribution system and to influence price formation. The administrative machinery has been reorganized and a federal body set up for the development of fisheries, which is to draw up a national plan for fisheries development and propose measures for its implementation. The new authority is empowered to purchase and sell craft and materials, to set the prices to industry for these requisites, to regulate the prices of landings, to supervise storage and distribution, to control imports of fishing materials, to participate technically and financially in fishery enterprises, and to grant special licences to private interests within the framework of the development plan it is to draw up.

Fisheries development on an ambitious scale has been initiated in Cuba. Fishing craft have been ordered in Japan, Poland, and the U.S.S.R. Under an agreement with the U.S.S.R. a fish harbor is to be installed in Cuba and several thousand Cuban fishermen are to be trained in the U.S.S.R.

In Ghana and Guinea also craft are being acquired and crews trained in the more advanced fishing countries. Plans are for a rapid increase in domestic production and a consequent reduction of imports. In Nigeria too it is hoped to reduce imports through the rapid development of the domestic industry. In Sierra Leone the new ten-year plan aims to assist fisheries by extending credits for the acquisition of craft, outboard motors, and modern fishing gear, the facilities to be extended primarily to co-operative organizations; the construction of cold storage and of a boat yard, as well as fish pond and oyster bank projects, are also planned. Zanzibar is attempting to establish partnerships with foreign companies, in the hope that after an impetus to development has been provided in this manner

and some nationals have been trained in fishing operations, the foreign partners can be bought out and further growth achieved independently.

Many Far Eastern countries are increasingly relying on fisheries development to assist in solving their food and nutritional problems. In the Philippines a new program includes the establishment of 16 fishing harbors, and of cold storage installations, fish farms, and breeding stations. In Pakistan government support is provided for the expansion and modernization of the fish-processing industry. In Thailand revision of the act relating to the promotion of industrial investment has substantially increased the benefits to the industries to be promoted, including fish processing, deep-sea fishing, and pearl oyster breeding.

Some countries are paying particular attention to the improved exploitation of waters which are at present only inadequately fished. A number of governments, including Iran, Kuwait, and Qatar, are planning intensified exploration of the Persian Gulf, through fishing companies organized under government auspices.

#### FOREST POLICIES

In the more developed countries, there has been a change in the habitual attitude of management policies towards assessing the allowable cut. For more than a century, the estimation of stocks and increments and the assessment of the allowable cut have been treated very cautiously, but from recent inventories it has become apparent that, as a rule, these factors have been considerably underestimated. As a result, the last few years have seen considerable increases in allowable cuts, initially in northern Europe, and more recently in North America, central Europe, and Japan. In the Federal Republic of Germany, for example, the allowable cut has increased from 18 million  $m^3$  in 1953 to 26 million  $m^3$  in 1962; other factors are of course also involved in this increase, such as greater accessibility brought about by forest road construction. Even in countries such as Poland, where fellings were believed to have exceeded the allowable cut, recent investigations are likely to show that this was not the case. In Africa, too, it appears that the hitherto conservative attitude is becoming more dynamic, an example of which is the revision of the felling cycle of 100 years by the Nigerian Timber Association. In general, it

seems that the rather conservative attitude of foresters, who naturally tend to defend stocks against premature removals, is changing progressively toward a more dynamic and flexible forest policy, in which it is recognized that the wood requirements of the developing national economy must be met in a manner ensuring adequate revenues to the owner of the forest and the people employed.

The increasing standard of living in Europe has affected some aspects of forestry, and considerable forest areas are being lost, mainly to housing and industry. The rural exodus and the abandonment of marginal croplands, however, have given new opportunities for forestry expansion and restoration. On the whole the forest area is increasing and, with it, the multiple role of forestry in the policies of European countries. Within the framework of the changing pattern of agriculture, the economic functions of farm forests are taken into consideration in governmental plans. Financial aid for farm forests is given in Austria, Finland, France, the Federal Republic of Germany, the Netherlands, Luxembourg, and Spain.

Although timber supply is still the main objective of forest policy in Europe, the increasing industrialization and urbanization and the changing pattern of agriculture have resulted in a great deal of attention being paid by the public authorities to the physical and social roles of the forest. Thus, forestry considerations have recently been given greater priority in land use policy in France, the Federal Republic of Germany, Switzerland, and Austria. The question has arisen as to who should provide the necessary financial or other means in order to enable the forest owners to meet the social objectives which are having an increasing effect on forestry. An example is the prevention of forest fires, the danger of which increases during the tourist season.

In the northern part of Europe, forestry and forest industry are becoming a single entity and are increasingly treated as such by the government. Forest workers' efficiency is now considered the main task of rationalization, in order to decrease the costs of forest production.

Poland is developing its board industry in order to cover the gap between the requirements of wood products and the supply of timber logs. One plant with a sawmill for parquetry and veneer production has been set up as a first step in the utilization of beech. In order to save its European forests, the U.S.S.R. has been developing roads and indus-

trial plants for the exploitation of the well-forested regions of Siberia, and has considerably intensified forest management and harvesting in these areas.

In the Near East, the field staff of the forest administration has been decentralized and enlarged in Jordan and in Syria. In many countries there is a serious shortage of forest personnel, and the problem of forest education is consequently being given priority in the region. In Turkey the principles of the national forest policy have been embodied in the new constitution; properties with woods covering less than three hectares are exempted from all restrictions, and their owners can therefore dispose freely of forest products. In Syria a five-year plan provides for forest management, the construction of roads, houses and firebreaks, and the establishment of forest plantations for productive and protective purposes. In Iran all privately owned forests, formerly 90 percent of the total forest area, are now nationalized. In Jordan, ambitious afforestation plans are to be carried out in both the Mediterranean and semiarid regions, under the new five-year plan. Further afforestation is planned along river banks, and plantations of fast-growing species are to serve as fuel areas in 500 villages.

Cambodia, Japan, Nepal, the Philippines, and Thailand have enacted basic forest legislation. In Japan, under the revised forest law, nation-wide forest plans are established periodically as a basis for long-term production goals. The attempt to integrate forest policy and planning into the over-all national development plans is reflected in certain countries by the structure of forest administration. In Indonesia, for example, the management of profitable national forests is reserved to the *Perhutani*, a special agency formed to make the maximum profit out of the production and marketing of wood, and to use the proceeds to finance projects in the national development plan.

Progress has been made in the protection of forest estates by demarcation and reservation in India, Thailand, Japan, Malaya, Laos, and Fiji, but there is still much to be done in other countries, such as Burma and the Philippines. Though inventories and forest-working plans are making progress in most countries, only Japan has undertaken a complete forest inventory. Malaya and Thailand have completed reconnaissance inventories of the accessible and potentially accessible forests, and inventories are under way in Papua and East Kalimantan. In Indonesia inventory work has been concentrated on areas where information on raw

material supplies is essential for planning forest-industry development projects. Some 1,600,000 hectares of forested areas were opened recently in India, 16,000 hectares in Fiji, and 5,000 hectares in Borneo, while the exploitable forest area is also increasing in Burma, Cambodia, and New Zealand as a result of improved accessibility. To assure future timber supplies, countries like Japan and New Zealand, which are short of wood, have ambitious afforestation schemes. Afforestation is also an important item in Pakistan, where since 1960 the forest area has increased by about 280,000 hectares, mainly former waste land. In the central part of the Far East region, however, no shortage of timber is felt, and what is needed is, above all, improved forest management of tropical broadleaf forests, including all species, many of which have not yet been put to commercial use.

In Australia a Forestry Council has been formed to give advice on forestry matters at the federal level, and a Forest Research Institute established as a division of the Forestry and Timber Bureau. A national inventory is under way, but it is doubtful whether the states will have their inventory data complete by 1967. Over the next 40 years soft-wood plantations will be increased by up to 10,000 hectares annually. Laws have been passed for the protection of the forests.

In accordance with the law passed in 1960, the administration of the national forests in the United States continues to provide for outdoor recreation, range, timber, watershed, wildlife, and fishery purposes, in order to develop the renewable surface resources of the national forests for multiple use and sustained yield of the products and services obtained from them. Multiple use is defined as the management of all the various renewable surface resources so that they are utilized in the combination that will best meet the needs of the people. A high output is to be achieved without impairing the productivity of the land.

In Canada, cost-sharing agreements with the Provinces on such matters as inventories, road construction, fire protection, and regeneration have been in force since the creation of a separate Federal Department of Forestry in 1961. About \$8 million were available from the Federal Government in 1962. Research staff has increased by approximately 35 percent over the past five years. Legislation for the detection and suppression of fire has been further developed, with considerably greater use of aircraft for this purpose. Inventories

have been nearly completed. The Agricultural Rehabilitation and Development Act aims at the rehabilitation of some 6 million hectares of marginal croplands, a large portion of which will be planted with conifers.

The Latin American Forestry Commission has approved a charter embodying the basic requirements of forestry administration and land use policy in the region. The pressure for rapid land reform has brought increasing interest in forestry, as large forest areas are subject to agrarian reform and settlement plans. Forestry aspects are important in Ecuador, where the government maintains that, in order to obtain effective land reform, reforestation must be carried out on a large scale. Mexican law provides for forest exploitation by the *ejidatarios* themselves and curbs uncontrolled fellings by lumbermen.

The first systematic inventories and preinvestment surveys of forest resources are being made in Mexico, Honduras, Guatemala, Ecuador, and Venezuela. Throughout the region there is still an immense need for forest management and forest-working plans. Forestry now plays an important role in watershed management projects in Colombia. Ambitious projects of protection against forest fire are being carried out in Cuba and Nicaragua. A Forestry and Watershed Management Training Institute has been established in Argentina, to undertake training and research on torrent control. In Argentina, Brazil, and Colombia a number of forest reserves and national parks have been established. The projected Pan-American highway will have an important influence on forest development, and the layout of secondary roads and the exploitation of the timber are being planned in relation to the progress being made with the highway.

The findings of the Eighth Commonwealth Forestry Conference, held in Nairobi in June-July 1962, reflect the conditions in east Africa. The need for a co-ordinated land-use policy, with effective national organizations and full forestry representation, was endorsed, as well as the need to main-

tain and extend protection forests to assure water supply. The importance of private and communal forests for the general economy of east Africa was stressed, and it was recommended that governments should endeavor to ensure efficient forest management. Secondary uses, e.g., grazing, cultivation, wild life, conservation, and recreation, should also be developed under the control of forest authorities, preferably in consultation with other appropriate authorities. In unreserved areas under the control of other authorities, management, conservation, and extension of forest resources should be administered in co-operation with the forest authorities. Emphasis was laid on the importance of wild-life management, which must include keeping the animal population under control and ensuring that it does not cause damage to the forest.

In west Africa, forest inventories are being made of important forest resources in Congo (Brazzaville) and Liberia. Grading and inspection are being carried out by the Forest Department in Ghana. The tropical Shelterwood System is applied with good results in tropical countries such as Ghana and Nigeria where conditions are similar. In Nigeria, the emphasis is on plantations of fast-growing species. In Congo (Leopoldville) a Forest Fund has been established to ensure the financing of all forest activities and of studies leading to the more rational exploitation, maintenance, and development of the forests. Wildlife and game reserves and national parks have been or are to be extended in a number of countries including Upper Volta, Mali, Nigeria, and Chad. In Gabon, as a compensatory measure for okumé restrictions, the permissible felling period in the first zone has been extended for a further six months. In Western Nigeria, new measures have been approved to prevent timber companies from selecting the richest areas for earliest exploitation; the range of utilized species has greatly expanded, and in order to assist the trade in the introduction of less known species and to develop the industry, a Forest Products Research Laboratory has been opened at Ibadan.

### Short-term outlook

No great change in the world food and agricultural situation seems likely during the rest of 1963 and the early part of 1964. Supplies of most commod-

ities will remain large, though the slackening in the rate of accumulation of surplus stocks should continue. The recent revival in world prices of some

commodities will probably prove only temporary.

On the demand side it appears that the recent slower rate of economic growth is likely to continue in the main industrialized countries, though fears of a recession seem to have given way to a cautious optimism. Some uncertainty is likely to continue until the full details of the common agricultural policy of the European Economic Community have been finally agreed. While there is growing concern in the industrialized countries to prevent a decline in the rate of growth of economic activity, the conflict remains in many countries between measures to increase the rate of growth and to protect the balance of payments.

The short-term outlook is examined in more detail below, first the 1963/64 agricultural production prospects in each of the main regions of the world, and then the general outlook commodity by commodity.

#### AGRICULTURAL PRODUCTION OUTLOOK FOR 1963/64

The data so far available indicate that there will be further increases in production in most countries and for most commodities in the 1963/64 season, though unfavorable weather later in the season could of course considerably alter present prospects.

In western Europe the late spring substantially reduced wheat acreage, and with the main exception of the Federal Republic of Germany the crop is likely to be much below the record level of 1962/63. The output of coarse grains, especially maize and barley, is again likely to be high in 1963/64, and sugar production should recover from the low 1962/63 level. In the absence of unfavorable weather later in the year, a normal orange crop should be harvested in the Mediterranean countries, in spite of the effects of the severe winter of 1962/63. The output of apples and pears will probably be close to the high level reached in 1962/63. While the upward trend in the output of meat and dairy products is continuing, pigmeat production is unlikely to be much larger in 1963 than in 1962.

Good grain crops are expected in eastern Europe and the U.S.S.R., although the severe winter and early spring delayed sowing. Agricultural production in Poland, however, is likely to be sharply reduced as a result of the summer drought.

The United States wheat acreage is 8 percent larger than in 1962/63, but production will probably remain unchanged. The production of the main

coarse grains except barley should increase, and a rise of about 8 percent is expected for maize. Citrus areas in Florida suffered damage during the severe 1962/63 winter which may influence output for some years to come; in California and Arizona, however, the condition of the new orange and grapefruit crops is better than a year ago. Apple and pear crops are likely to be smaller than in 1962/63. Cotton acreage is reported to be considerably lower in 1963/64, and the area planted to tobacco has also decreased. Continued increases are anticipated in the output of meat, milk, and eggs. In Canada, the area sown to wheat shows an increase of 3 percent, and a record crop is in prospect. Some increase is also likely in the acreage of maize and barley in Canada.

For the remaining regions of the world the available information is even more scanty. The wheat acreage in Australia is higher than in 1962/63, when there was a record crop, but the wet season makes it difficult to predict the size of the harvest. In Latin America severe droughts and shortage of irrigation water in northern Mexico have reduced the prospects for cotton and forage crops, though the wheat crop is large. The increase in the producer price of wheat in Argentina is expected to result in a larger sown acreage.

In the Far East the planting of paddy was delayed by late rains in Cambodia, the Republic of Viet-Nam, and Thailand, and there were frosts and droughts in Taiwan. With the failure of the monsoon, crops are likely to be poor in parts of northern India, but total wheat production may nevertheless reach record levels in India as well as Pakistan. In Japan and the Republic of Korea lower acreage and bad weather are likely to bring a reduction of 40-50 percent in the wheat harvest, and barley production will also be lower. Sugar production should recover, especially in India, where price incentives are designed to remedy the shortfall in the 1962/63 output. Prospects are for large jute crops both in India and in Pakistan. In Mainland China expectations for the 1963/64 harvests are optimistic in spite of serious drought which delayed the planting of wheat in the north and of paddy in the southeast, and the total grain area is reported to have increased slightly.

Prospects for the major crops in the Near East point to a further increase in the region's production in 1963/64. Record harvests of wheat and barley are expected in Syria and Turkey, though in Iraq earlier expectations of good crops are likely to be vitiated as a result of floods in the northern part of the

country. Cotton production should increase further over the very high 1962/63 level; some increase in acreage is anticipated in both the United Arab Republic and Sudan, and Syrian and Turkish production should also rise. The tobacco crop in Turkey, Iraq, and Syria, however, will drop considerably because of blue mold disease.

Forecasts of the 1963/64 crops indicate a further rise in grain production in northwest Africa. Wheat production should increase in Morocco (in spite of flood damage) and Tunisia, though reports from Algeria indicate a setback to production. A record maize harvest is expected in South Africa, and sugar output should also reach record levels since producers have been advised to harvest all mature cane. Sisal production is likely to increase further, and the rapid expansion of the region's coffee production is expected to continue in 1963/64.

#### COMMODITY PROSPECTS

Present prospects are for a moderate decline in world wheat production in 1963/64 from the record level reached in 1962/63. As already indicated above, large crops are expected in most regions, but production will drop sharply in western Europe and will be more or less unchanged in the United States. The smaller crops and reduced opening stocks in western Europe, together with the partial failure of the Japanese harvest, should lead to some increase in imports, but carry-over stocks are likely to show little change by the end of the 1963/64 season.

World production of coarse grains is expected to increase further in 1963/64, with increases in all the main regions except the Far East. Maize production should show the largest increase, while the decline in the production of oats may continue. Total coarse grain exports can be expected to increase, in spite of the rise in production in western Europe, since the use of grain for feed in that region continues to grow rapidly. Stocks of coarse grains should show a further decline by the end of the 1963/64 season, though probably of more modest proportions than in the last two years.

There are as yet no firm indications of the size of the 1963/64 rice crop, though, as noted above, late rains delayed planting in parts of the Far East. A substantial increase is likely in the volume of exports. The increase in production in 1962/63 was concentrated in exporting countries, and there were small crops in several deficit countries of the Far

East, so that the expansion in export availabilities has been more than matched by a strengthening of import demand. International prices of both long and round-grain varieties of rice have tended to rise, but the excessive fluctuations that occurred in 1962 are likely to be avoided as a result of the more cautious sales policies adopted by exporting countries.

The downward movement of sugar prices to more normal levels, following the speculative fever of the spring of 1963, is likely to be reinforced during the next few months by the arrival of the beet crops in Europe and North America, which should be considerably larger than was anticipated during the spring. However, it is unlikely that the 1963/64 crops will be sufficient to permit either the rebuilding of depleted stocks or the continuation of the long-term trend for consumption to expand by about 1.5 million tons a year.

Supplies of oranges and grapefruit for marketing during the summer and autumn of 1963, primarily from the Southern Hemisphere, will be somewhat higher than last year. With the shortage of winter citrus fruit, marketing of summer fruit started very early at good prices, and no great change may be expected until the arrival of the new Northern Hemisphere winter crop, which on present indications should recover from the low level of 1962/63. Apple prices are likely to be under pressure during the autumn of 1963, in spite of lower production in the Federal Republic of Germany and the United States. Supplies of dried vine fruit in the 1963/64 marketing year are likely to be below the high level of 1962/63, and prices should remain firm.

With olive production in 1963/64 likely to be average or better, the long-term upward trend in world production of vegetable oils and oilseeds should be resumed in 1963/64. Since stocks of oils and fats in the United States (the world's largest exporter) are large, further substantial increases in prices appear unlikely.

The expansion of world meat production appears to have slowed down slightly, and beef exports in 1963 are unlikely to exceed the high level of 1962. Less beef is available for export in the surplus countries of western Europe, and the growth of exportable supplies appears to be slower in the Southern Hemisphere. Among the major importers, only Italy's beef imports will be much larger in 1963; those of the United Kingdom should remain at the 1962 level, but in the United States, with a sharp rise in domestic production, imports are likely to be below the 1962 record level. Pigmeat prices will on the

whole be firm, with production in western Europe not much larger than in 1962. Import demand may improve as a result of the halting of the expansion of pig numbers in the United Kingdom and the decline in production in the Federal Republic of Germany expected in the second half of 1962. The volume of trade in poultry meat is showing the effects of the decline in sales to the Federal Republic of Germany resulting from the increased duty under the EEC import regulations.

The upward trend in milk production in the developed countries is continuing. The situation in the United Kingdom butter market will probably become more normal later in 1963, following the temporary shortage in the early part of the year. In general the recent tendency for milk production to grow more rapidly than consumption will probably continue, unless there are major changes in national dairy policies.

The size of the 1963/64 cocoa crop remains uncertain. If it should again fail to increase, the pressure of rising demand may strengthen prices; a new record crop might cause a slight drop in prices, but would also stimulate manufacturers' stock-buying for future consumption expansion. The situation will also be affected by the outcome of the negotiations to be held in the autumn concerning an International Cocoa Agreement. For coffee, the recent greater stability in world markets should be further strengthened by the entry into operation of the new five-year International Coffee Agreement in the 1963/64 season. In view of the expected increases in African output, however, it is possible that prices of robusta coffee will show less strength than in recent years. Exportable production of tea is expanding in a number of areas and prices may continue to drift slowly downwards, though any major change in prices seems unlikely.

With the sharp reduction in the United States acreage, world cotton production is unlikely to be maintained at the 1962/63 record level, in spite of continued increases in the Near East and Far East. The consumption of cotton may recover after its temporary setback, particularly in western Europe and Japan, though not in the United States. Wool prices may continue firm into the 1963/64 season, but the rate of virgin wool consumption is likely to level off with more intensive competition from synthetic fibers. With large jute crops in India and Pakistan, world production will probably recover in 1963/64 from the previous season's setback, and prices may become more stable. The production

of hard fibers is likely to increase after some years of stability, with a sharp recovery in abaca output, and further expansion of sisal production in Africa and Latin America. The recent sharp rise in sisal prices may thus be brought to a halt. A further large increase is expected in the production of natural rubber, and since, owing to competition from synthetic rubber, consumption may not keep pace, prices are likely to continue under strong pressure.

Further improvements are anticipated in the world market for fishery products. Peru expects to raise fish meal production from about 1.1 million tons in 1962 to 1.5 million tons in 1963, and Chile's production of fish meal should double, to reach 250,000 tons in 1963. A slight reduction in world production and trade is expected, however, in the marine animal oil industry in 1963. Japanese deliveries of frozen tuna to European countries should rise from 50,000 tons in 1962 to some 70,000 tons in 1963; large deliveries are also expected to be made to United States canneries. Prospects are good for an expansion of Norway's exports of frozen fish fillets, especially to the United States and France.

Expectations of a better year in 1963 in the European forest products market were somewhat dimmed by the severe weather early in the year, but it is hoped that some of the backlog in production and consumption will be recovered in the remainder of the year. Even if consumption should not expand, some renewed stock building may lead to a modest upturn in trade, which would affect exporters not only in Europe but also in the U.S.S.R., North America, Africa, and the Far East. In North America the production and consumption of forest products are likely to show further gains, though the three-month New York newspaper strike will probably bring a reduction in the total use of newsprint in 1963. New pulp and paper capacity is due to come into production in Latin America during the year, and there are a number of projects for opening up new areas by road building and for the establishment of new industries and the integration of existing ones to improve the efficiency of the forestry sector. The better trading outlook in Europe should enable African countries to raise production and exports, while their own internal consumption should also expand. In the Far East also, import demand in Japan, Australia, and elsewhere, combined with domestic demand, should ensure further growth in production and trade in 1963. Progress in the establishment of new capacity is expected in eastern Europe and the U.S.S.R. in 1963.

## Chapter III. - BASIC FACTORS AFFECTING THE GROWTH OF PRODUCTIVITY IN AGRICULTURE

### Introduction

The most striking difference between the agricultures of developed and less developed countries, or for that matter between their economies as a whole, lies in their relative productivity. A farmer in North America or Europe, by more advanced methods of farming and the extensive use of machinery, fertilizers, and other inputs from outside agriculture, will produce many times more food and other agricultural products than a farmer in a less developed country. It follows that farm incomes are correspondingly higher in the more developed economies. It follows also that a small and gradually diminishing percentage of the population can provide for the needs of the community for food and agricultural raw materials even while continuing to meet the demand for exports, thus releasing an increasing proportion to work in industrial production or in the provision of services. This shift in the occupational structure is basic to economic development.

An essential problem in less developed economies is thus to raise the productivity of agriculture toward the level of more developed countries. It is only in this way that their rapidly growing populations can be assured of an adequate diet. It is only by a larger output per man that farm incomes can be increased and the mass of the rural population relieved from the glaring poverty which now oppresses them. It is in these ways, too, that agriculture can make its fullest contribution to the over-all economic development of the less developed countries.

Raising productivity, in the first place, is a technical problem. In agriculture, as is shown later, output per hectare as well as output per man is usually, although not always, much higher in developed than in less developed countries. This largely reflects the rapidly improving technical methods of agriculture rather than any inherent superiority of climate and soil. A century ago crop yields (and also the produc-

tivity of farm livestock) in Europe were at levels comparable with those in many less developed countries today. It is indeed only the last few decades that have seen the most remarkable increases in agricultural yields. By contrast, yields both of crops and of livestock in a majority of less developed countries have shown little or no increase. In the main, production in these countries has kept pace with the increasingly rapid growth of population, but this has resulted as much or more from a larger area under cultivation as from increased productivity per hectare.

To take in new land, however, is clearly a process which cannot continue indefinitely. Already many countries are reaching the limit of the area which can be cultivated economically, and are extending into very marginal land. Increased productivity of the land already cultivated will have to be resorted to by more and more countries, and this solution may often prove to be more effective, as well as less costly, than extending the area cultivated. Some important aspects of raising yields are discussed in Chapter IV on the role of fertilizers.

Raising agricultural productivity, however, is not only a technical problem. It is no less a social and economic problem, and also a problem of organization. Agricultural research and improvement is proceeding faster than ever. But even the systematic application of methods already well known and in regular use in more developed countries could raise immensely the productivity of agriculture in most less developed countries. The principal block is not the lack of technical knowledge, but the problem of transmitting that knowledge to millions of uneducated and often illiterate farmers, and perhaps still more of creating an environment which will enable them to put it into practice.

The obstacles which stand in the way of the more rapid adoption of improved methods of farming

are now increasingly recognized. They may be broadly classified as (a) problems of production and (b) limitations of demand.

On the production side, investment resources are frequently lacking for major projects of irrigation, land settlement, or for the provision of the infrastructure often necessary for higher agricultural productivity. At the working level, farmers in less developed countries commonly lack the means and do not have access to credit on reasonable terms for the purchase of fertilizers, draft animals, machinery, and other aids to increased output. Land tenure in many countries is still so insecure that it is hazardous to embark on long-term improvements. Conditions of tenancy often mean that a large share of any increase in output benefits the landlord rather than the actual cultivator, who thus has correspondingly less inducement to produce more for the market. Unorganized marketing and extreme fluctuations in farm prices, especially the sharp fall in prices immediately after the harvest when most farmers have to sell, are also serious deterrents to increased productivity.

These are difficult problems, not easily solved even in advanced countries, and still less so in developing countries where the machinery of government is less organized, and where the field staff (whether government, co-operative, or commercial) necessary for carrying out agricultural policies is generally weak or lacking. Nevertheless, they are problems for which solutions may reasonably be expected in the course of time.

Even then, however, there remain the problems of demand. Apart from the needs of their own families farmers cannot produce larger quantities than they can sell. If unsaleable produce is left to rot in their fields and barns, or if agricultural markets are flooded so that prices fall to unremunerative levels, farmers will clearly tend to cut back their output. In effect this means that agricultural production, and therefore productivity, must grow more or less in step with the growth of the rest of the economy, which usually provides the bulk of its market, and with the growth of export demand.

In the last century agriculture could develop rapidly in the newly opened countries of North America, Australasia, and in parts of temperate Latin America, partly because their farmers were already skilled, but also because at the same time vast new export markets were developing as Europe became industrialized. Today the impetus from the export sector is much reduced. Export markets are grow-

ing slowly and they are largely filled by the exporters who were first in the field.

With only limited prospects for growing export demand for their farm products the farmers of the newly developing countries must rely mainly on the growth of their domestic markets for the wider outlets which make possible increased agricultural production and productivity. The growth of agricultural productivity will thus be closely linked with the growth of other sectors of the economy, and vice versa. For in less developed countries the preponderant agricultural sector also provides the main market outlets for newly established industry. The integrated development of agriculture and industry is thus not only desirable, it even imposes itself on an economy, if not by careful planning, then by the wasteful braking effect of a lagging sector on the sectors which are more advanced.

But although the growth of agricultural production and productivity cannot run far ahead of the growth of demand from the rest of the economy, it must be stressed that lack of domestic demand is seldom an immediate hindrance to higher levels of productivity in less developed countries at the present time. On the contrary many of these countries are curtailing food exports, or are turning increasingly to food imports. These trends, together with rising food prices, indicate that in general food production is lagging behind rather than exceeding the growth of domestic demand.

The present chapter is designed to examine some of the main economic factors stimulating or retarding the growth of productivity in agriculture. It is not primarily concerned with the technical methods of increasing output, and only to a limited extent with the institutional problems which need to be solved if improved technical measures are to be effective. These matters have been discussed at length in earlier issues of *The state of food and agriculture*. Its main theme is rather the basic interrelations between the growth of agricultural productivity and economic development as a whole.

The chapter begins with a brief general discussion of the methods and uses of productivity measurement in agriculture. It then proceeds to a review of the magnitude of the differences in the productivity of land, livestock, and labor in different countries of the world, with some indication of their rates of growth. Consideration is given also to the role of capital in agriculture. On the basis of this factual review an analysis is developed of

some of the economic factors associated with the level and rate of growth of agricultural productivity and of their implications for agricultural development. It is hoped that this analysis, and the conclusions drawn from it, will be of help to member

countries in agricultural planning, and in the search for policies and measures which in their own circumstances will contribute most effectively to agricultural productivity and to general economic development.

## Aspects of agricultural productivity

There are a number of ways of measuring productivity in agriculture, as also in other sectors of the economy or in the economy as a whole. Each measure has its uses, and the most suitable will depend on the purpose in view. In agriculture most attention has been paid to the productivity of land, of labor, and of capital, and it is with these three aspects that the present chapter is mainly concerned. The attempt may also be made to measure the over-all productivity of the resources used in agriculture. In that case all inputs, including labor, land, buildings, machinery, fertilizers, etc., are aggregated and compared with the gross output of the whole sector. It may help to put the various aspects of agricultural productivity into perspective if the main significance of each aspect is briefly reviewed before considering them in greater detail.<sup>1</sup>

Measurement of the over-all productivity of agriculture has been attempted only for a few economically developed countries.<sup>2</sup> It requires a wealth

of statistical information which would seldom be available in countries at an early stage of economic development. Such a measurement gives an indication of the rate of growth of productivity in the agricultural sector, which may be compared with rates in other sectors or the economy as a whole. The results of national studies of this kind, however, are not as a rule comparable, as the exact conventions adopted in the measurement are not the same, and the values assigned to the various kinds of inputs and end products vary considerably from country to country.

Among the partial productivity ratios, the simplest, but in some respects the most useful, is the productivity of land. This is obviously of primary importance in countries with a high density of population. When land resources are limited the principal means of raising production to keep pace with the growth of population and the demand for improved diets is by raising yields per hectare. This applies particularly to developing countries which can ill afford heavy expenditures on food imports and must as far as possible rely on their own agricultural resources.

Raising the productivity of land, however, does not mean only raising the yields of individual crops. It encompasses the whole output of a farm or country in relation to the total area of farm land, and may be raised also by changing the pattern of production toward more intensive systems of cultivation or toward higher value crops. The productivity of land may be increased, for example, as in Japan, China (Taiwan), or United Arab Republic by raising two or even three crops a year on the same land. It may be increased also by progressively changing land from low-value crops to high-value crops.

Here a distinction must be made between the measurement of agricultural output in terms of calories (or some other measurement of food values), and in terms of money values. For example, if in temperate countries land is shifted from cereals to potatoes the output per hectare in terms of calories

<sup>1</sup> For a concise discussion of the methods and uses of various measurements of agricultural productivity, see OECD. *Concepts of productivity measurement in agriculture on a national scale*. Paris. OECD Documentation in Food and Agriculture, No. 57, 1962.

<sup>2</sup> Attempts to measure the over-all productivity in agriculture include:

Belgium: J. Lommez. *La productivité dans l'agriculture*. *Revue de l'agriculture*, 9: 1335-1380, 1956.

Canada: S.H. Lok. *An enquiry into the relationships between changes in overall productivity and real net return per farm, and between changes in total output and real gross return*, *Canadian Agriculture*, 1926-1957. Canada, Department of Agriculture, October 1961. (Mimeographed.)

New Zealand: B.P. Philpott and J.D. Stewart. *Income and productivity in New Zealand farming, 1921-56*. Christchurch, Lincoln College, University of New Zealand. Technical Publication No. 17, August 1958.

United Kingdom: Productivity measurement in agriculture. In *Economic trends* No. 91, May 1961. (Published by the Central Statistical Office of the Government of the United Kingdom.)

United States: U.S. Department of Agriculture. *Productivity in agriculture: United States, 1870-1958*. Washington, D.C., Technical Bulletin No. 1238, 1961.

John W. Kendrick. *Productivity trends in the United States*. Princeton, Princeton University Press. National Bureau of Economic Research General Series No. 71, 1961.

of human food is likely to be increased. But its productivity in terms of money values may be changed up or down according to the relative prices of cereals and potatoes. Again shifting land from main crop potatoes to early season potatoes or to luxury vegetables may well increase its productivity in money terms, but will almost certainly reduce it in terms of calories. Good pasture land used for grazing will usually produce less in calories for human food than if cropped with cereals for direct consumption, but may well show higher productivity in money values.

In less developed countries with dense and fast-growing populations where food is perennially scarce, the first need may be to maximize the volume of the total output. The same was true in many of the more developed countries during the second world war. In such cases the measurement of the total output in terms of calories would be of significance. Of more general application, however, are value aggregates, and in the sections which follow, therefore, the productivity of land (except for individual crops) is discussed primarily in terms of money values or in conventional units based ultimately on average price relations. This is the method used also for calculating indices of total output.

For some other purposes the productivity of labor may be a more significant measure. Labor productivity is in fact the most common form of measurement, and is usually implied in economic discussions when no specific definition is given.<sup>3</sup> Insofar as the output per man is one of the major determinants of the general level of economic welfare, labor productivity is a significant yardstick of economic progress. Various measurements of labor productivity may, moreover, have specific uses in policy formulation, e.g., with regard to income distribution, occupational distribution of labor force, etc.

The productivity of labor is a somewhat more complex concept than land productivity. It may be simply expressed by the hours of work needed to produce, e.g., a ton of wheat or cotton. But except where mainly monocultural agriculture is practiced such measurements have a limited meaning, and more commonly labor productivity is measured by the total agricultural output per unit of labor.

At this point the problem becomes more difficult, not only because of the difficulties of measurement – these are discussed later – but also because two different methods may be used to measure both labor and output. Thus, according to the purpose in hand and the data available, the labor input may be expressed as the total number in the labor force or, in order to take into account the intensity of labor, as the number of man-hours worked in agriculture. Similarly the total agricultural output may be taken as the gross farm output (net only of seed and feed, to avoid double counting as is done for production indices). Or it may be taken as the value added by labor and other factors in the agricultural sector; i.e., the value of fertilizers, pesticides, fuels and other inputs from outside the agricultural sector, is subtracted from the value of the output in order to determine the net contribution of the agricultural sector.

These more refined systems of measurement, in particular value added per man-hour, are of importance chiefly in economically advanced countries where it is intended to compare labor productivity in agriculture with that in other occupations, or where it is necessary for social purposes to compare the incomes and productivity of workers in agriculture with those in other sectors. They are of less importance in economically less developed countries where there is commonly an abundance of farm labor, and where farm workers are often seasonally unemployed or underemployed except at times of peak labor demand, e.g., at harvest. Even there, however, estimates of output per man-hour may be of value in giving some indication of the extent of underemployment, and to show what reserve of working time might be available for other agricultural enterprises, or for part-time work outside agriculture.

More significant for countries at an early stage of economic development, however, is the cruder ratio showing merely the gross output per person engaged in agriculture, which is closely related to the distribution of the labor force between agriculture and other sectors of the economy. It is well known that as countries develop economically the percentage of the population engaged in agriculture progressively declines. In those at a very early stage of development as much as 80 percent of the population may be engaged in agriculture, largely of a subsistence type. In the most developed economies this proportion may have fallen to 10 percent or less. This gradual shift from agriculture to other

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<sup>3</sup> The primacy of labor is recognized in one form of productivity measurement, the "accumulated labor" concept, in which the labor necessary to produce all the inputs is aggregated and added to the labor worked in the sector under consideration. See, for example, OECD. *Op. cit.*, p. 23-24.

economic sectors is of the essence of economic development. The needs for food and fibers, etc., although increasing, are met by a gradually diminishing proportion of the labor force; this releases a constantly increasing share of the manpower for industrial and service activities and makes possible a continuing increase in the total national product.

But for the agricultural needs of a community to be met by a diminishing percentage of the population it is obviously necessary to have a corresponding increase in the output per person remaining in agriculture. Whereas at a very early stage of development the surplus product of the 80 percent in agriculture has to feed only the 20 percent in other occupations (ignoring for the moment any exports or imports), at a midway stage the 50 percent in agriculture must produce enough food and other farm products for themselves and for the 50 percent in other occupations and so on to an advanced stage when say 10 percent in agriculture feed themselves and the 90 percent outside agriculture. Labor productivity must indeed grow faster than would be necessary to compensate for the changing balance of population between sectors, for with economic development and rising incomes there is also a rise in the per caput demand for farm products. This rise in labor productivity in the earlier stages of development is likely to take the form of a reduction in agricultural unemployment or underemployment, and an increase in the number of hours or days of work. In later stages the main increase comes from a larger output per hour, often coupled with a reduction in the number of hours worked.

The above is an oversimplified statement of the significance of the growth of labor productivity in agriculture for economic development as a whole. This is discussed more fully in a later section. It may serve, however, to bring out the key role in economic growth of a continuing rise in labor productivity in agriculture.

Before turning to the productivity of capital the point may be made that in any country increases in the productivity of land and of labor often go hand in hand.<sup>4</sup> When crop yields are increased or the pattern of cropping intensified there is usually — although not always — an increase in output per man. Similarly when improved methods are adopt-

ed to increase efficiency and raise labor productivity and farm incomes, there is often as a secondary result an increase in land productivity and total output. In countries with agricultural surplus problems this may be embarrassing, and increased labor productivity may then have to go hand in hand with measures for a more rapid reduction in the agricultural labor force and with measures to limit the area under cultivation.

Less can be said on the productivity of capital. Clearly, in agriculture as in other industries a rise in labor productivity is associated with increasing capital investment, in the form of land improvement, irrigation, farm buildings, livestock, and machinery. It is mainly these facilities, and the skills needed to use them efficiently, which make possible an increased output per man.

In fact, however, estimates of capital productivity give relatively little guidance in ensuring the most efficient use of the limited capital resources. In part this is because the statistics on capital in agriculture are rather poorer than those on land and labor, not least because much of this investment, especially in less developed countries, consists of nonmonetized investment stemming from the unpaid labor of the farmers themselves. The terracing of slopes, the bunding of paddy fields, the construction of irrigation ditches are examples of this type of nonmonetized investment which is of crucial importance for raising both output and productivity. In addition the annual input of capital flowing from the total capital stock of the sector, as measured by the sum of interest and depreciation of the capital stock, is a relatively small portion of the total input, and one which is being constantly substituted for other inputs, e.g., mechanization to replace labor. Ratios of total output to the capital input are therefore unlikely to reveal much about the efficiency of the use of this resource.

This does not mean, of course, that capital is not of vital importance to agriculture. As is shown later, the requirements of fixed capital stock in agriculture — even excluding land — often appear to be greater in relation to the output than those of manufacturing industries and mining, though there are considerable differences between countries in methods of estimation. In addition, agriculture in more advanced countries requires a substantial investment of working capital, in the form of fertilizers and other goods and services, where the main return from the outlay incurred comes within the course of a few months. It is pointed out later

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<sup>4</sup> This relation applies only to changes in any particular country. As is shown later, countries with a high output per hectare are by no means always those with high labor productivity, and vice versa.

that these two characteristics, together with the frequent exclusion of the important element of nonmonetized investments, may have sometimes led to an underestimation of the capital needs of agriculture.

But if short of monetary capital, and especially of foreign exchange, less developed countries commonly have an ample supply of farm labor. In planning agricultural development it is thus no more than common sense, wherever possible, to adopt policies and measures which make use of this abundant resource by encouraging nonmonetized investment, rather than highly mechanized or other capital-intensive development better suited to an economy where labor is scarce and capital more abundant. It is significant that in nearly all highly developed agricultures, including those of western Europe, North America, and Japan, the first stages of development were carried through with relatively little aid from other sectors. Little indeed was then available. On the contrary, agriculture provided much of the capital required for development in other sectors. The experience of these countries makes it clear that a fairly high degree of development in agriculture

is possible through improved methods developed within the farm sector, with little external investment.

One further clarification may be useful at this stage. It has to do with the difference between the concept of rentability or profitability on the one hand, and productivity on the other. Both are economic concepts, and the fact that inputs and outputs are necessarily aggregated in value terms brings about a close relationship between the two. Productivity measurement, however, aims principally at finding out the changes or differences in the total physical output (although measured in value terms) per unit of input, and thus uses statistical methods (i.e., a set of fixed price weights) to eliminate the effect of price changes on the ratio of output to input. For profitability, on the other hand, price changes themselves are a major determinant and as significant as the relationship between inputs and outputs, which enter into the measurement of productivity. They are therefore calculated with current prices of inputs and outputs.

These three aspects of agricultural productivity, the productivity of land, of labor, and of capital, may now be discussed in turn.

### The productivity of land

In the 23 years from 1934-38 to 1956-60 world population grew by nearly 35 percent and world agricultural production by about 45 percent.<sup>5</sup> Available statistics, especially of land used for grazing, do not permit any global estimate of how much of the increased output came from a larger farming area and how much from greater productivity. Some indication of the relative contribution of these two factors is obtained however from Table III-1. This shows the percentage change in cultivated area, production, and yield of 12 major crops since the pre-war period, combined on a price-weighted basis.<sup>6</sup>

<sup>5</sup> Unless otherwise indicated all world totals in this chapter exclude Mainland China, for which recent statistics are not available.

<sup>6</sup> The price weights used here and in other aggregations of gross farm output shown in the chapter are, unless otherwise indicated, those used in calculating the FAO index numbers of agricultural production. The weights are based on regional averages of producers' prices for the various products relative to the price of wheat, which for all regions is taken as 100. For a list of the price weights and for a description of the methods of calculating the indices, see FAO, *Monthly Bulletin of Agricultural Economics and Statistics*, Vol. IX, No. 3, March 1960.

It is at once evident that the situation is very different in different regions of the world. In North America, Europe, and Oceania, or, generally speaking, in the economically more developed countries, much the largest contribution to increased production has come from higher yields. In the economically less developed regions, on the contrary, increased yields have contributed relatively little, and the higher output has come primarily from an extension of the cultivated area. This is true even in the Far Eastern region, where population is already dense relative to cultivable land.

The picture as shown in Table III-1, though much oversimplified, nevertheless brings out the essential point that, although in the earlier stages of economic development increased agricultural production has depended mainly on an extension of the cultivated area, this does not apply in more developed economies. In North America and western Europe, indeed, crop areas have tended to contract, (partly owing to deliberate policy) but production has continued to climb because of the rapid increase

TABLE III-1. - GROWTH OF PRODUCTION OF 12 MAJOR CROPS<sup>1</sup> 1934-38 TO 1958-60 AND CONTRIBUTION OF AREA AND YIELD

	Change in production	Change in crop area	Change in yield per hectare
	Percent	Percent	Percent
North America .....	+ 73	- 3	+ 78
Western Europe .....	+ 23	- 4	+ 29
Eastern Europe and U.S.S.R. ....	+ 24	+ 6	+ 16
Oceania .....	+ 78	+ 18	+ 52
Latin America .....	+ 60	+ 41	+ 14
Far East <sup>2</sup> .....	+ 32	+ 24	+ 6
Near East .....	+ 69	+ 65	+ 2
Africa .....	+ 92	+ 50	+ 28
All above regions .....	+ 41	+ 13	+ 24

<sup>1</sup> Price-weighted totals of wheat, rye, barley, oats, maize, rice, potatoes, soybeans, groundnuts, tobacco, cotton and jute. - <sup>2</sup> Excluding Mainland China.

in yields. It seems clear that the emphasis on higher yields must gradually extend to the less developed regions of the world if the greatly increased populations expected by the end of the century are to be fed, and especially if they are to be fed at the higher nutritional levels now accepted as necessary.

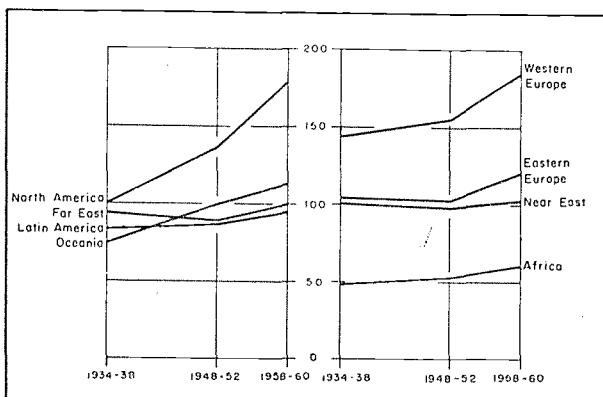
On present United Nations estimates, the world's population may well double by the end of the century. And while FAO studies<sup>7</sup> indicate that in the world as a whole there remain large areas of unused land which are suitable for cultivation, more indeed than has sometimes been believed, it is most unlikely that an extension of the crop area alone could cope with the enormous increase in the demand for farm products which is now foreseen. Many countries in the less developed regions are already running short of land and are turning to more intensive methods of farming and, as population continues to grow, still more will find themselves in this position.

This more recent development is only evident from more detailed statistics, for the averages in Table III-1, though they bring out the broad trends, inevitably conceal differences between the various crops or between the individual countries of each region. The long period of nearly a quarter century also distorts the picture, since some regions were much more affected by the second world war than others. For example, by 1948-52 average yields of the 12 crops in North America<sup>8</sup> were already

<sup>7</sup> W. H. Pawley. *Possibilities of increasing world food production*. Freedom from Hunger Campaign, Basic Study No. 10, Rome, FAO, 1963.

<sup>8</sup> Yields were particularly low, however, in North America in 1934-38, a period which included two years of extreme drought, and this tends to overstate the percentage increase.

FIGURE III-1. - GROWTH OF COMBINED AVERAGE YIELDS OF 12 CROPS, BY REGIONS, 1934-38, 1948-52, AND 1958-60 (INDICES OF PRICE-WEIGHTED AVERAGES; WORLD AVERAGE 1934-38 = 100)

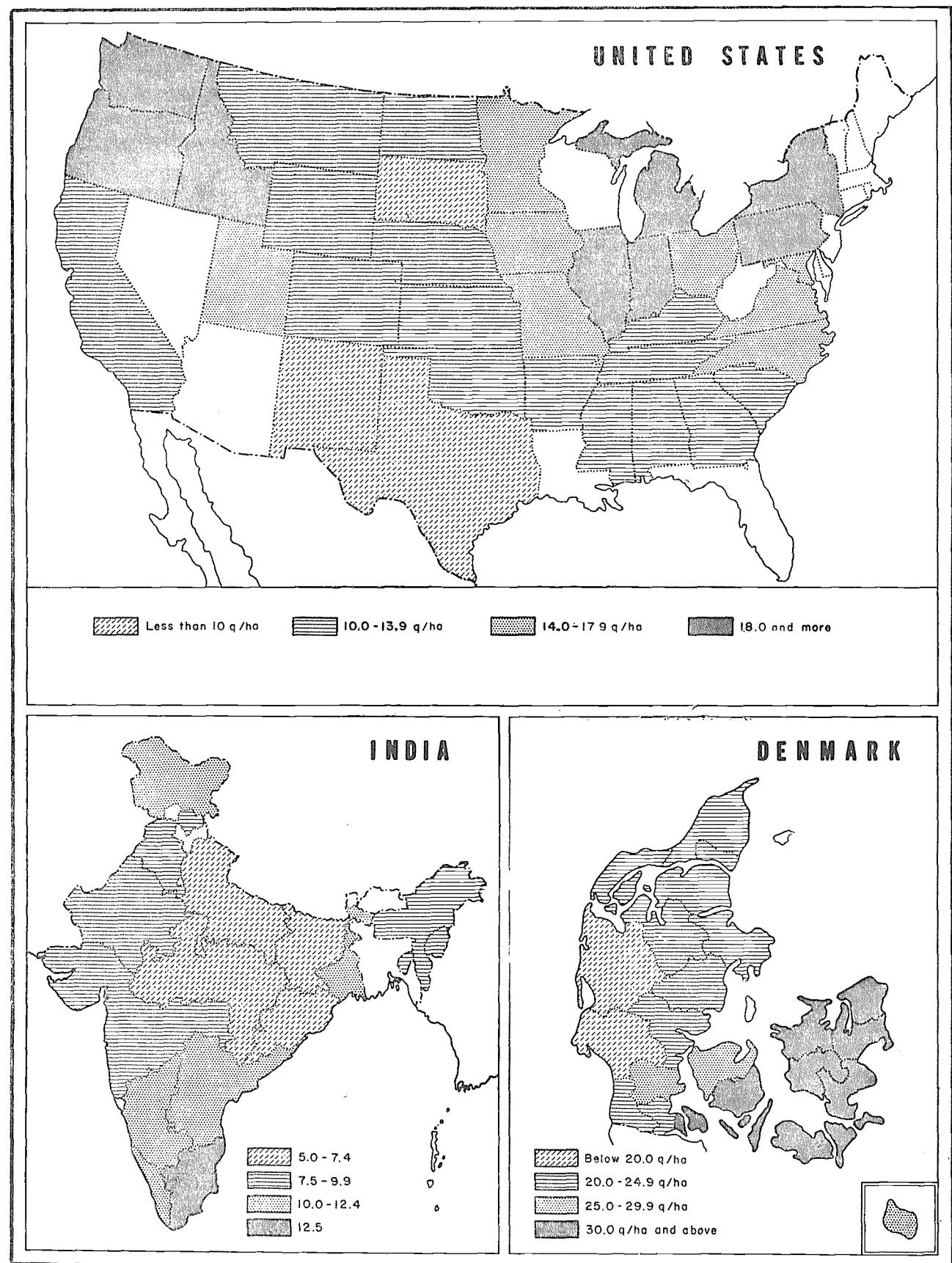


35 percent, and in Oceania 34 percent higher than in 1934-38, while those in Europe had little more than regained their prewar level and those in the Far East were still appreciably lower than before the war.

The growth of yields of the 12 crops in each region is shown in Figure III-1 in the form of indices (world average 1934-38 = 100). The use of price weights tends to reduce somewhat the over-all levels of the indices for Europe and Oceania which do not produce very extensively such high-value crops as cotton and tobacco. Nevertheless it reflects approximately the relative position of each region. It may be noted that apart from the high yields in western Europe and the low yields in Africa, the range in 1934-38 was more limited than at the present time. While the more rapid increase in yields in the economically more developed countries is evident, an encouraging feature is the upturn in the rate of growth in the economically less developed regions during the past decade. In comparison with the world average of 17 percent, the growth of average yields since 1948-52 was 15 percent in Africa, 10 percent in Latin America, 13 percent in the Far East, and 4 percent in the Near East where, however, yields were reduced by widespread drought.

The fact that yields of crops and livestock in most less developed countries are commonly low compared with those in most economically more advanced countries is well known, though there are a good many exceptions. To a considerable extent these differences in yields reflect differences in soils and climate. It has indeed been argued that economic development began in the areas best endowed agriculturally. But while this may be

FIGURE III-2. - DIFFERENCES IN GRAIN YIELDS IN DIFFERENT PARTS OF THE UNITED STATES, INDIA, AND DENMARK. UNITED STATES: WHEAT, 1956-60 AVERAGE (EXCLUDING STATES WITH A HARVESTED AREA OF LESS THAN 40,000 HECTARES); INDIA: RICE, 1954/55-58/59 AVERAGE (CLEANED BASE); DENMARK: RYE, 1948-52 AVERAGE



partly true, it seems too simple a view to accept without heavy qualifications. It ignores, for example, such facts as that, a few centuries ago, some countries where crop yields are still low (e.g., India and Pakistan) were in the vanguard of civilization. It leaves out of account that crop yields in the more advanced countries of today were formerly much lower than they are now, and probably not much higher than those still found in many less developed countries.<sup>9</sup>

This section, therefore, examines the extent of the differences in yields between countries, and considers how far they are related to the stage of economic development and how far the recent rapid growth of the productivity of land in the more developed countries may be expected to extend to the less developed countries. Given the 20th-century population explosion, these are evidently questions of crucial importance.

#### YIELDS OF INDIVIDUAL CROPS

There is no question of the immense influence on crop yields of soil and climate. This is evident not only between countries, but also within individual countries where differences between the stage of economic development and the general economic and social background are likely to be less than between countries. Examples are shown in Figure III-2 (*a*, *b*, and *c*) which compare current yields of wheat in different areas of the United States, of rice in India, and of rye in Denmark. In the United States, for example, average yields in 1956-60 varied from less than 10 quintals of wheat per hectare in Texas, New Mexico, and South Dakota to over 20 quintals per hectare in parts of New England, the Lake States, and the Pacific Northwest and Idaho. The range between the lowest and highest yielding states (excluding those with a very small acreage) was approximately threefold. In India the distribution of rice yields appears to be associated with rainfall, and the differences may even out as irrigation becomes more developed. The example of Denmark is interesting; there is little difference in climate between the western and eastern sides of this relatively small country and the fact that 10 years ago yields of rye were only about half as great on

the western side appeared to be mainly due to soil type. Since then, however, the differences in yields between the two sides of the country have been greatly reduced. It is possible that the closer proximity of the eastern side to the main centers of population may have been another factor leading to an earlier development of an intensive pattern of farming.

Differences in yield are naturally very much greater when different countries are compared. Average wheat yields in selected countries in the period 1958-60 range from less than 4 quintals per hectare in the arid climate of Tunisia to over 40 quintals per hectare in the more favorable conditions of the Netherlands, where in addition standards of cultivation are particularly high. This represents a range of more than tenfold.

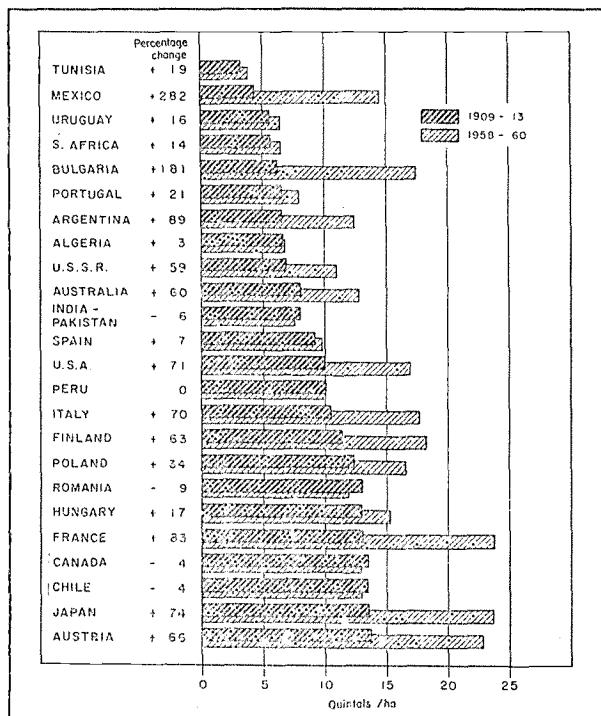
The most significant fact about these intercountry comparisons of wheat yields, however, is perhaps not the range at the present time, but the fact that if countries are ranked according to the level of yields, the relative position of different countries has changed radically in the last few decades. In some countries yields have remained almost unchanged for a long period of years, while in others there has been a rapid increase in output per hectare. This makes it clear that the effects of climate and soil are in no way immutable, but may be profoundly modified by improvements in methods of farming.

The effects of technological developments are well brought out in Figure III-3, which shows average wheat yields in 24 countries, all with relatively low yields, in the period 1909-13, immediately before the first world war, in comparison with average yields nearly 50 years later in the years 1958-60. In some countries there has been rather little change in yields during this period, and in a few instances average yields in 1958-60 were fractionally lower than in 1909-13. Because of year-to-year fluctuations due to weather, however, little significance can be attached to differences in yields of less than 10 percent between the two periods, or in countries with extreme annual fluctuations even of 20 percent.

In many instances, however, the increase in yields is so large that its significance cannot be questioned. Nine of the countries included in Figure III-3 have increased their average yields between 50 and 100 percent during the 50-year period. Even more striking are the figures for Bulgaria which has raised its average yield of wheat nearly three times, and for Mexico with an increase of nearly four times during the period.

<sup>9</sup> See for example Tables IV-9 and IV-10 in the following chapter on fertilizers showing the long-term development of yields of wheat in England and of rice in Japan.

FIGURE III-3. - AVERAGE WHEAT YIELDS IN 24 COUNTRIES IN 1909-13 AND 1958-60



Thus if the ranking had been based on 1958-60 data, the order of the countries would have been very different indeed. Mexico in the lowest position after Tunisia in 1909-13 now has yields midway between those of the United States and Canada. Australia in 1909-13 had average yields slightly lower than those in India and Pakistan, though they are now almost 70 percent higher. France in 1909-13 had wheat yields comparable to those of Chile, though they are now nearly twice as high.

Average increase in wheat yields over the period for the countries in the chart are set out in Table III-2.

What is particularly striking in Table III-2 is the number of instances where countries with comparable geographical conditions and climate show wide differences in the growth of yields, e.g., Spain and Italy; Romania and Bulgaria; Australia and South Africa; Uruguay and Argentina.

The countries included in Figure III-3 were chosen to bring out the large increases which had been attained in some countries with low yields where natural conditions were not always favorable. It should not be supposed, however, that comparable increases have not taken place in countries where yields were already relatively high before the first world war. For example, yields of wheat in the United Kingdom averaged 21 quintals per hectare in 1909-13 and 34 quintals in 1958-60, an increase of 61 percent. In the Netherlands the average rose over the same period from 23.4 to 41.6 quintals, or by 78 percent, and is now the highest in the world.

As with the data in Figure III-1, account needs to be taken of historical circumstances in considering the data on wheat yields. Thus in most European countries yields were considerably depressed during the first world war and again in the second world war, as in Japan and some other countries during the second world war, and this may well have influenced the over-all rate of growth. In Canada average yields fell over the period 1909-13 to 1934-38 under the combined influence of a rapid extension of the crop area and unfavorable weather, but have since begun to climb. Similarly in India and Pakistan there was a slow decline in yields until about

TABLE III-2. - PERCENTAGE CHANGE IN YIELDS OF WHEAT, 1909-13 TO 1958-60

Fall in yield %	Increase in yield by:								
	up to 20 %	20 - 50 %	50 - 100 %	over 100 %					
Morocco .....	23	Peru .....	-	Portugal .....	21	Brazil .....	52	Bulgaria.....	181
Romania.....	9	Algeria .....	3	Denmark .....	30	Greece .....	56	Mexico .....	282
India/Pakistan .....	6	Spain.....	7	Poland .....	34	U.S.S.R.....	59		
Chile .....	4	Ireland .....	8	U.A.R.....	37	Australia .....	60		
Canada .....	4	Sweden .....	13	Belgium .....	47	United Kingdom .....	61		
		South Africa .....	14	Switzerland .....	47	Finland .....	63		
		Uruguay.....	16			Austria .....	66		
		Hungary.....	17			Italy .....	70		
		Tunisia .....	19			United States .....	71		
						Japan .....	74		
						New Zealand .....	75		
						Netherlands .....	78		
						France .....	83		
						Argentina .....	89		

1928-32 after which a gradual upward tendency became evident, interrupted, however, by the second world war. In Japan, except during the second world war, there has been a continuous rise in yields of both wheat and rice since the Meiji restoration in 1868, though the rate of growth slowed down during the interwar period as a result of the economic depression coupled with large competitive imports of rice from Korea and China (Taiwan). In the United States and the United Kingdom, on the contrary, wheat yields showed no very marked upward trend until the early 1940s, but have since shown a fairly continuous rise.

It may appear that the rate of growth in yields would be associated with economic and social factors in the various countries, coupled with "lumpy" technological developments, e.g., large-scale irrigation projects. That the factors concerned are complex, however, is evident from the fact that the rate of growth of wheat yields in a roughly comparable period varied almost as much between individual states of the United States as between

different countries (Table III-3), though all states will have benefited from such measures as support prices. From the tabulation it appears that, in general, the rise in yields was greatest in some well-defined geographical belts, and often in areas where yields were lowest in the initial period 1906-15.

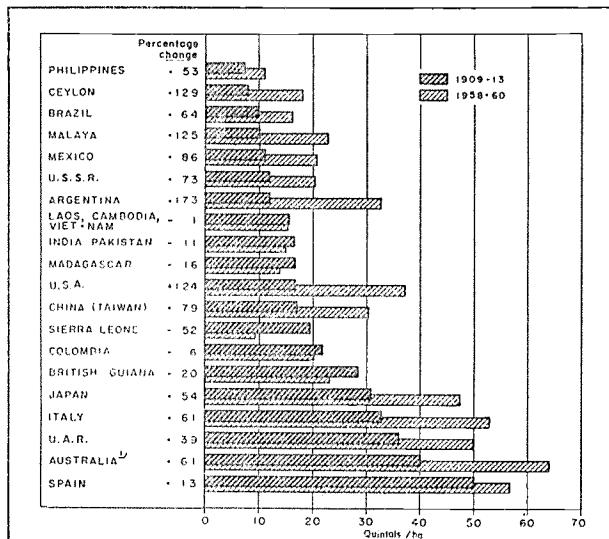
Turning to rice, the world's other major food grain, the situation is essentially similar to that of wheat (Figure III-4). The current range of yields from the lowest to the highest yielding countries is about seven times, but because of wide differences in the rate of increase, the ranking of countries today is very different from what it was before the first world war. At that time, for example, average yields of rice per hectare in the United States and China (Taiwan) were much the same as those in India and Pakistan. Since then yields in India and Pakistan have shown no net gain (they are now beginning to rise after a long, slow decline) whereas yields in China (Taiwan) and the United States have risen dramatically by about 80 percent and 120 percent respectively and

TABLE III-3. - CHANGE IN WHEAT YIELDS IN INDIVIDUAL STATES OF THE UNITED STATES, 1906-15 TO 1956-60

Average wheat yield 1906-15 (quintals per hectare)	Fall in yield %	Increase in yields by:		
		up to 20 %	21 - 50 %	over 50 %
Under 8			S. Dakota (+ 22) Alabama <sup>1</sup> (+ 47)	N. Dakota (+ 51) Tennessee (+ 55) Arkansas (+ 69) Georgia <sup>1</sup> (+ 76) S. Carolina (+ 97) N. Carolina (+ 104)
8 - 10		Texas (+ 16) Mississippi <sup>1</sup> (+ 19)	Kentucky (+ 32) Oklahoma (+ 46) Kansas (+ 49)	W. Virginia (+ 54) Missouri (+ 67) Virginia (+ 79) Minnesota (+ 81)
10.1 - 12			California (+ 29) Nebraska (+ 34) Maryland (+ 43)	Delaware (+ 53) Pennsylvania (+ 53) Ohio (+ 58) Illinois (+ 71) Indiana (+ 80) Michigan (+ 88)
12.1 - 14			Iowa (+ 25) New Jersey <sup>1</sup> (+ 33) New York (+ 45)	
14.1 - 16	New Mexico (-53) Colorado (-27) Montana (-2/) Wyoming (-26) Utah (-18)	Idaho (+ 18)	Washington (+ 41) Oregon (+ 48)	

<sup>1</sup> Less than 50,000 hectares under wheat in 1956-60. States with less than 40,000 hectares under wheat have been omitted.

FIGURE III-4. - AVERAGE RICE YIELDS IN 20 COUNTRIES IN 1909-13 AND 1958-60



<sup>a</sup> Black bar refers to 1923-27.

are thus around twice the level of current yields in India and Pakistan.

Indeed the contrasts between the almost unchanging yields in some countries, and the striking gains in others is even more remarkable for rice than for wheat (Table III-4). This may reflect the rather low yields of rice in most countries in 1909-13 and the fact that research to raise rice yields began considerably later than research on wheat. It suggests that very large gains are possible in many countries where yields are now low.

It would be possible to make similar comparisons for other crops, though there are fewer countries for which long-term series of yield statistics are available. The main point, however, seems to be established that while soil and climate greatly influence the yield of individual crops, current levels

of productivity are by no means immutable. By improved methods of farming, which may necessitate irrigation as well as the provision of improved seeds, fertilizers, and pesticides, the yields per hectare of the currently less productive countries could be greatly increased. The data presented above cover a 50-year span as it seemed well to take a long perspective to bring out the magnitude of the changes which have taken place. But as already noted in some countries, the United States and the United Kingdom for example, the greater part of the increase in yields has been crowded into the last two decades. The same is true of some less developed countries, e.g., wheat in Mexico. The fact that a 50-year period has been covered thus by no means implies that so long a period is needed to achieve major increases in yield. Where the necessary measures are taken, large increases can be achieved in an appreciably shorter time (Figure III-5).

#### PRODUCTIVITY OF LIVESTOCK

Increased productivity of livestock contributes no less than higher yields of crops and pasture to the total output from each hectare of land. To measure it in a meaningful way is, however, more difficult than to measure the productivity of land.

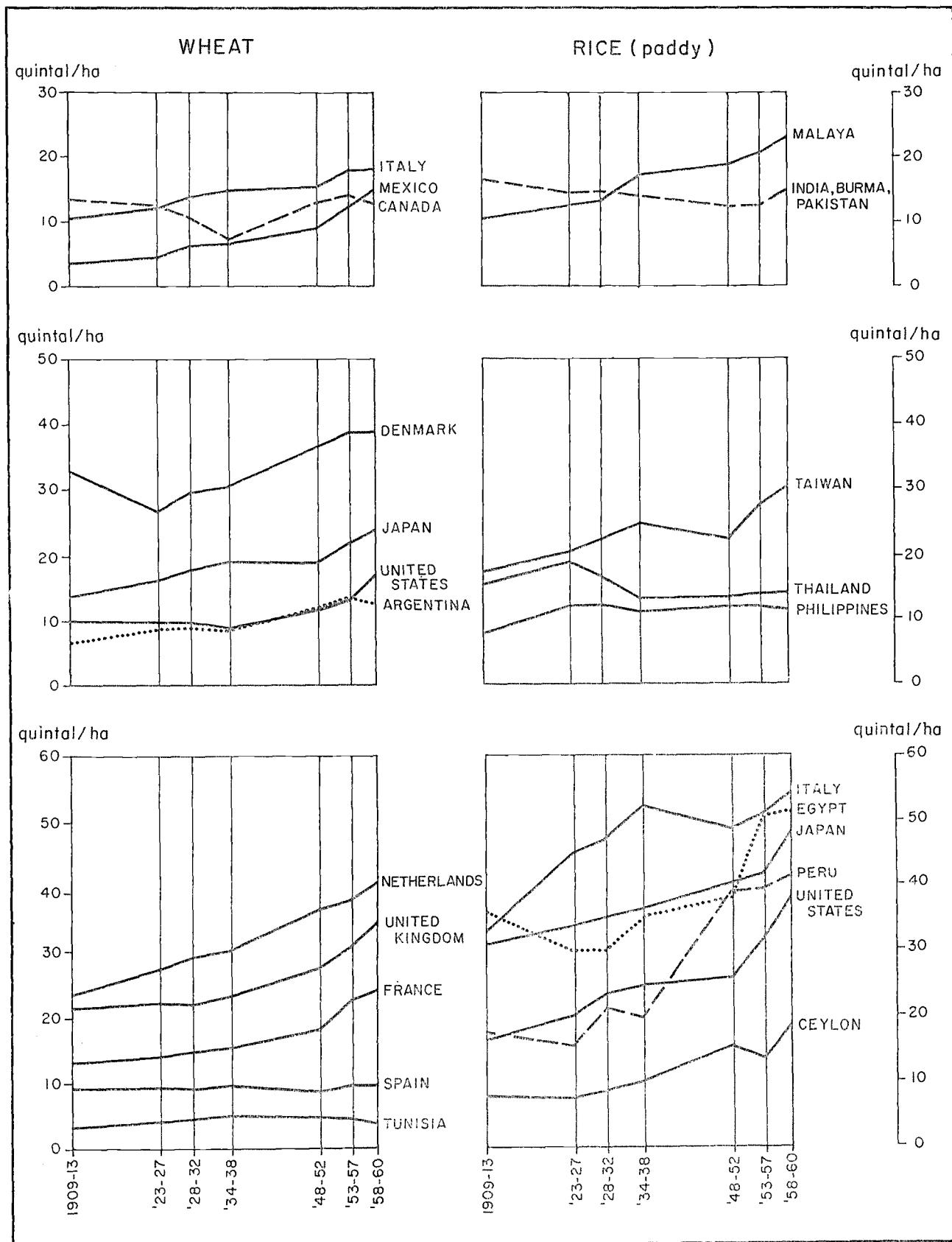
The difficulty applies to both the output and the input. Much of livestock production results in more than one end product: cattle may produce milk, beef, and hides, sheep may produce wool and meat, etc. A comparison of, say, the milk output of specialized dairy cows with that of dual purpose animals kept for both milk and beef may be misleading. To aggregate the output of all livestock products, with suitable price weights, solves part of the problem but not all of it, because

TABLE III-4. - PERCENTAGE CHANGE IN YIELDS OF RICE, 1909-13 TO 1958-60

Fall in yield %	Increase in yield by:								
	up to 20 %	20 - 50 %	50 - 100 %	over 100 %					
Fiji .....	58	Spain .....	13	U.A.R. .....	39	Philippines .....	53	Portugal .....	103
Sierra Leone.....	52					Japan .....	54	United States .....	124
British Guiana .....	20					Bulgaria .....	59	Malaya .....	125
Madagascar .....	16					Australia <sup>a</sup> .....	61	Ceylon .....	129
India/Pakistan .....	11					Italy .....	61	Peru .....	134
Thailand .....	8					Brazil .....	64	Argentina .....	173
Colombia .....	6					U.S.S.R. .....	73		
Laos, Cambodia, Viet-Nam .	1					China (Taiwan) .....	79		
						Mexico .....	86		

<sup>a</sup> From 1923-27 to 1958-60.

FIGURE III-5. - TREND OF WHEAT AND RICE (PADDY) YIELDS IN SELECTED COUNTRIES 1909-13 TO 1958-60



of the widespread use of livestock, particularly in the less developed regions, for draft power. A complete accounting of the output would therefore also require the inclusion of the draft power produced by livestock.

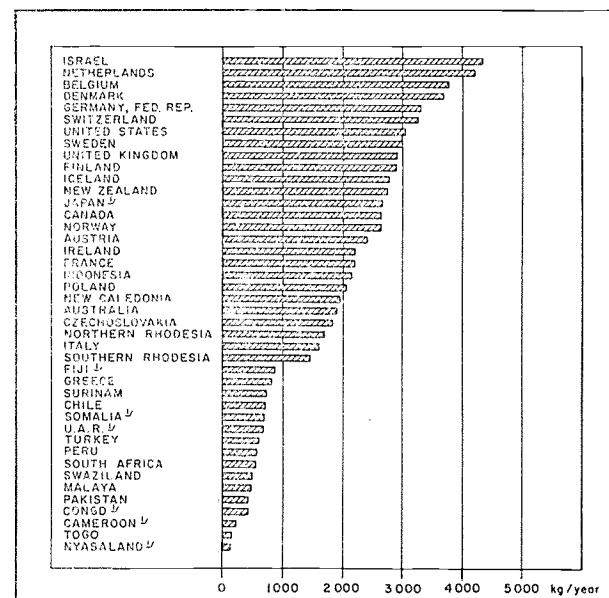
The principal input is in a sense the capital represented by the livestock itself. Other inputs include the feeding stuffs which they consume, whether from grazing or in the form of preserved or concentrate feeds, and the land which as pasture or cropland is devoted to livestock production.

None of these measurements when combined give a very satisfactory indication of productivity. The simplest and the most frequently used comparison is the output of milk or meat per animal, which would be significant when cattle are of about the same size or weight. But if in one country the common breeds of livestock are large and in another small, differences between the average output per animal in the two countries will in part reflect these differences in size rather than their relative efficiency. And since small cattle eat less and since more small cattle can be kept on a given area, the total output of meat or milk per unit of feed or per hectare of land may be as high in one country as in the other. It could not then be said that the average productivity of the larger breeds was greater than that of the smaller breeds.

A further complication is that the productive life of cattle spreads over many years. During the first years the output is nil unless the gain in live weight can be counted; during maturity it may fluctuate, and at times may even be negative (e.g., if beef cattle lose weight during a period when feed is scarce); while finally, there is a large output of meat, hides, etc., when the animal is slaughtered. The difficulty of spreading the output over the whole life cycle is admittedly averaged out when the annual output of a fairly stable livestock population is considered. But in many countries livestock numbers fluctuate considerably with profitability (the pig cycle is a well-known example) or in accordance with feed supplies (as when livestock are slaughtered in time of drought), and the annual output is then a less valid indicator of productivity.

Finally, even in the more economically developed countries livestock statistics are not as a rule as accurate as those for the main crops, while in less developed countries they are often very incomplete and inaccurate indeed. Comparisons, except among the few developed countries with good livestock statistics, must therefore be made with much caution.

FIGURE III-6. - AVERAGE MILK YIELDS PER MILK COW IN 42 COUNTRIES IN 1958-60



<sup>1</sup> 1948-50.

NOTE: The figures used here and in Table III-5 generally exclude milk sucked by calves, but include milk fed to them after milking.

These qualifications should be borne in mind in considering Figure III-6 showing average milk yields per cow as the simplest indicator of livestock productivity, and little significance should be attached to the smaller differences between countries. It is evident, however, from the contrast between the yields in the neighborhood of 4,000 kg of milk per year recorded in the Netherlands, Belgium, and Israel and the very low figures for some African and Asian countries, that the range of productivity between countries is at least as wide and probably wider than those for the cereal crops discussed above. Output of milk per cow is more than 20 times higher in the countries with highest yields than in those at the foot of the chart.

In the main the distribution of yields between countries resembles the pattern already shown for cereals, with the economically more developed countries, especially those in Europe, at the top of the range. There are, however, some differences. Thus some of the relatively sparsely populated developed countries (United States, Canada, Australia) which have rather low cereal yields (except of rice) have yields of milk comparable with those in western Europe. Efficient utilization of feed is associated with high milk yields, and farmers in these countries are well able to obtain high yields when this is economic. On the other hand, there are not many

TABLE III-5. - GROWTH IN MILK YIELDS PER MILK COW, 1934-38 TO 1958-60

	Increase in yield 1934-38 to 1958-60	Average yield per cow 1958-60		Increase in yield 1934-38 to 1958-60	Average yield per cow 1958-60
	Percent	Kg/year		Percent	Kg/year
Norway .....	56	2 630	Austria .....	20	2 405
United States .....	56	3 043	Belgium .....	18	3 760
Finland .....	52	2 897	France .....	18	2 198
Canada .....	48	2 645	Denmark .....	15	3 670
Poland .....	42	2 053	United Kingdom .....	15	2 907
Germany, Fed. Rep. ....	33	3 300	Switzerland .....	14	3 243
Ireland .....	25	2 200	Australia .....	13	1 890
Sweden .....	24	2 976	New Zealand .....	7	2 743
Netherlands .....	23	4 193			

examples of high yields in economically less developed countries, as in the case of crops, though high milk yields per cow are reported from, e.g., the Republic of Korea and China (Taiwan), omitted from Figure III-6 because of the minor importance of their milk production. The consistently high level of feeding needed for high milk yields would be harder to maintain in developing countries than in those with advanced agricultures, while the frequent use of cows as draft animals in less developed countries must also reduce yields of milk. These considerations, together with the greater incidence of disease and lack of breeds highly developed for milk production, may account for this difference.

As with crops, some countries have shown sharp increases in milk yields in recent years, while in others the increase has been less striking. The average milk yields per cow in 1934-38 and 1958-60 are set out above for the relatively few countries with reasonably comparable figures (Table III-5). In this period of nearly one quarter of a century milk yields have been increased by over 50 percent in three of the countries included in the table (Norway, the United States, and Finland) and there were increases of over 20 percent in a further six countries. This suggests that livestock yields are as susceptible to improvement as crop yields.

It might indeed be expected that the range of livestock yields would be wider and the scope for improvement even greater than for crops. The three main ways of raising livestock yields, better feeding, the control of disease, and better breeding have their analogy in crop husbandry if the increased use of fertilizers is considered as improved plant nutrition. But there is this distinction. Without fertilizers a certain yield of crops is obtained, even on poor soils, while if the level of livestock feeding is inadequate the yield may be nil, or, as already mentioned, in effect negative if the animal loses weight. This happens frequently enough in devel-

oping countries during the hungry preharvest period or at times of drought. In many developing countries the shortage of feedstuffs persists over the greater part of the year. When animals are on a "maintenance" basis, at which the feed supplied is no more than needed to maintain their liveweight or merely to keep them alive, the marginal productivity of an increased ration can be very high.

Even in more advanced agricultures there remains much scope for higher yields from improved feeding. Table III-6, based on national statistics, is illuminating in showing the increased output of livestock products per unit of feed achieved in three European countries since the war. No doubt better disease control and the selection of improved strains, as well as better and more balanced feeding, contributed to the increased productivity. The figures are especially striking for Denmark where an increase of 42 percent in the total output of livestock products has been obtained with the addition of only 11 percent to the supply of feedstuffs, a rise

TABLE III-6. - CHANGE IN LIVESTOCK PRODUCTION, FEED SUPPLY AND FEED EFFICIENCY SINCE BEFORE THE SECOND WORLD WAR IN SELECTED COUNTRIES

	Percent change
Denmark, 1935-39 to 1955-59	
total livestock production .....	+ 42
total feed supply <sup>1</sup> .....	+ 11
livestock production per unit of feed supply .....	+ 28
Germany, Fed. Rep., 1935-38 to 1959-61	
livestock production .....	+ 46
feed supply <sup>2</sup> .....	+ 22
livestock production per unit of feed supply .....	+ 20
Finland, 1937/38 to 1957/58 - 1959/60 <sup>3</sup>	
output of milk per cow .....	+ 27
output of butter fat per cow .....	+ 39
feed consumption per cow <sup>4</sup> .....	+ 22
milk production per unit of feed consumption .....	+ 4
butter fat production per unit of feed consumption ....	+ 14

SOURCE: National statistics.

<sup>1</sup> Original data in feed units. - <sup>2</sup> Original data in grain units. -

<sup>3</sup> Cows in farms belonging to milk inspection associations.

of 28 percent in the return from each unit of feedstuffs. Such increased efficiency in the utilization of feedstuffs must clearly have a large effect on the output per hectare of the "national farm."

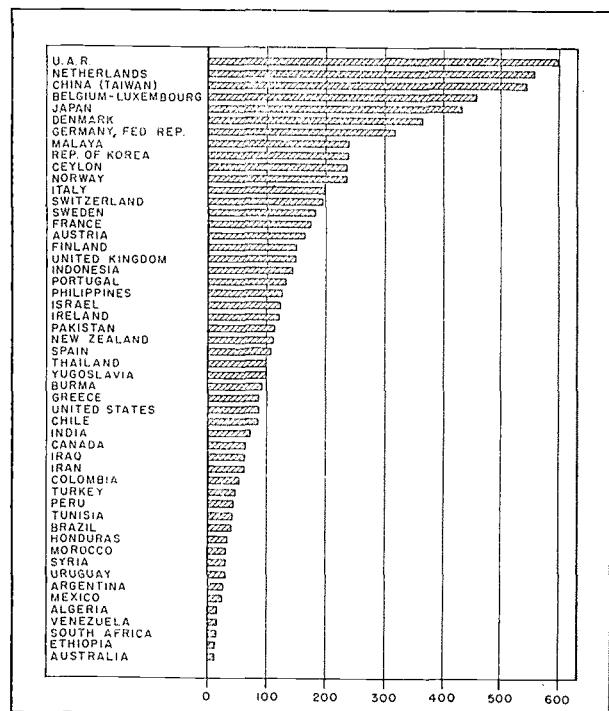
As in the case of milk, data on output of meat in relation to the numbers of each type of livestock indicate in general a much lower level of productivity in the less developed than in the economically more developed countries. The number of eggs produced per hen shows a similar variation. Available data are to be found in the FAO *Production yearbooks*. Although the margin of error in the livestock statistics of most of the developing countries is likely to be large, there can be no doubt as to the broad conclusion. It is generally accepted that in most developing countries the productivity of livestock is low and that with improved animal husbandry it would be possible to obtain a very much higher output in relation to the livestock population.

#### OVER-ALL PRODUCTIVITY OF LAND

More significant than either crop yields or livestock yields by themselves is the over-all productivity of land, the whole output from each hectare of land used for agriculture. For while the individual yields reflect the efficiency of crop husbandry or livestock husbandry, the over-all productivity also takes into account the managerial skill with which the various farm enterprises are integrated to increase the total farm output. Suitable rotations, for example, can obviate the need for fallow, typical of many less developed agricultures. Catch crops can be sown to utilize moisture or fertility remaining after the main crop has been harvested. Mixed farming with crops and livestock gives the opportunity of conserving fodder from the flush season for use in lean periods, of using for animal feed the crop residues which might otherwise be wasted, and at the same time of improving the fertility of the soil. The over-all productivity reflects also the opportunities to produce high-value crops, e.g., tobacco, or in suitable climates or under irrigation to raise more than one crop per year from the same land.

Because of these factors, it might be expected that the range of over-all productivity between countries would be greater than the range of yields for either crops or livestock. This in fact turns out to be the case. The countries with the highest total output per hectare appear to have an over-all productivity some 40 times greater (exceptionally

FIGURE III-7. - GROSS AGRICULTURAL OUTPUT PER HECTARE IN 52 COUNTRIES IN 1956-60<sup>1</sup>  
(INDICES. THAILAND = 100)



<sup>1</sup> Total production, less feed, seed, and waste aggregated with regional average producers' prices relative to wheat, divided by number of hectares classified as agricultural land.

even more) than those with the least intensive agricultures (Figure III-7).

The data in this chart have been calculated by dividing the total price-weighted output, as estimated for FAO indices of total agricultural production (gross production net only of quantities used for seed and feed), by the total area classified as used for agriculture in national statistics. In countries where substantial quantities of animal feedstuffs are imported their value (weighted by the same values as domestic production) has also been deducted from the aggregate production.<sup>10</sup> All figures have been expressed in relative terms with Thailand, the country at the midpoint of the range, given as 100.

In some earlier estimates of land productivity, adjustments were made to reduce the total area of agricultural land to an "arable land equivalent." Up to ten hectares of rough or otherwise unimproved grazing, for example, were taken as equivalent to one hectare of arable land.<sup>11</sup> No such adjustment has been made in the present estimates, partly be-

<sup>10</sup> See footnote 6, page 100.

<sup>11</sup> See, for example, FAO/ECE. *Towards a capital intensive agriculture*, Part I. General review, p. 7-8. Geneva, 1961. And P. Lamartine Yates. *Food, land and manpower in western Europe*, p. 154. London, Macmillan, 1960.

TABLE III-7. - NUMBER OF PERSONS PER HECTARE OF FARM LAND IN COUNTRIES AT DIFFERENT LEVELS OF PRODUCTIVITY PER HECTARE

Highest productivity per hectare	Second highest productivity per hectare	Third highest productivity per hectare	Lowest productivity per hectare
Number per hectare			
U.A.R. .... 9.5	Sweden ..... 1.7	Thailand ..... 2.4	Tunisia ..... 0.80
Netherlands ..... 4.9	France ..... 1.3	Yugoslavia ..... 1.2	Brazil ..... 0.50
China (Taiwan) ..... 10.5	Austria ..... 1.7	Burma ..... 2.4	Honduras ..... 0.54
Belgium ..... 5.0	Finland ..... 1.5	Greece ..... 0.9	Morocco ..... 0.69
Japan ..... 13.3	United Kingdom ..... 2.7	United States ..... 0.4	Syria ..... 0.37
Denmark ..... 1.4	Indonesia ..... 4.6	Chile ..... 1.1	Uruguay ..... 0.19
Germany, Fed. Rep. ..... 3.6	Portugal ..... 2.1	India ..... 2.4	Argentina ..... 0.14
Malaya, Fed. ..... 3.0	Philippines ..... 3.4	Canada ..... 0.3	Mexico ..... 0.27
Korea, Republic of ..... 11.7	Israel ..... 1.7	Iraq ..... 1.0	Algeria ..... 0.20
Ceylon ..... 6.4	Ireland ..... 0.6	Iran ..... 1.1	South Africa ..... 0.15
Norway ..... 3.4	Pakistan ..... 3.2	Colombia ..... 0.7	Venezuela ..... 0.30
Italy ..... 2.3	New Zealand ..... 0.2	Turkey ..... 0.5	Ethiopia ..... 0.28
Switzerland ..... 2.4	Spain ..... 1.4	Peru ..... 0.8	Australia ..... 0.02
Unweighted average ..... 5.9	Unweighted average ..... 2.0	Unweighted average ..... 1.2	Unweighted average ..... 0.34

NOTE: The countries follow the order of output per hectare as in Figure III-7.

cause it is bound to be arbitrary, and partly because the proportion of arable land or improved pasture to the total area is in itself likely to be an indication of the method of farming and the intensity of cultivation. In the past, for example, much land in Europe now under the plow was rough moorland or common land used for seasonal grazing. In countries where land is at present relatively abundant it is likely that an increasing proportion of the total area will be brought under intensive cultivation, or used for intensive grazing, as rising populations and incomes increase the demands made upon the agricultural area.

The ranking of the countries in Figure III-7 is of considerable interest in that it gives some indication of the factors influencing the productivity of land. As might be expected, most of the countries in the upper part of the range have a high density of population which they can support only by intensive methods of cultivation. Conversely all the countries in the lowest part of the range have a low density of population. The countries included in Figure III-7 are grouped in descending order of productivity per hectare in the four columns of Table III-7. In the first column only one country, Denmark, has less than two persons per hectare of agricultural land, while three of the 13 countries (Japan, Republic of Korea, China [Taiwan]) have a population density exceeding 10 persons per hectare of farm land. An unweighted average of the 13 countries gives 5.9 persons per hectare. In the two center columns the unweighted averages are 2.0 and 1.2 respectively, and with few exceptions

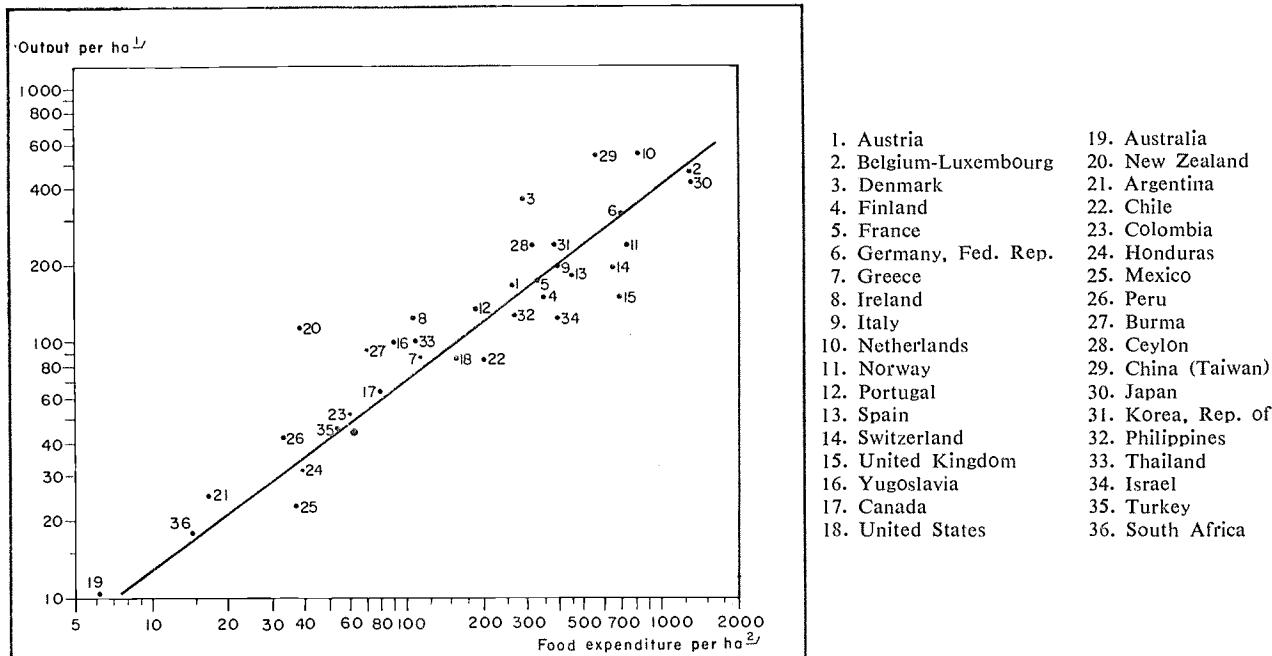
(e.g., New Zealand, Canada, United States, and Turkey) the number of persons per hectare of farm land runs from just under one to rather more than two. In the final column, comprising the countries with lowest productivity of land, each one has less than one person per hectare of farm land with an unweighted average of only 0.34 person per hectare.

A second point is that a large proportion of countries with high per caput incomes fall into the first two columns of the table, the main exceptions being the United States, Canada, and Australia. Moreover, in each column the density of population in countries with relatively low per caput incomes tends to be higher than the population density of countries with higher incomes. These relationships suggest that the increased expenditures on food which go with higher incomes are another factor stepping up the demands made upon the available farm land, and encouraging greater intensity of cultivation.

Yet a third point is that in spite of their high density of population a good many of the countries in the first column (highest productivity of land) are substantial exporters. In general they export high-value farm products and import grain and other cheap basic foods. For example, Egypt exports cotton, the Netherlands and Denmark livestock products (based largely on imported feed-stuffs), Ceylon exports tea, rubber, and vegetable oils, and Italy, fruit and vegetables. The production of these high-value products for export appears also to raise the gross productivity per hectare.

An attempt is made in Figure III-8 to relate these factors for as many countries as possible to the

FIGURE III-8. - GROSS PRODUCTIVITY OF LAND IN RELATION TO POPULATION DENSITY AND PER CAPUT EXPENDITURE ON FOOD IN 36 COUNTRIES, 1956-60 (LOGARITHMIC SCALE)



<sup>1</sup> Index of gross output per hectare, Thailand = 100 (see fig. III-7). - <sup>2</sup> U.S. dollars at fixed prices of 1960, converted at official or other applicable exchange rates.

estimated aggregate output per hectare as shown in Figure III-7. This estimate of over-all productivity has been plotted against the average expenditure per person on foodstuffs (as estimated in national statistics) multiplied by the number of persons per hectare of farm land. In effect this represents the total effective domestic demand for food in relation to each hectare of farm land. The relationship in the chart appears to be fairly close: in other words, where the pressure of demand on the land cultivated is high, the intensity of cultivation and the output per hectare are also proportionately high, and vice versa.

It will also be noted that the countries indicated in Figure III-8 lying appreciably above the free-

hand line, which indicates the general trend, are in all cases exporters of farm products, while those below the line are all net importing countries. In the first group the export demand appears to have raised further the intensity of cultivation and productivity. In the other group substantial imports of farm products appear to have eased the pressure on the available land and average productivity is lower.

To sum up, there is evidence that over a wide range of countries the output per hectare varies in conformity with the pressure of demand, and tends to rise with increasing pressure of population, with higher per caput expenditures on food, and with the growth of export markets.

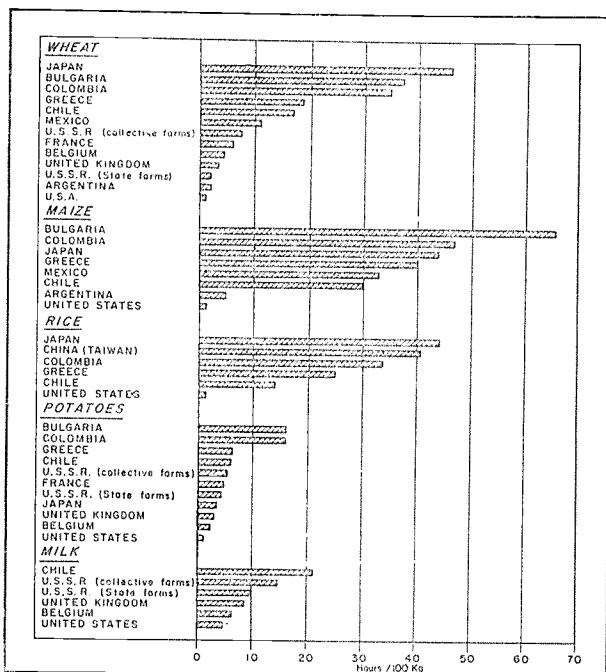
## The productivity of labor

The significance of labor productivity and the various ways of measuring it were reviewed briefly in the section, Aspects of Agricultural Productivity, and need not be repeated. It may be recalled, however, that while the productivity of land is related mainly to the domestic and export demand for farm products, the productivity of labor determines primarily the level of farm incomes and of rural welfare.

### LABOR INPUT PER UNIT OF OUTPUT

Probably the most common way of expressing differences in labor productivity is that of comparing the number of man-hours or man-days spent in different countries to produce a unit of an agricultural commodity, such as a ton of wheat, a bale of cotton, or a kilogram of butterfat or of milk. Inter-

FIGURE III-9. - AVERAGE LABOR TIME USED IN VARIOUS COUNTRIES TO PRODUCE 100 KG OF SELECTED FARM PRODUCTS



SOURCE: Table III-8.

national comparisons of such estimates are, of course, seldom strictly comparable. The methods of estimating the average labor time used for production of different commodities vary somewhat from country to country, as do their relative prices. The ranges of labor input per unit of output are, however, so wide that they are likely to overshadow the differences caused by such factors, and these simple indicators thus give a vivid picture of the differences in the productivity of labor.

Table III-8 and Figure III-9 show the estimated number of man-hours used in producing 100 kilograms of various farm products in a number of countries at various stages of economic development. It should be noted, however, that there are considerable differences in the times at which the various estimates were made and in countries where productivity is increasing rapidly the situation may have changed significantly in the meantime.

For some products the range between the highest and lowest national averages is very wide. Thus in the United States, Argentina, and on the state farms of the U.S.S.R., 1-2 hours of labor time under conditions of extensive cultivation are sufficient to produce 100 kilograms of wheat, barley, or rice, while something like 4-5 hours are required in most of the western European countries included in the

table, and in some of the less developed countries the figure rises to as much as 30-50 hours. Fairly wide ranges are evident also in the case of potatoes (1 to 16). But for a number of other products the ratio is much narrower, e.g., about 1 to 6 or 7 for sugar beets, cotton, and tobacco, and about 1 to 5 in the case of milk.

Many factors must contribute to the wide differences between the countries, including the intensity of cultivation, the level of yields, and methods of farm management. Of major importance is the degree to which mechanization and other labor-saving techniques have been adopted. Their effect is particularly evident in the wide gap between the countries showing the highest and lowest labor use for grains.

The much narrower range for some other commodities suggests, however, that not all products have yet lent themselves equally well to the application of such methods. For example, the time required to produce a quintal of maize is about 30 times greater in Greece than in the United States, of wheat about 19 times greater, and of rice 18 times. But for potatoes and cotton the time required is only 6 times and for tobacco only 5 times greater in Greece than in the United States. In Japan it takes more than 40 times as many man-hours to produce a quintal of wheat as in the United States, but only 6 times as many for tobacco and 3 1/2 times as many for potatoes. In the United Kingdom it takes about 3 times as many hours to produce a quintal of grains or potatoes as in the United States but less than twice the number to produce the same amount of milk.

Differences in the rate of growth of labor productivity in different sectors of agriculture are also evident from estimates which have been made in the United States of the labor required to produce a quintal of certain farm products at various periods, together with a similar time series for the hours of work needed to produce a quintal of rice in Japan (Table III-9). Leaving aside the earliest figures, which are presumably subject to a wider margin of error, it is estimated that between 1910-14 and 1950-53 in the United States, the labor input per unit of output was reduced by about three quarters for wheat, maize, rice, and sugar cane, compared with 55-60 percent for hay and cotton, 40 percent for milk, less than 30 percent for pigmeat, and only 16 percent for tobacco. Cotton depended for a long time on hand picking and tobacco continues to require a heavy labor input because of the necessity of se-

TABLE III-8. - AVERAGE LABOR TIME USED IN SELECTED COUNTRIES<sup>1</sup> TO PRODUCE 100 KG OF VARIOUS FARM PRODUCTS

	Date of estimate	Wheat	Barley	Oats	Maize	Rice	Hay	Sugar cane	Sugar beets	Potatoes	Bananas	Cotton	Tobacco	Milk
..... Hours of work per 100 kg .....														
United States .....	1950-53	1.0	1.0	1.2	1.3	1.3	0.5	6.0	0.5	1.0	...	51.6	81.6	4.5
Argentina .....	1955	1.8	1.8	4.2	4.8	...	...	...	...	...	...	...	...	...
U.S.S.R. (state farms) .....	1956-57	<sup>2</sup> 1.8	...	...	...	...	...	...	2.1	4.2	...	...	...	9.9
United Kingdom .....	1948-49	3.1	2.7	3.5	3.6	...	1.5	...	1.7	2.8	...	...	...	8.5
Belgium .....	1950	4.2	4.7	...	...	...	...	...	1.1	2.1	...	...	87.9	6.1
France .....	1951	5.8	...	8.1	...	...	...	...	1.6	4.5	...	...	...	...
U.S.S.R. (collective farms)	1956-57	<sup>2</sup> 7.3	...	...	...	...	...	...	3.1	5.1	...	...	...	14.7
Mexico .....	1949	11-14	...	...	33.0	8-33	...	...	...	...	...	...	...	...
Chile .....	1948-50	17.0	12.0	20.8	30.0	14.0	...	...	...	6.0	...	...	...	21.1
Greece .....	1955	18.9	...	...	40.5	25.2	...	...	...	6.3	...	295.0	421.7	...
Colombia .....	1953	35.0	26.0	...	47.0	34.0	...	<sup>3</sup> 8.0	-	16.0	4.0	...	279.0	...
China (Taiwan) .....	1931-34	...	...	...	...	41.0	...	...	-	...	...	...	...	...
Japan .....	1955-59	46.3	...	...	<sup>4</sup> 44.2	44.5	...	...	<sup>4</sup> 3.3	3.4	...	...	<sup>4</sup> 492.3	...
Ecuador (a) <sup>5</sup> .....	1955	...	...	...	...	55.0	...	<sup>3</sup> 45.0	-	...	2.0	...	...	...
(b) <sup>6</sup> .....	1955	...	...	...	...	12.0	...	<sup>3</sup> 6.0	-	...	1.0	...	...	...

SOURCES: R. W. Hecht and K. R. Vice. *Labor used for field crops*. Washington, D.C., U.S. Dept. of Agriculture, Agricultural Research Service. Statistical Bulletin No. 144, June 1954.

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<sup>1</sup> In decreasing order of labor time used in production of wheat or other grains. - <sup>2</sup> Average for all cereals. - <sup>3</sup> Including labor used for cultivation, cutting, and hauling. - <sup>4</sup> 1955-58. - <sup>5</sup> Traditional method of cultivation. - <sup>6</sup> Modern techniques of cultivation.

TABLE III-9. - LONG-TERM TRENDS IN AVERAGE LABOR TIME USED IN THE UNITED STATES AND JAPAN TO PRODUCE 100 KG OF VARIOUS FARM PRODUCTS

	United States													Japan
	Wheat	Barley	Oats	Maize	Rice	Hay	Sugar cane	Sugar beet	Potatoes	Cotton	Tobacco	Milk	Pigmeat	
..... Hours of work per 100 kg .....														
1800	13.7	...	...	13.5	...	...	...	...	...	264.5	...	...	...	...
1840	8.6	...	...	10.9	...	...	...	...	...	193.2	...	...	...	...
1880	5.6	...	...	7.1	...	...	...	...	...	133.8	...	...	...	...
1900	4.0	...	...	5.8	...	...	...	...	...	124.3	...	...	...	...
1910-14	3.9	3.6	3.7	5.3	7.5	1.1	<sup>1</sup> 23.5	1.3	2.8	121.7	97.0	<sup>1</sup> 7.9	<sup>1</sup> 9.9	...
1925-29	2.7	2.6	2.8	4.5	4.3	1.1	...	1.1	2.4	118.2	105.8	...	...	58.9
1935-39	2.5	2.3	2.4	4.4	3.1	1.0	<sup>2</sup> 13.4	0.9	2.2	92.2	103.6	<sup>2</sup> 7.3	<sup>2</sup> 9.3	<sup>2</sup> 52.6
1945-49	1.2	1.3	1.5	2.1	2.1	0.7	...	0.7	1.3	65.7	86.0	...	...	71.0
1950-53	1.0	1.0	1.2	1.3	1.3	0.5	6.0	0.5	1.0	51.6	81.6	4.5	7.2	58.2
1955-59	...	...	...	...	...	...	...	...	...	...	...	...	...	44.5

SOURCES: United States: 1800-1900: M. R. Cooper, G. T. Barton, and A. P. Brodell. *Progress of farm mechanization*, p. 3, Washington, D.C., U.S. Dept. of Agriculture. Miscellaneous Publication No. 630, October 1947.

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<sup>1</sup> 1909-13. - <sup>2</sup> 1932-36. - <sup>3</sup> 1937-39.

TABLE III-10. - RANGE OF HOURS OF WORK REQUIRED IN 1950 TO PRODUCE 100 KG OF FARM PRODUCTS IN DIFFERENT STATES OF THE UNITED STATES<sup>1</sup>

	Hours of work per 100 kg			Ratio of largest to smallest (4)		
	National average (1)	Largest labor requirement (2)	Smallest labor requirement (3)			
Wheat .....	0.96	Texas .....	1.6	Washington .....	0.4	4.0
Barley.....	0.96	Nebraska .....	1.6	Washington .....	0.6	2.7
Oats .....	1.24	S. Carolina .....	2.3	Illinois .....	0.6	3.8
Potatoes.....	0.99	N. Carolina .....	1.9	Idaho .....	0.7	2.7
Soybeans .....	0.99	N. Carolina .....	2.7	Illinois .....	0.8	3.4
Tobacco .....	81.57	Florida .....	123.5	Wisconsin .....	30.9	4.0
Cotton .....	57.32	N. Carolina .....	110.2	California.....	28.7	3.8
Sugar beets.....	0.53	Utah .....	<sup>2</sup> 0.7	Oregon .....	0.4	1.8

SOURCE: R. W. Hecht and K. R. Vice. *Labor used for field crops*. Washington, D.C., U.S. Department of Agriculture, Agricultural Research Service, Statistical Bulletin No. 144, June 1954.

<sup>1</sup> The table refers only to States producing a minimum of 1 percent of total national output: in some minor producing states labor requirements are considerably higher than those shown in column (2). - <sup>2</sup> 1952.

lective harvesting. Dairy cows still need a good deal of individual attention, despite the gradual mechanization of the milking and feeding operations.

In Japan the labor required for rice production had begun to decline in the interwar period, but rose steeply during the war and immediate postwar years, when farmers attempted by even more meticulous cultivation than before to compensate in part for shortages of fertilizers and other production requisites. In recent years, labor requirements for rice have begun to decline sharply with the development of machines adapted to the extremely small holdings still prevalent in Japan; the minute holdings, however, greatly increase the difficulty of reaching a level of labor productivity comparable with other industrialized countries.

Although labor is not the only cost item in agriculture, it is in most countries the most important one, and differences in the relative labor requirements of various products are likely to be reflected in the relative prices, except to the extent that this trend is counteracted by changes in demand or by systems of price supports which restrict changes in price relations. Thus greater economy of labor, together with better feed conversion in livestock production, as well as the trend of demand, are likely to lie behind the rather general tendency in many countries for prices of grains to decline relative to those of livestock products or fruits. When countries are compared, however, the lower productivity of labor in less developed countries is reflected in much lower earnings and on world markets their exports are therefore often competitive in price with those of more developed countries, with more productive but also more highly paid labor.

The national averages in Tables III-8 and III-9 conceal a rather wide range in labor productivity within countries due both to the varying efficiency of individual farmers and also to differences between different districts or different sectors within agriculture, e.g., the subsistence and export sectors. This is evident from the two sets of estimates shown for Ecuador in Table III-8, where the labor requirements under "traditional methods of cultivation" exceed those of modern methods by about 4 times in the case of rice and by about 7-8 times in the case of sugar cane. Even more striking differences have been noted in Colombia, where about 20 times as much labor is required to produce a unit of rice under a traditional system of production as under a more modern and semimechanized system.<sup>12</sup>

Such differences in labor productivity are not, however, confined to developing countries. This is evident from a comparison between data for collective farms and the larger, more mechanized, state farms in the U.S.S.R. Comparable differences are also found between different states of the United States (Table III-10). For most of the products shown, average labor requirements in 1950 were estimated to be three to four times as great in the states with lowest productivity as in those where labor productivity was highest. As might be expected, labor requirements were largest in the southern states where economic development has tended to lag behind the national average. With the faster progress of these states in the last decade, however,

<sup>12</sup> United Nations. Economic Commission for Latin America. *The economic development of Colombia*, Table 160, p. 201 (E/CN.12/365/Rev.1). November 1956.

it is likely that such regional differences in labor productivity have been reduced, as they were shown earlier to have been reduced for crop yields.

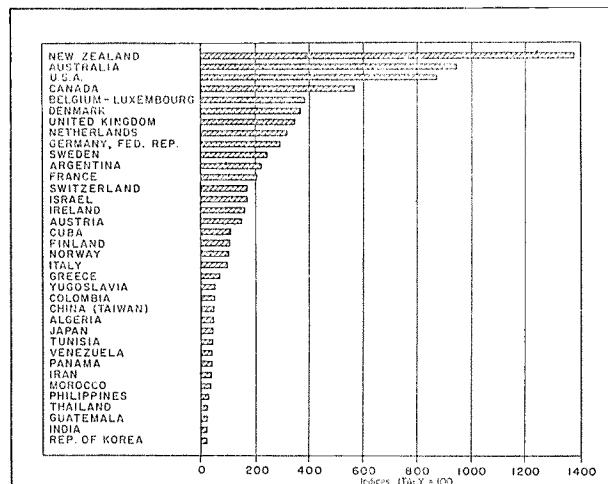
#### TOTAL OUTPUT PER UNIT OF LABOR INPUT

As indicated earlier, measurements of the overall productivity of labor in agriculture are hazardous. In the first place considerable uncertainties arise on the input side. Relatively few countries, all economically developed ones, publish estimates of the number of man-hours spent annually in farming operations, and even these are not always fully comparable. Even if the simpler method is adopted of measuring labor only in terms of the number of persons engaged in agriculture, there remain many difficulties. National statistics do not always distinguish between full-time and part-time farmers; they differ from country to country in their treatment of seasonal workers, e.g., those employed only for the harvest, and they are equally varied in their inclusion or exclusion from the farm labor force of women and children belonging to farm families.

For the present purpose, the relatively crude measure of the number of adult males active in agriculture has been adopted as the least open to objection. Even so, for some countries where recent census data or national estimates were lacking, resort was necessary to estimates, based on past trends. It should be recognized, however, that this method tends to underestimate the labor force and therefore to overestimate output per man in less developed countries where the unpaid labor of farm families usually represents a larger share of the total labor input than it does in economically more developed countries. Such a measure can obviously take no account of the number of hours worked or of the degree of seasonal or total unemployment or underemployment. For some purposes, however, notably where significance attaches to the distribution of the labor force between agriculture and other industries, or where relative income levels are under consideration, this method of measuring the labor force is probably the most appropriate.

On the side of output, the most reliable figures are probably those relating to the gross production (net of feed and seed). These have been worked over for many years in the countries themselves in collaboration with FAO and other international organizations in connection with construction of indices

FIGURE III-10. - GROSS AGRICULTURAL OUTPUT PER ADULT MALE ENGAGED IN AGRICULTURE IN 36 COUNTRIES, 1956-60  
(ITALY = 100)



SOURCE: Table III-11.

of production and a fair degree of uniformity of working methods has gradually been established, though obviously an appreciable margin of error must remain, more especially for the less developed countries. In the present chapter, therefore, most use has been made of estimates of gross production, utilizing the price-weighted aggregates prepared for FAO production indices which were used also in estimating the productivity of land. It may be added that where, as in most developing countries, an increase in the total farm production is the main objective, it is this concept of output which is most relevant.

In economically more developed countries where there is more concern with the level of farm incomes, the more relevant figure is the net output, or value added (i.e., the gross output less inputs from outside agriculture). Here, the most widely available figures are those prepared for national income statistics, and these have been used below. For most countries they refer to the gross domestic product (GDP) at factor cost, but in some cases only data on net domestic product (NDP) or on GDP at market prices were available. These figures, too, are not fully comparable between countries. It is likely, for example, that there are some divergences between countries in allowing for inputs. Further lack of comparability arises from differences in the price-weights used in the various countries, which reflect national price relationships, from differences in the treatment of food consumed on farms, and finally from the problems of converting estimates in national

currencies into dollars, even when resort is made to factors correcting for differences in purchasing power.

The FAO estimates of gross output per man derived as above are set out in Table III-11 for some 36 countries, together with estimates of net output per man for countries where appropriate data from national income estimates are available. To bring both series to a comparable base, the data have been expressed in relative terms with the level in Italy, the mid-country in the range, taken as 100.<sup>13</sup>

The range of gross productivity per man (shown also in Figure III-10) is remarkably wide, amounting to nearly 14 times the Italian level in New Zealand and more than eight times in the United States but only about one fifth of the Italian level in some less developed countries. The extreme range is about 80 times.

Net productivity shows an appreciably narrower range. The output per man in countries at the bottom of the range is still about one fifth of the Italian level, but in countries at the top of the range for which data are available net output per man is only 2 to 4 times as large as in Italy. Net production estimates for New Zealand and Australia, where gross production per man is highest, are not, however, available on a comparable basis.

A narrower range would in fact be expected, as the inputs from outside the sector (machinery, fuel, fertilizers, transport, and other services, etc.) forms an increasingly larger share of the total output in the most advanced agricultures. The contraction of the range is somewhat greater than can be accounted for on this ground alone, however, and it should be noted that the two series are not closely comparable in other respects. For example, the estimates of net output usually include forestry and fisheries production which are not included in the FAO estimates of gross output. This probably largely explains, for example, the relatively higher ranking in the estimates of net than of gross productivity of Norway, Finland, and Japan, all countries where these products form an important part of the total output.

Despite these differences of coverage and some lack of comparability between the gross and net series, the general picture which emerges from Ta-

ble III-11 is fairly clear and, as in the case of land productivity, it is of interest to consider more closely the order in which the countries are ranged.

It is immediately evident from the table that output per man is related to the general level of eco-

TABLE III-11. - ESTIMATED OUTPUT PER ADULT MALE ENGAGED IN AGRICULTURE IN 36 COUNTRIES, 1956-60 AVERAGE

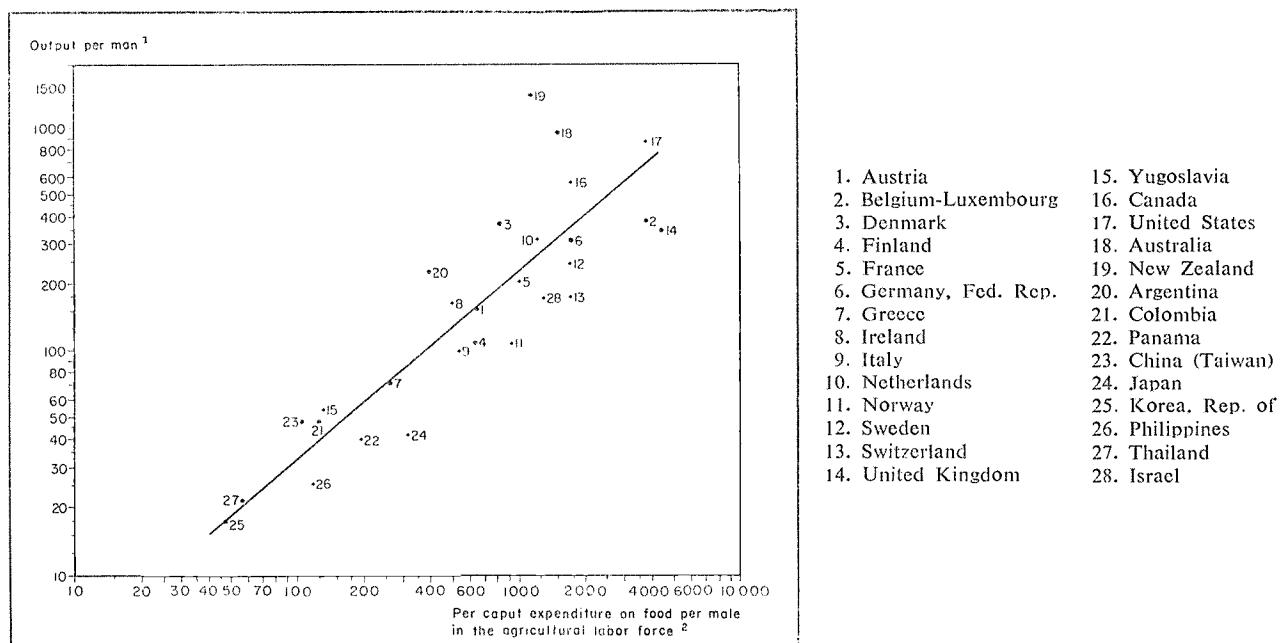
	Gross output <sup>1</sup>	Net output <sup>2</sup>	
		Converted at official exchange rates	Adjusted for differences in internal purchasing power of currencies <sup>3</sup>
..... Indices, Italy = 100 .....			
New Zealand .....	1 380	...	...
Australia .....	941	...	...
United States .....	869	412	286
Canada .....	567	286	199
Belgium-Luxembourg .....	379	290	247
Denmark .....	367	228	211
United Kingdom .....	346	256	231
Netherlands .....	319	212	228
Germany, Fed. Rep. ....	291	<sup>4</sup> 219	<sup>4</sup> 218
Sweden .....	244	...	...
Argentina .....	224	87	91
France .....	204	<sup>4</sup> 158	<sup>4</sup> 132
Switzerland .....	173	...	...
Israel .....	172	<sup>5</sup> 200	<sup>5</sup> 195
Ireland .....	162	92	86
Austria .....	153	...	...
Cuba .....	109	...	...
Finland .....	107	157	156
Norway .....	103	176	158
Italy .....	100	100	100
Greece .....	72	66	74
Yugoslavia .....	53	...	...
Colombia .....	49	50	45
China (Taiwan) .....	47	27	33
Algeria .....	43	<sup>4</sup> 32	<sup>4</sup> 33
Japan .....	41	<sup>5</sup> 54	<sup>5</sup> 60
Tunisia .....	40	...	...
Venezuela .....	39	<sup>4</sup> 47	<sup>4</sup> 32
Panama .....	39	60	54
Iran .....	38	...	...
Morocco .....	35	...	...
Philippines .....	25	...	...
Thailand .....	21	<sup>4</sup> 15	<sup>4</sup> 21
Guatemala .....	21	...	...
India .....	21	<sup>5</sup> 18	<sup>5</sup> 25
Korea, Rep. of .....	17	20	21

<sup>1</sup> Total output less feed, seed, and waste, aggregated with regional average producers' prices relative to wheat. - <sup>2</sup> Unless otherwise specified, gross domestic product in agriculture at factor cost. - <sup>3</sup> Adjustment factors calculated by P. N. Rosenstein-Rodan. International aid for underdeveloped countries. *The Review of Economics and Statistics*, Vol. 43, No. 2, May 1961. -

<sup>4</sup> Gross domestic product at market prices, expressed as relative to the corresponding figure for the United States. - <sup>5</sup> Net domestic product at factor cost, expressed as relative to the corresponding figure for the United States.

<sup>13</sup> Italy, rather than Finland or Norway, has been taken to represent the midpoint of the range because of the exceptional importance of forestry and fisheries in the economies of the latter two countries.

FIGURE III-11. - GROSS PRODUCTIVITY OF LABOR IN RELATION TO PER CAPUT EXPENDITURE ON FOOD AND SHARE OF MALE LABOR FORCE ENGAGED IN AGRICULTURE IN 28 COUNTRIES, 1956-60 (LOGARITHMIC SCALE)



<sup>1</sup> Index of gross output per adult male in agriculture, Italy = 100 (see Table III-11). - <sup>2</sup> Per caput private consumption expenditures on food divided by the percentage of the male labor force in agriculture.

nomic development. The economically more developed countries with relatively high per caput incomes are generally to be found in the upper part of the table, and the economically less developed with lower per caput incomes fall into the lower half of the table. The operative mechanism here seems likely to be effective demand. High per caput incomes imply larger expenditures on food in absolute terms (though not as a percentage of total expenditure) and this means larger domestic markets for producers in the more developed countries. Even so price support measures are often resorted to in these countries to raise farm incomes nearer the level of those in other occupations; but the prices themselves, as distinct from their influence on production, would not affect gross productivity as measured by physical output per male worker in agriculture.

Other factors also appear to be involved. For example, at the head of Table III-11, among the ten countries with the highest output per man are four in which only about 10 percent or less of the male labor force is engaged in agriculture (United Kingdom, Belgium, United States, and Federal Republic of Germany), while only in Denmark (24 percent) and Argentina (30 percent) does the share of agriculture in the labor force exceed 20 percent.

This may be associated with a point made earlier; that when the percentage of the population engaged in agriculture is reduced the domestic market available to each farm family is correspondingly increased.

Export demand also appears to affect the ranking of the countries, and here it is notable that the ten countries with the highest gross output per man include six major exporters of farm products (New Zealand, Australia, United States, Canada, Denmark, and Argentina). This suggests that export outlets raise the "ceiling" on output per man as they were shown in the preceding section to raise the potential output per hectare.

In Figure III-11 the two factors largely influencing the effective domestic demand for farm products in relation to the farm labor force (per caput expenditure on food and the percentage of the labor force engaged in agriculture) have been combined and plotted in relation to the gross output per man. This is analogous to Figure III-8 where the two factors mainly influencing domestic demand in relation to the farm area were plotted against output per hectare. The relationship is again seen to be close. Moreover, as in the earlier chart the level of productivity per man in relation to per caput domestic demand tends to be relatively higher in

agricultural exporting countries and relatively lower in countries importing agricultural products. The significance of this relation is discussed further in the final section of this chapter.

#### CHANGES IN LABOR PRODUCTIVITY OVER TIME

Data on changes in labor productivity are hard to come by, especially for the more distant past, and such data as do exist become less reliable as the period lengthens. The following paragraphs are therefore based mainly on data for the postwar period.

Data for 21 countries on changes in gross and net output per man in farming during the 1950s are shown in Table III-12. They show that gross output per man has grown at annual rates ranging from rather less than 2 percent in India to around 8 percent in Belgium and the Federal Republic of Germany. Although most of the economically advanced countries show relatively high rates of increase, generally exceeding 4 percent a year, in some of them the increase has been rather slower, as for instance in Finland (3.6 percent), Ireland (2.9 percent), and Canada (3.1 percent). In the few less developed countries for which data are available the growth of productivity appears to have been somewhat slower, but the picture is by no means uniform, for Mexico and Venezuela show increases that are comparable with those of the economically advanced countries.

Many European countries show substantial differences between the growth of gross output and net product per man, reflecting the rapid increase in the share of inputs purchased from nonagricultural sectors, to which attention has been drawn in earlier issues of this report, and which is briefly discussed below in the section dealing with capital in agriculture.

It is also of interest that in most of the countries included in Table III-12 the gross output per man in agriculture, and often the net output as well, has grown more rapidly than the per caput national income, which may be taken as an indicator of the average level of labor productivity in the economy as a whole.

Though based on limited and not fully comparable data, this finding is in agreement with the observation of Kuznets and others that over time, as economies develop, there is a tendency for the output per man to grow more rapidly in agriculture than in the

TABLE III-12. - POSTWAR CHANGES IN OUTPUT PER MAN IN AGRICULTURE

	Period	Gross output	Net output	Per caput national income <sup>1</sup>
		Average annual percent change		
<b>EUROPE</b>				
Austria .....	1952-54/1955-59	4.5	4.4	6.8
Belgium .....	"	7.8	7.5	2.2
Denmark .....	"	7.0	5.7	2.9
Finland .....	"	3.6	2.1	3.2
France .....	"	4.3	2.6	3.7
Germany, Fed. Rep. ....	"	8.5	6.6	7.4
Ireland .....	"	2.9	2.7	1.6
Italy .....	"	4.8	4.0	6.3
Netherlands ...	"	6.1	3.6	4.0
Norway .....	"	5.4	3.5	2.0
Sweden .....	"	4.2	2.9	3.1
United Kingdom	"	5.4	4.5	2.3
<b>OTHER REGIONS</b>				
Canada .....	1951-59	3.1	...	1.9
Puerto Rico ...	1950-61	7.1	...	4.5
United States .	1950-59	7.3	...	1.2
Argentina .....	1945-49/1955-57	...	<sup>2</sup> 0.6	-0.1
Colombia .....	1945-53	2.8		2.4
Mexico <sup>3</sup> .....	1950-58	4.0	...	1.7
Venezuela .....	1950-58	...	4.1	6.2
India <sup>4</sup> .....	1951-58	1.6	...	1.6
Japan .....	1950-59	4.3	...	8.5

SOURCES: European countries: FAO/ECE Doc. ST/ECE/AGRI/5, *Towards a capital intensive agriculture*, based on national indices of agricultural production and labor force in agriculture.

Other regions: National indices of agricultural production, and national statistics on labor force in agriculture, except Argentina [United Nations, Economic Commission for Latin America, *El desarrollo económico de la Argentina*, Parte 2, p. 113. (Sales No. 59.II. G.3) June 1959] and Colombia [United Nations, Economic Commission for Latin America, *The economic development of Colombia*, p. 23. (Sales No. 1957.II.G.3) 1957].

<sup>1</sup> 1950-52 to 1958-60, in constant prices. - <sup>2</sup> The rate of change varied from -1.3 percent a year between 1945-49 and 1950-54 to +3.3 percent a year between 1950-54 and 1955-57. - <sup>3</sup> Crops only; labor force including women. - <sup>4</sup> Crops only; labor force for 1958 estimated.

nonagricultural sectors as a whole.<sup>14</sup> This is evident, for instance, from data on relative levels of product per man in different sectors assembled by

<sup>14</sup> This is not necessarily true of a comparison between agriculture and manufacturing industry, where rapid increases in labor productivity are possible. But even compared with the manufacturing sector, labor productivity has in many countries since the war risen faster in agriculture. This appears to be the case for instance, in the United States (since 1937), Denmark, and the Federal Republic of Germany (since 1950-52). See J. W. Kendrick, *op. cit.*, Table 40, p. 152; ECE/FAO Doc. ST/ECE/AGRI/5, *op. cit.*, p. 110, and G. Müller and H. Schmidt, *Kapitaleinsatz und Produktivität in Landwirtschaft und Industrie*, Tables 15 and 16, p. 58, 59. Berlin-München, IFO-Institut für Wirtschaftsforschung, 1959.

TABLE III-13. - LONG-TERM CHANGES IN RATIO OF PRODUCT PER WORKER IN AGRICULTURE TO PRODUCT PER WORKER IN NONAGRICULTURAL SECTORS,<sup>1</sup> 15 COUNTRIES

	Period covered (approximate)	Initial ratio	Terminal ratio	Change
United Kingdom	1893 - 1950	0.60	1.08	+ 0.48
France .....	1895 - 1950	0.62	0.62	0
Germany .....	1895 - 1935	0.36	0.40	+ 0.04
Netherlands ...	1910 - 1949	0.49	0.61	+ 0.12
Denmark .....	1895 - 1950	0.55	0.79	+ 0.24
Norway .....	1910 - 1950	0.35	0.39	+ 0.04
Sweden .....	1900 - 1950	0.34	0.59	+ 0.25
Italy .....	1900 - 1952	0.57	0.51	- 0.06
Hungary .....	1900 - 1940	0.65	0.37	- 0.28
United States .	1900 - 1950	0.35	0.56	+ 0.21
Canada .....	1900 - 1950	0.67	0.61	- 0.06
South Africa ..	1911 - 1945	0.13	0.15	+ 0.02
Japan .....	1900 - 1950	0.40	0.34	- 0.06
Australia .....	1891 - 1939	1.62	0.78	- 0.84
New Zealand ...	1901 - 1936	2.13	1.60	- 0.53

SOURCE: Simon Kuznets. *Six lectures on economic growth*, Table 7, p. 53. Glencoe, Illinois, The Free Press. 1959.

<sup>1</sup> The original sectoral ratios of relative product per member of labor force were obtained by dividing the share of the sector in national product by its share in the labor force of each country, generally excluding unpaid family workers. The ratio shown here is that of product per worker in agriculture over the product per worker in all other sectors combined.

Kuznets, and reproduced in Table III-13. The data cover generally the first half of the present century. The relationship between productivity in agriculture and in the nonagricultural sectors is expressed in terms of the ratio of product per worker in agriculture to product per worker in all the other sectors combined. It is evident that although in most countries the product per worker in agriculture remains below that in the other sectors — in the terminal period it was estimated by Kuznets to be higher only in the United Kingdom and New Zealand — its relative level has in most countries

increased. If Australia and New Zealand are excluded, on the ground that their development, based on immigration of skilled population and massive exports of agricultural products, is not typical, it is found that the relative productivity of labor in agriculture has risen faster than productivity in the nonfarm sectors in 8 of the remaining 13 countries.

Such an increase in the relative productivity of labor in agriculture as will be shown later, would indeed be expected from the observed functional relationships between the per caput income level and the changes in patterns of consumption, and in the occupational distribution of labor force associated with it. Table III-14, again from the work of Kuznets, though based on a limited number of countries and covering a relatively short period, suggests that the most rapid relative improvement in the labor productivity of farmers takes place at the later stages of economic development. In the earlier stages, indeed, his data suggest a relative deterioration in the output per man in agriculture.

It may be added that Kuznets' data on output are based on national income statistics in current prices. There is evidence that agricultural prices rise, relative to the general price level, in the course of economic development, largely because of the rising relative prices of animal products, for which demand tends to rise more rapidly than the productivity of the labor engaged in producing them.<sup>15</sup> This increase may in part be responsible for the rise in the relative product per man in farming shown by Kuznets' data.

<sup>15</sup> E. M. Ojala. *Agriculture and economic progress*, Chapters IX and X. London, Oxford University Press, 1952.

TABLE III-14. - RELATIVE LEVEL OF PER CAPUT PRODUCT IN AGRICULTURE AND IN NONAGRICULTURAL SECTORS, BY LEVEL OF PER CAPUT NATIONAL INCOME

	Per caput national income level groups <sup>1</sup> .....						
	I	II	III	IV	V	VI	VII
Number of countries in group ..	5	5	5	3	4	7	4
Relative level of product per caput <sup>2</sup> in:							
agriculture .....	0.92	0.85	0.75	0.59	0.75	0.79	1.00
nonagricultural sectors .....	1.01	1.05	1.10	1.44	1.31	1.33	1.34
Ratio of relative per caput product in agriculture to that in non-agricultural sectors .....	0.95	0.81	0.70	0.45	0.61	0.65	0.89

SOURCE: Simon Kuznets. *Six lectures on economic growth*, Table 5, p. 45-47. Glencoe, Illinois, The Free Press. 1959.

<sup>1</sup> A rough index of per caput product for the seven classes, with Class VII given as 100, is: I - 1,700; II - 1,000; III - 650; IV - 400; V - 270; VI - 200; VII - 100. Data refer to postwar years. - <sup>2</sup> For explanation of methods, see footnote 1 of Table III-13.

## Capital in agriculture

In discussing the productivity of land and labor in the preceding sections, input was implicitly defined as the amount of services available or flowing from the land and from labor in agriculture during a year. An analogous definition of fixed capital input would be the sum of the annual compensation for the use of the capital stock (i.e., interest) and of its annual consumption (i.e., depreciation).

To relate the total output to such a measure of capital input would, however, have little meaning. This is because the annual input of fixed capital, even in advanced economies, is of relatively minor importance compared with the other major input groups, i.e., land, labor, and working capital;<sup>16</sup> the effect of changes in capital input on the total output would therefore be likely to be overshadowed by changes in the other inputs.

A more useful ratio of a closely related nature is the capital/output ratio. It shows the value of the total stock of fixed capital historically associated with a given value of annual output, either on average or at the margin. It is widely used as a rough indication of the additional investment of fixed capital required in order to achieve planned rates of growth in production.

Needless to say, there are many practical and conceptual difficulties in valuing the stock of capital, particularly in a sector like agriculture, where much of the investment is nonmonetary and takes the form of land improvements and construction by unpaid family labor. The methods and standards of valuation also differ from country to country, which reduces the international comparability of capital/output ratios.

Moreover, it is important to keep in mind that the capital/output ratio is not a measure of productivity, in the sense that a ratio of, say, 2, would be an indication of higher capital productivity than one of, say, 4. This is because capital/output ratio relates the annual output to the *total* stock of existing capital (or the increase in annual output to the increase in the total stock of capital), and not to the *input flow* emanating from the capital stock. It is true that the efficiency of the use of capital is one of the factors which determine the size of the

capital/output ratio and that, everything else remaining constant, the more efficient the use of capital, the lower the capital/output ratio. But many other factors, too, are involved. In particular the capital/output ratio is strongly influenced by the durability of the capital investment, so that investment with a productive life expectancy of several decades such as irrigation dams or housing, quite regardless of the productivity of the services they supply annually, are likely to show a higher capital/output ratio than investment lasting relatively few years, such as a tractor.

### SECTORAL DIFFERENCES IN CAPITAL/OUTPUT RATIOS

Nonetheless it is of interest to review briefly some of the available data on capital/output ratios in agriculture. Table III-15 shows recent estimates of average capital/output ratios and long-term averages of incremental capital/output ratios in various economic sectors of nine countries at different stages of economic development.

Much of the wide range of capital/output ratios in agriculture shown by the data undoubtedly reflects differences in concepts, in particular whether the capital stock is related to gross or net output. If the gross and net ratios are considered separately, the range is in fact tolerably narrow, given the difficulties of measurement and differences in definitions followed in different countries. Among average ratios, those relating to a net concept range from 0.72 (United States) to 2.1 (South Africa), but the two ratios relating to a gross concept are very near each other, at 2.8 (Colombia) and 3.4 (Argentina). The two net incremental ratios are also very close at 2.2 (United States) and 2.5 (Norway), while of the four gross ratios all but one (Canada) fall within the range of 5.2 to 6.4.

Of greater interest than the absolute magnitudes of the ratios are, however, their relative levels in the various economic sectors. Here the data show a rather more consistent pattern: the ratio in agriculture in ten of the eleven series shown<sup>17</sup> is substantially higher than in manufacturing or mining, although lower than the ratio in transport and com-

<sup>16</sup> In the United States in 1957 the share of fixed capital (including land) in the total input of labor and capital in the entire economy is estimated to have been about 19 percent. See J. W. Kendrick. *Productivity trends in the United States*, Table 26, p. 114. Princeton, Princeton University Press, 1961.

<sup>17</sup> The exception is India and there, too, the ratio is higher in agriculture than in "small enterprises" in manufacturing.

TABLE III-15. - SECTORAL CAPITAL OUTPUT RATIOS (EXCLUDING LAND) IN NINE COUNTRIES

	Type of ratio	Agriculture	Mining	Manufacturing	Transport and communic.	Public utilities	Housing	Total
<b>A. RECENT AVERAGE RATIOS:<sup>1</sup></b>								
India (1950-51) .....	net	1.07	1.57	<sup>2</sup> 3.10	<sup>3</sup> 8.74	...	11.00	1.79
South Africa (1944-53) .....	net	2.1	1.9	0.9	...	...	...	...
United States (1938) .....	net	0.72	0.49	...	3.26	...	...	...
Argentina (1950-54) .....	gross	3.4	<sup>4</sup> 1.9	<sup>5</sup> 4.3	...	—	—	3.4
Colombia (1953) .....	gross	2.8	1.7	2.0	<sup>6</sup> 4.8	...	...	2.9
<b>B. LONG-TERM INCREMENTAL RATIOS:<sup>7</sup></b>								
Norway (1900 to 1953) .....	net	2.5	2.3	2.9	...	35.2	3.0	
United States (1880 to 1948) .....	net	2.2	1.1	...	1.9	...	...	
Argentina (1900-09 to 1955) .....	gross	6.4	<sup>4</sup> 4.5	<sup>8</sup> 14.9	...	<sup>9</sup> 9.6	8.3	
Australia (1861-70 to 1930-39) .....	gross	5.9	5.1	...	...	16.5	...	
Canada (1927-29 to 1951-55) .....	gross	10.9	<sup>10</sup> 3.3	8.2	...	30.1	5.8	
Sweden (1861 to 1950) .....	gross	5.2	<sup>4</sup> 2.6	10.5	...	24.4	4.3	

## SOURCES:

## A. Recent average ratios:

India: M. Mukherjee and N.S.R. Sastry. An estimate of the tangible wealth of India. In *The measurement of national wealth*, Table II, p. 386. London, Powers. Income and Wealth Series 8, 1959.

Union of South Africa: D. G. Franzsen and J. J. D. Willers. Capital accumulation and economic growth in South Africa. In *The measurement of national wealth*, *op. cit.*, Table IX, p. 308.

United States: Simon Kuznets. Long-term changes in the national income of the United States of America since 1870. In *Income and wealth of the United States; trends and structure*, Table XXIII, p. 122. Income and Wealth Series 2, 1952.

Argentina: Alexander Ganz. Problems and uses of national wealth estimates in Latin America. *The measurement of national wealth*, *op. cit.*, Table XVII, p. 246.

Colombia: Same as Argentina. Table XXVIII, p. 260.

## B. Long-term incremental ratios:

Simon Kuznets. Quantitative aspects of the economic growth of nations. VII. Long-term trends in capital formation proportions. *Economic development and cultural change*, Vol. 9, No. 4, Part II, Table XV, p. 45-47, July 1961.

<sup>1</sup> The underlying totals are in all cases in constant prices. - <sup>2</sup> Factory establishments. The ratio for "small enterprises" is 0.84.

<sup>3</sup> Railways only. - <sup>4</sup> Includes construction. - <sup>5</sup> Transport, communications, electricity. - <sup>6</sup> Transport only. - <sup>7</sup> Averages of annual ratios during the period shown. The underlying totals are in constant prices, except for Norway and Australia. - <sup>8</sup> Includes electricity. - <sup>9</sup> Includes trade and services. - <sup>10</sup> Includes electric power and construction.

munications, public utilities, or housing. The rest of the sectoral data are too heterogeneous to permit any generalizations, and they have been omitted from the table.

This suggests that, contrary to the commonly held impression that agriculture is a "bargain sector" for investment, where large returns may be expected from relatively low investment outlays, farming in fact is characterized by relatively high capital requirements relative to the level of output. Whether the satisfaction of these capital needs makes corresponding demands for monetized capital is not quite certain; it is possible, although most of the available data are not clear on this account, that a part of the capital stock included is the result of nonmonetized investment in the form of utilization of manpower on farms to create capital in the form of various land improvements, simple farm buildings, farm road construction, etc.

The average ratio for the United States, which

is based on data which exclude such nonmonetized capital formation, is substantially lower than net ratios for other countries. It is unlikely, however, that nonmonetized capital formation would be of much significance in the United States farm sector; the low ratio is therefore likely to reflect mainly other factors than the exclusion of this type of capital. Moreover, capital/output ratios in the other sectors are also lower in the United States than in the other countries included in the table. In most countries the estimated capital/output ratio in agriculture is so much higher than in manufacturing or mining that even if it were assumed that nonmonetized capital formation is included in all other series shown, it would be doubtful whether its exclusion would reduce the ratio to the level of those for mining and manufacturing.

Among the various factors which affect the level of the capital/output ratio, the most influential appear to be the following:

1. The degree of divisibility of the capital investment. Where investment is "lumpy," that is, where it has a large minimum size and cannot be readily adjusted to changes in demand, the ratio of capital to output tends to be high, and vice versa.
2. The life expectancy of the assets. The ratio of a long-term investment to annual output will be higher than that of an investment which normally has a short duration. This may be related to some extent to the "lumpiness" of the investment, although there are also many divisible investments with long life expectancy.
3. The degree of utilization of the capital stock. Utilization at less than full capacity will raise the ratio, and vice versa. This, too, is related to the "lumpiness" of the investment, insofar as less than full utilization of capacity is typical of indivisible investments, at least in the early phases of their life.
4. The rapidity with which innovations take place. Industries or sectors where the level of technology is stable, so that there is little "writing off" because of obsolescence, tend to have higher capital stock relative to output than those where innovation is rapid.
5. The strength and direction of linkages with other sectors of the economy. Ability of a sector or industry to utilize the external economies created by other sectors tends to lower its capital/output ratio and vice versa.
6. The strength of intrasectoral links. A high degree of complementarity between the various branches of a sector will tend to reduce the capital/output ratio, and vice versa.

If the nature of the capital stock in the various sectors is considered in the light of these criteria, many of the differences between capital/output ratios appear to be explained. Thus investment in infrastructure, for instance, is "lumpy" and of long duration; it tends to be underutilized, especially in the early phase of its life. Innovations come slowly. The main role of the infrastructure is to provide external economies for other sectors, without equal reciprocation. The housing sector, too, is characterized by long life expectancy and slow innovation.

In contrast, manufacturing industry might be expected to have a low capital/output ratio. Capital

investment is of fairly short duration and divisible, i.e., the productive capacity can be adjusted to the requirements of demand in a relatively smooth manner. Consequently there tends to be less lag in capacity utilization on this account. Innovations are frequent and often capital-saving. Linkages with outside sectors are strong, in the sense that the sector benefits strongly from improvements in other sectors, particularly in infrastructure. Finally there are strong complementarities within the sector, so that expansion in one branch causes a chain of external economies for the other branches.

In agriculture, both the characteristics which tend to raise the capital/output ratio, and those which lower it, are to be met with. The latter include the limited importance in most countries of "lumpy" investment in the total; public investment in large-scale irrigation or land settlement projects would be the main exceptions. With the exception of service buildings and of land improvements (where they are included in the capital stock) most of the capital is of relatively short duration, such as tractors and implements, livestock and crop inventories. The importance of transport and marketing arrangements for agriculture means, moreover, that agriculture benefits considerably from the development of infrastructure.

Some other characteristics of farming, on the other hand, tend to raise the capital/output ratio. One of the most important is the underutilization of much of the capital stock, notably machinery and draft animals, because of the seasonal character of much of agriculture. Thus while a machine in manufacturing industry may be used at a rate of anywhere from 2,000 to 8,000 hours a year, a tractor, one of the most intensively utilized pieces of farm machinery, is in Europe or North America used for an average of some 400-800 hours a year. Seasonal implements are used for a much shorter period still. In some circumstances this may be true of buildings also, e.g., where much space is needed for seasonal storage of animal feed, or where the climate necessitates indoor feeding during a part of the year.

Other factors tending to raise the capital/output ratio are the predominance of small operational units, which in many countries deprives agriculture of economies of scale and the nature of innovations which, in the economically advanced countries at least, have been largely of capital-using type.

It may be added that, aside from the question of whether or not the nonmonetized forms of capital

are included in the capital stock, there are two reasons why the data in the table do not fully reflect the real capital requirements of agricultural production. In the first place, increased farm output may demand the establishment of various industries, such as fertilizer factories and manufactures of implements and machinery, the capital requirements for which are included in the industrial rather than in the farm sector. Secondly, a rapid growth of farm production perhaps even more than growth in the other major sectors, will require the development of infrastructure, in particular, roads and railways to permit access to markets.

#### CAPITAL REQUIREMENTS AND ECONOMIC GROWTH

Study of long-term series of capital/output ratios in a number of economically advanced countries suggests that in earlier phases of development the ratio for the economy as a whole tends to rise gradually with the expansion of the country's economic base. Once the base is fairly established the ratio becomes stable, and at very advanced levels it shows signs of a decline as emphasis is switched from labor-saving and capital-consuming inventions to attempts at economizing capital.<sup>18</sup>

Whether such a pattern of change applies also to agriculture is less certain, and the long-term series of agricultural capital/output ratios for five countries shown in Table III-16 do not support this view. In the United States, for example, the estimated ratio in the 1950s was at about the same level as it was late last century, or again in the 1920s, but substantially higher than in the intervening periods. In New Zealand, too, the ratio has been rising since the early 1930s. The ratio in Argentina has on the whole shown little change, fluctuating during most of the present century between 3 and 4. The only countries showing a fall in recent periods are South Africa and Colombia, neither of which is yet a fully developed economy.

These series refer, of course, to fixed capital stock. With regard to the annually rotating funds of working capital used to purchase intermediate goods and services from other sectors, the trends are more consistent. In less developed countries such pur-

<sup>18</sup> William Fellner. Long-term tendencies in private capital formation: the rate of growth and capital coefficients. In *Long-range economic projections*, p. 275-331. Princeton, Princeton University Press, Studies in Income and Wealth, Vol. 16, 1954.

TABLE III-16. - TIME SERIES OF CAPITAL OUTPUT RATIOS IN SELECTED COUNTRIES

Argentina <sup>1</sup>	Colombia <sup>1</sup>	New Zealand <sup>2</sup>		
1900-04 3.8	1925 3.3	1921/22 - 1925/26	4.46	
1905-09 4.0	1945 3.0	1926/27 - 1930/31	4.56	
1910-14 4.1	1953 2.8	1931/32 - 1935/36	4.08	
1915-19 4.0		1936/37 - 1940/41	4.12	
1920-24 3.8		1941/42 - 1945/46	4.43	
1925-29 3.6		1946/47 - 1950/51	4.59	
1930-34 3.9		1951/52 - 1954/55	5.51	
1935-39 3.4				
1940-44 2.9				
1945-49 3.2				
1950-54 3.4				
South Africa <sup>3</sup>		United States		
1919-23 2.3		( <sup>3</sup> )		( <sup>3</sup> )
1924-33 2.9	1870	1869	2.23	
1929-38 3.2	1880	1879	1.98	
1934-43 2.9	1890	1889	1.89	
1939-48 2.6	1900	1899	1.62	
1944-53 2.1	1912	1909	2.10	
	1922	1919	2.41	
		1929	2.02	
	1938	1937	1.88	
		1948	2.12	
		1953	2.47	

SOURCES: Argentina, Colombia, South Africa, and the United States series for fixed capital stock: as in Table III-15.

New Zealand: B. P. Philpott and J. W. Stewart. *Income and productivity in New Zealand farming, 1921-56*. Christchurch, Lincoln College, University of New Zealand, Technical Publication No. 17, August 1958, calculated from Table VI, p. 23, and Appendix Table I.

United States series for structures, machinery, and livestock: J. W. Kendrick. *Productivity trends in the United States*. Princeton, Princeton University Press, 1961; calculated from Table B-I and B-III (Appendix A), p. 347 and 367.

<sup>1</sup> Ratio of fixed reproducible capital to gross domestic product at constant prices. - <sup>2</sup> Ratio of structures, machinery, and livestock to net farm output. - <sup>3</sup> Ratio of fixed capital stock (excluding land) to net product at constant prices.

chases are of limited importance and are likely to equal only a fraction of the value of gross output in agriculture. Higher levels of agricultural technology require, however, increasingly larger purchases of fertilizers and other chemicals, fuels and electricity, imported seed and feed, and various contract services. Table III-17 shows the share of such expenses in the gross output of the "national farm" in selected countries. From below 10 percent in Greece, Spain, and Yugoslavia it rises to around 20 percent in Japan and between 25 and 35 percent in most countries of western Europe, in the United States, and New Zealand. The highest proportions, between 40 and 50 percent, are to be found in countries like the United Kingdom and the Netherlands, with large consumption of imported feedstuffs.

Over time, too, the importance of working capital

TABLE III-17. - PURCHASES FROM NONAGRICULTURAL SECTORS AND ABROAD AS PERCENT OF GROSS AGRICULTURAL OUTPUT IN 22 COUNTRIES IN 1958-60<sup>1</sup>

United Kingdom .....	50.7	Ireland.....	27.1
Netherlands.....	38.8	Austria .....	26.1
New Zealand .....	37.2	Finland .....	21.5
Switzerland .....	36.8	France .....	21.1
Israel .....	35.4	Japan .....	19.0
Belgium.....	33.6	Italy .....	15.2
Sweden .....	31.9	Poland .....	10.9
Germany, Fed. Rep. ....	30.4	Portugal .....	10.1
Norway <sup>2</sup> .....	29.3	Yugoslavia .....	8.7
Denmark .....	27.5	Spain <sup>3</sup> .....	8.3
United States .....	27.5	Greece <sup>3</sup> .....	8.2

SOURCES: European countries and Israel: FAO/ECE. *Towards a capital intensive agriculture. Part I. General review*, p. 24. Geneva. 1961. (Mimeographed.)

Japan: *Social accounts of agriculture F. Y. 1960*. Tokyo. Research Section. Ministry of Agriculture and Forestry.

United States: U. S. Dept. of Agriculture. *The farm income situation*. July 1960 and July 1961. U. S. Dept. of Commerce. *Statistical abstract of the United States*. p. 883. 1961.

New Zealand: B. P. Philpott and J. D. Stewart. *Income and productivity in New Zealand farming. 1921-56*. Christchurch. Lincoln College. University of New Zealand. Technical Publication No. 17. August 1958.

<sup>1</sup> All data refer to current prices. - <sup>2</sup> Underestimated because of exclusion of maintenance and repairs. - <sup>3</sup> Excluding domestic feedstuffs of nonagricultural origin, which have been deducted from gross output.

in farming has risen in the economically advanced countries. Postwar data for a number of western European countries show that between 1950-52 and 1959 current expenses grew nearly twice as fast as did the gross output in agriculture.<sup>19</sup> In Japan, the development has been similar. Between late last century and the first world war, a period of rapid development when the country's agricultural output doubled, the index of working capital rose three-fold. During the interwar period, when agriculture generally developed less rapidly, output and working capital grew at roughly comparable rates, but in the postwar years the working capital has again grown at about twice the rate of agricultural output.<sup>20</sup>

#### CAPITAL SHORTAGE AND AGRICULTURAL DEVELOPMENT

Although the evidence is incomplete, available data thus suggest that agriculture may be in fact a sector

<sup>19</sup> FAO/ECE. *Towards a capital intensive agriculture: fourth report on output expenses and income of agriculture in European countries. Part I. General review*, Table vii. p. 23. Geneva. 1961. (Mimeographed.)

<sup>20</sup> *Agricultural development in modern Japan*. Appendix Table I. Document WFC/63/CP/IC/1. World Food Congress. June 1963.

which sets rather high requirements on the total capital supplies of the economy, especially if working capital is included. Given on the one hand the need for a rapid increase in agricultural production and on the other the perennial scarcity of investment capital, this clearly poses a problem for the developing countries.

There are two principal ways in which the problem of agricultural capital requirements may be alleviated. The first, and most important in the past, is the conversion of available "excess" supply of labor into investments in land improvements, irrigation works, farm road construction, etc. This has clearly been the method by means of which much of the basis for today's highly developed farming was developed in Europe and Japan.

In some of the countries more recently opened up, investment of imported capital played a part in developing agriculture for production of export crops, but today the opportunities and incentives for such investment are much reduced. Nonmonetary capital investment is bound to remain a major form of agricultural capital formation in the less developed countries, and opportunities for it are particularly favorable where there is substantial rural underemployment. It may be promoted by the injection of key materials from outside the farm sector (cement, structural steel), and by providing staff to assist in organizing the efforts, as has been done in various countries under the community development schemes. International food aid, to meet the increased demand for food arising from the enhanced work effort, can be of great assistance.

A second method is that of achieving a more rapid turnover of the capital invested. As was pointed out earlier, one of the major factors determining the size of the capital/output ratio is the duration of the capital investment: an investment, such as a large-scale irrigation project, which will continue to provide services for 30 or 50 years, will tie down much more capital relative to the annual output than does one which, in the normal course of affairs, will be replaced in a few years. It may be recalled, for example, that latterly the Indian Planning Commission has tended to emphasize the construction of small-scale, quick-yielding irrigation works, rather than of large-scale schemes. The turnover of capital is even more rapid when used as working capital. As already noted, the input of working capital accounts for a progressively greater portion of the gross farm output in more developed countries as the technical level of farming improves.

## Conclusions

It is useful at this stage to recapitulate some of the main findings of the foregoing factual analysis. A more complete summary is to be found in Chapter I, but the following points seem significant in reaching general conclusions.

1. In the last half century, and especially in the last two decades, there have been striking increases in crop yields in many countries. Increases of 50 to 100 percent in yields of cereals, for example, are fairly common and in a few countries they have increased two or threefold. In other countries, often with similar conditions of soil and climate, yields have scarcely changed over this period. Yields of livestock products have so far increased rather more slowly than those of crops, though in many cases their potentialities for higher productivity seem even greater. Recent developments amply demonstrate the immense capacity of agriculture for increased output, especially when allowance is also made for more intensive methods of farm management, such as double cropping, and the full utilization of pasture, fodder crops, and crop residues for animal feed.
2. Out of 52 countries for which data are available, the over-all productivity of land (gross output per hectare of agricultural land) in recent years was about 40 times higher in countries at the top than in those at the bottom of the range.<sup>21</sup> High over-all productivity of land is generally associated with (a) high density of population in relation to the agricultural area; (b) high per caput incomes and expenditures on food; (c) substantial exports of farm products.
3. There are similar wide differences in the productivity of labor, especially for crops such as cereals which lend themselves to mechanization. For example, it takes about 40 times more man-hours of work to produce a ton of wheat in Japan or Colombia than in the United States. The over-all productivity of labor shows a still wider range. Gross output per man engaged in agriculture is some 50-80 times greater in Australia and New Zealand than in the Republic of Korea and India, with all intermediate values. Net output per man,

after allowing for the cost of fertilizers and other inputs from outside agriculture, shows a narrower but still very substantial range.

4. High productivity of labor bears no apparent relation to the productivity of land or to the density of population. It is associated with the general level of economic development, and is highest in countries where incomes and therefore per caput expenditures on food and other farm products are high, and where a fairly small percentage of the work force is engaged in farming. It tends also to be high in countries with large exports of farm products.
5. Data on the productivity of capital in agriculture are scarce. A limited number of national studies, not necessarily generally applicable, do not support the widely held view that the capital/output ratio in agriculture is generally low compared with other sectors. Nor do they indicate that in agriculture the capital/output ratio tends to rise in the course of economic development. They show clearly, however, the much greater requirement of working capital (for production requisites) in the more advanced and productive agricultures.

These are some of the main findings which emerge, and the question arises whether any general pattern can be found which may throw some light on the nature and magnitude of the differences between countries in the productivity of land and labor.

Differences in the productivity, of course, often reflect natural conditions of soil and climate. Climate and soil, however, are clearly not the whole story. So much is evident from the fact that in many countries where yields were formerly low they have been raised dramatically in one or two decades. The study suggests that, except in especially unfavorable environments, national average levels of productivity, whether of land or of labor, reflect the technical progress of agriculture as much or even more than natural conditions of soil and climate.

This in itself is not surprising. It is well known that the productivity of land and livestock may be greatly increased by such means as the use of fertilizers – the following chapter gives many striking examples – by better breeding, by the control of plant and animal disease, and by a whole range of other improved practices. The productivity of labor is usually incidentally increased by these measures, and is raised more directly by the use of ani-

<sup>21</sup> These are national averages and there will often be pockets of highly productive land in countries where the general average is low, and vice versa.

mal or mechanical draft power, by improved management, and increasing skills. These matters form the basis of agricultural science and it is on such developments that all attempts to raise the productivity of agriculture must ultimately rely.<sup>22</sup>

As is said in the introduction, however, it is not the purpose of the present chapter to discuss the technical means of raising productivity. The aim is primarily to consider the underlying economic and social factors which in some countries have made it possible and profitable for farmers to make use of the tools which agricultural science has put at their disposal but which in other countries appear to have hindered their general adoption.

The evidence presented above suggests that a determining factor is the growth of the domestic and export demand for farm products. This acts as the main stimulus to increased production. It appears that – in the absence of certain impediments to be discussed later – there is a tendency for agricultural production to expand up to the level of effective demand insofar as this demand is felt at the farm level. In view of the capacity of agriculture for expansion, whether by extension of the area cultivated or, where land is scarce, by more intensive cultivation, this seems entirely plausible.

The growth of domestic and export demand, however, is not only a stimulus to increased production. At any point of time it also sets, within fairly wide limits, as it were, an economic ceiling on the agricultural output of a country. If that ceiling is greatly surpassed there will be a sharp fall in farm prices (unless this is prevented by effective measures of price support) and low prices will discourage any further expansion until the continuing growth of demand due to rising populations and incomes once more makes it profitable. The adjustment may be made quickly by reducing the area or by the less intensive cultivation of annual crops. It may be long drawn out and painful; for example, if there is over-planting of slow maturing tree crops representing a large financial investment. But in the absence of government intervention producers cannot for more than a limited time maintain production for the market in excess of effective demand. All this is no more than a restatement of the relationship between demand and supply.

Thus the growth of effective demand, at home and on world markets, acts both as the main stimulus to agricultural expansion and as a governor which impedes production from greatly exceeding the

volume of profitable outlets. It regulates, also within rather wide limits, the volume of output which, in relation to the agricultural area of a country and to its farm labor force, determines the national level of productivity.<sup>22</sup>

This would account for the high productivity of land, even in underdeveloped countries, where population is dense relative to the area of agricultural land, and for the still higher productivity if demand is further increased by rising incomes or by production for export. It would explain also the higher productivity of labor in the more developed countries. The low percentage of the population engaged in agriculture, characteristic of developed economies, means that there is a correspondingly larger market for each person remaining in agriculture, while the high level of incomes ensures a large per caput expenditure on food. Here, too, the ceiling on production, and therefore on productivity, is further raised in countries with export as well as domestic outlets.

It by no means follows, however, that output will always expand fully up to the limit set by the growth of demand. As is well known, in many western European countries and in Japan the growing demand for farm products, with rising populations and industrialization, gradually outran domestic production with the result that these countries became heavily dependent on agricultural imports. A similar lag is evident in many developing countries today, and they have had either to reduce food exports or to increase food imports. As shown elsewhere in this report, imports of foodstuffs into many countries of Asia, Africa, and Latin America have grown sharply since the second world war. The influence of international trade on agricultural productivity is discussed more fully below.

Among the main factors which impede production from expanding up to the limit of effective demand four may be singled out: (1) limitations of natural conditions; (2) competition from other countries; (3) lack of technical knowledge; and (4) institutional weaknesses. Each of these factors is discussed briefly below.

<sup>22</sup> It may be useful to repeat at this point that the entire discussion in the chapter is in terms of national aggregates and national averages. The data apply to what is sometimes called the national farm. They do not apply to individual farms. With skilled management high levels of output per hectare and output per man are entirely possible in countries where, because of limitations of demand, national averages of productivity are low. This would be likely to increase the share of the market and the profitability of these particular farms, even though the possibilities of the agricultural sector as a whole were restricted by the over-all size of domestic and export outlets.

*Natural conditions.* It was suggested above that today the average level of productivity in a country usually depends at least as much on farming techniques as on the natural factors of climate and soil, except of course in desert areas or other extremely unfavorable environments. While this is broadly true of agricultural production as a whole, few countries have so wide a gamut of climates and soils that they can produce all the agricultural commodities they consume. Temperate countries depend on tropical countries for coffee, tea, cocoa, rubber, tropical fibers, etc., and as their per caput incomes rise, tropical countries may in time come to import a range of temperate products. Climate is a first factor which tends to make output, and hence productivity falls short of the ceiling set by effective demand.

*Competition from other countries.* The market open to agricultural producers, whether at home or abroad, may be restricted by competition from other countries, including competition from synthetic substitutes for natural products. This may be illustrated by a few concrete examples. Perhaps the most striking historic example is that of the United Kingdom. The remarkable growth of British agricultural production and productivity in the first half of the 19th century, stimulated by the industrial revolution, was first checked and then turned into agricultural depression by increasing shipments of grain and later of livestock products, etc., from North America, Latin America, and Oceania at prices with which few British farmers could compete. In this century the expansion of Japanese agriculture was slowed down between the wars, largely by heavy imports of low cost rice from the Korea and Formosa, which met a large part of the domestic demand.

For countries which industrialized relatively early, there were often some compensating advantages, in that agricultural imports helped to open up export markets for their manufactured goods. Today, with export markets for manufactures heavily supplied by established industries in the countries which were first to industrialize, newly developing countries find it much more difficult to derive this type of compensating trade benefit. However, food imports obviously become essential if farm production lags too far behind demand.

Competition from other countries can also limit export outlets. For instance, outlets for Latin American coffee exporters have been affected by rising exports from African countries; outlets for tropical

oilseeds have been reduced by the growth of oilseed production in, e.g., the United States, while outlets for rubber and fibers have been restricted by competition from synthetic products made in industrialized countries.

Both on domestic and export markets the effect of competition from producers in other countries is, in effect, to lower the economic ceiling on production. This, of course, is a process which can work in both directions. By greater production efficiency, by improved quality, or by accepting a lower price, farmers can also increase their outlets in competition with producers in other countries, and this will tend to increase productivity. Whether total receipts and net returns also increase will depend in each particular instance on the response of demand to price changes.

*Lack of technical knowledge.* If production lags behind the growth of demand, especially in developing countries, an important contributing factor is often that with limited research, education, and extension services, most farmers have no knowledge of any but their traditional methods of farming, not only in producing for the market but also in subsistence production. In many cases farmers in developing countries, with little additional labor or expense, could improve the diets and well-being of themselves and their families by producing fruits and vegetables, small livestock, and fuel wood for their own use if they were aware of the value of such projects and how to carry them out. This must have been the practice of the relatively skilled farmers who settled in North America and Oceania. The same thing could and should be encouraged in the developing countries, and would contribute greatly to the well-being and working efficiency of rural people.

*Institutional deficiencies.* Probably the biggest factor retarding agricultural growth in developing countries is the unsatisfactory institutional framework within which agricultural production is carried out. This may include unsuitable forms of land tenure, lack of farm credit except at extortionate rates of interest, and farm price instability exacerbated by poor systems of marketing. Because of these institutional deficiencies the full impact of the rapid growth of demand in towns often is not felt by rural producers. Much emphasis has been laid by FAO on the serious braking effect

of such institutional weaknesses on agricultural development.<sup>23</sup>

If, for example, a tenant pays half of his output as rent and contributes all the main inputs other than land, his incentive to use fertilizers or to increase production in other ways is halved, while the market risk he incurs is doubled. If he has no security of tenure, he will not easily embark on any but short-term projects to improve his holding. If credit is available only at high rates of interest, production loans for improved seeds, fertilizers, or pesticides are less likely to be profitable. If, because of indebtedness or lack of resources, most farmers must sell immediately after the harvest, thereby depressing the market to an unprofitable level, there is again a seriously reduced incentive to increased production for the market. Such factors contribute largely toward the present lag of food production in developing countries in relation to demand.

These four main factors tending to make agricultural production fall short of demand do not operate equally in all countries. Limitations of natural conditions, for example, probably apply more strongly to temperate than to tropical climates. They are of more importance in high income countries with a wide range of demand for agricultural commodities, including many which cannot be grown in their own conditions of climate and soil, than in developing countries with lower incomes and a simpler pattern of demand.

In developing countries production is hampered mainly by lack of technical knowledge and by institutional deficiencies. These factors apply more strongly in the domestic economy than in the export sector, which in general is better organized, and in developing countries it is production for domestic markets that most often lags behind demand.

A relation between demand on the one hand and output and productivity on the other is of course in no way unexpected, and applies not only to agriculture, but to many other economic goods and services. What is more interesting, however, is that in spite of the impediments just considered, the relationships in agriculture are so clear over

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<sup>23</sup> See, for example: Some general problems of agricultural development in less developed countries in the light of postwar experience, *The state of food and agriculture, 1959*. Programming for agricultural development, *The state of food and agriculture, 1960*. Land reform and institutional change, *The state of food and agriculture, 1961*. See also the Declaration of the World Food Congress, Washington, June 1963.

such a wide range of countries with very different natural conditions, income levels, and population densities. This suggests that agricultural production has some special characteristics which explain the close correspondence between productivity and the level of demand, relative to the amount of land and labor.

Again, four factors appear to be particularly relevant. The first is that land as a production resource is capable of being used at widely varying intensities. It has few alternative uses, other than farming, and according to the intensity of demand, methods of production tend to be developed that utilize the resource in a rational way. What is true of agricultural land is true also of the agricultural population, and this constitutes the second factor. Because agriculture is man's first settled occupation, the farm population is nearly always a high percentage of the total at an early stage of development. Labor can be absorbed into other occupations only gradually, as jobs become available. In most developing countries there is therefore an abundance of farm labor, usually with no other available employment, which is used with greater or less intensity according to the level of demand. Hence the close association observed between the distribution of the work force between agriculture and other occupations and the productivity of agricultural labor. This consideration does not apply with the same force in other industries, where an increased demand can be met by an intake of labor without necessarily any change in the level of productivity. What is also remarkable is the great flexibility of production conferred by agricultural science which, as already shown, has made it possible in advanced countries, to attain productivities of land and especially of labor to levels up to 80-fold greater than in countries at an early stage of development.

The third and fourth factors relate to protection. Because of the bulky nature and fairly low unit values of most farm products transport costs are relatively high. Although the development of cheap ocean and land transport has reduced this natural protection, it still remains substantial. In addition many countries give domestic farmers some degree of protection by tariff and other measures against competition from abroad. The objectives may be varied, e.g., to save foreign exchange, to reduce the extreme price fluctuations characteristic of farm products on a free market, or to reduce disparities between farm and nonfarm incomes. Such measures add to the "natural protection" of agri-

culture, and hence to the rather close correlation between the demand for foodstuffs and the productivity of land and labor.

#### PRODUCTIVITY AND THE GROWTH OF DOMESTIC DEMAND

If demand is a main determinant of agricultural productivity, it is of some interest to consider the dynamics of this process in the course of economic development. For simplicity this may be done first in the context of a largely self-sufficient economy where net export and imports are relatively small, and where production is closely geared to domestic consumption.

The two main elements influencing domestic demand are the growth of population and the growth of income. While the effect of the first is directly proportional to the rate of population change, the effect of the second varies with the level of income. As is well known, the share of the income spent on food and other farm products declines progressively as income rises, even though the total expenditure on food rises. This means that a ten percent rise in average disposable incomes from say \$100 to \$110 in a developing country will have a *proportionately* greater effect on the consumption of food than an increase from \$1,000 to \$1,100 in an economically developed country. In other words, the effect of income on demand is greatest at an early stage of development. In the intermediate stages of development there is a gradual change in the dietary pattern toward preferred but more expensive foods; this implies higher expenditure on farm products, though at a diminishing rate. In the highest income countries the demand for food and other farm products is nearly saturated and changes but little with a further rise in incomes. A larger expenditure on one kind of food tends to be offset by a smaller expenditure on another, while a good deal of any increase in expenditure reflects more elaborate processing and distribution services rather than a larger consumption of farm products. At this stage, demand at the farm level grows scarcely faster than the growth of population.

The effect of the growth of demand on the productivity of land is fairly simple and may be considered first. Until recently, a rising demand for farm products seems to have been met mainly from an extension of the farm area when land was available, rather than by more intensive cultivation. This appears to explain why even in countries at a

high level of technical development the average productivity of land remains relatively low if land is abundant in relation to population. Examples are the United States, Canada, Australia, and New Zealand, though in each of these countries there are, of course, pockets of very high productivity per hectare.

Only, it appears, when opportunities to extend the area cultivated were becoming limited, were serious efforts made in the past to raise the productivity of land. In such conditions high outputs per hectare (though not per man) have often been reached, even in countries still at an early stage of economic development, such as the United Arab Republic and China (Taiwan) though high productivity of land is of course more readily achieved in technically advanced countries.

Whether the tendency toward first extending the farm area will persist now that agricultural science has greatly simplified the problem of raising yields and the productivity of land and livestock is another matter. Even countries with a low density of population may find it more economic to increase the intensity of cultivation than to extend the area cultivated. The fact that both in western Europe, with generally dense populations, and in North America and Oceania where land is still abundant relative to population, crop areas are tending to contract and the intensity of cultivation to increase, is perhaps indicative. In North America, however, an important contributing factor has been government restrictions on crop areas to limit the cost of price supports.

The effect of the growth of domestic demand on the productivity of labor is somewhat more complex. It responds to the growth of per caput consumption with higher incomes. Demand relative to the farm labor force, however, depends not on the growth of the total population, but on the occupational distribution of population between agriculture and other sectors. For if there is no change in the percentage of the labor force in agriculture, the increased demand resulting from population growth is merely spread over a proportionately greater number of workers.

It is easy to see how this operates if one considers the relative size of the domestic market potentially available to each farm family as the relative size of the farm sector changes. At an early stage of development, when farm employment stands at 80 percent, there are four families in agriculture to every one outside. On average each farm family

TABLE III-18. - TOTAL NUMBER OF FAMILIES PER FARM FAMILY (INDICATING RELATIVE SIZE OF THE DOMESTIC MARKET) AT PROGRESSIVE STAGES OF ECONOMIC DEVELOPMENT

Percentage of labor force in agriculture (1)	Number of families to each farm family (2)	Percent increase in potential domestic market (3)
<i>Percent</i>	<i>100/(1)</i>	<i>Percent</i>
80	1.25	—
70	1.43	14
60	1.67	17
50	2.00	20
40	2.05	25
30	3.33	33
20	5.00	50
10	10.00	100
5	20.00	100

thus has for its domestic market 1.25 families; itself and one quarter of a nonfarm family.

This ratio rises as the progress of economic development leads to a decline in the percentage of the population engaged in agriculture, but at first the change is slow. At early stages of development, a fall in the agricultural population from 80 to 70 percent (which implies an increase by 50 percent in the share of nonagricultural population, by no means a negligible achievement) leads to an expansion in the "market" to 1.43 families, or by 14 percent.

For the potential "market" to double, the share of agricultural population in the total must fall from 80 to 40 percent, or looked at the other way around, the share of the nonagricultural population must rise threefold, from 20 to 60 percent.

At a later stage of economic development, however, the process accelerates. The "market" will double once more when the share of agricultural population is reduced from 40 percent to 20 percent, although during this stage the share of non-farm families increases by one third. It doubles again when the farm labor force sinks from 20 to 10, and doubles once more when it falls from 10 to 5 percent, the lowest level so far reached, apart from a few exceptional economies, e.g., Hong Kong (Table III-18).

This accelerated growth in the potential market goes far to account for the very rapid rise in agricultural labor productivity in recent years in the economically developed countries of North America and northwest Europe, where farm employment has recently been falling over the range 30 percent to 10 percent or even lower. This is, of course, a two-way process. An expanding urban market is

essential for the sharp increase in productivity, but equally without mechanization and other improved techniques a major shift of labor to nonfarm occupations is out of the question.

The combined effect on the domestic market for foodstuffs of rising incomes and the distribution of population between agriculture and other sectors is evident in Table III-19, based on national estimates of consumer expenditure and labor statistics. Forty-three countries for which expenditure data are available have been placed in six groups, according to the level of per caput consumption expenditure on all items after adjustment for differences in the purchasing power of national currencies.<sup>24</sup> For each group unweighted averages are shown of per caput expenditures on food at both the retail and farm level, the latter roughly estimated as a percentage of the retail expenditure on the basis of the somewhat limited information available to FAO. Data are also given for each group of the average distribution of population between agriculture and other sectors.

Although the number of countries is small, especially at the lowest income group, the trend is unmistakable. Average per caput expenditures on food rise, but at a diminishing rate in the upper income groups. Thus, comparing the two groups \$400-800 and over \$1,000, total expenditures increase by two and a half times, while retail expenditures on food rise by about two thirds and estimated farm expenditures by only about one third. The estimated per caput expenditure on food at the farm level increases by 75 percent, however, in the group \$400-800 compared with the group \$100-200.

In contrast, the growth of the domestic market in relation to the farm labor force due to the movement of labor out of agriculture is seen to show an accelerating trend. At the lower income levels there is only a small rise in the total number of families for each family dependent on agriculture, but this figure nearly doubles from the group \$800-1,000 to over \$1,000.

Combining the two factors to show the apparent growth of the domestic market in relation to the farm labor force (column h), it is seen that this at first rises fairly slowly, but after the \$200-400 level roughly doubles in moving to the next higher income group. The final column shows also the

<sup>24</sup> See footnote 3 to Table III-11.

TABLE III-19. - RATE OF GROWTH OF DOMESTIC MARKET FOR FOODSTUFFS IN RELATION TO (a) RISING INCOMES AND EXPENDITURES AND (b) THE MOVEMENT OF LABOR FROM AGRICULTURE TO OTHER OCCUPATIONS

Per caput personal expenditure (a)	Number of countries included (b)	Average per caput retail expenditure on food (c)	Estimated farm share of consumer expenditure (d) <sup>4</sup>	Estimated per caput expenditure at farm level (e) (c×d)	Average percent male labor force in agriculture (f) <sup>2</sup>	Number of families per farm family (g) 100/(f)	Relative domestic market for farm products per farm family (h) (e×g)	Average gross output per man: Italy = 100 (i)
\$ <sup>1</sup>	Number	\$ <sup>1</sup>	Percent	\$ <sup>1</sup>	Percent	Number	\$ <sup>1</sup>	Indices
Over 1,000 (\$1,261) <sup>3</sup>	7	\$ 335	40	\$ 134	12	8.3	\$ 1.112	503
800 - 1,000 (\$916)	7	\$ 285	45	\$ 128	22	4.5	\$ 576	396
400 - 800 (\$542)	9	\$ 201	50	\$ 101	37	2.7	\$ 273	160
200 - 400 (\$305)	11	\$ 139	60	\$ 83	58	1.7	\$ 141	48
100 - 200 (\$167)	7	\$ 83	70	\$ 58	61	1.6	\$ 93	n.a.
Under 100 (\$70)	2	\$ 54	80	\$ 43	69	1.4	\$ 60	n.a.

<sup>1</sup> Adjusted for differences in purchasing power: see Table III-11, footnote 3. - <sup>2</sup> Or estimated percentage of population dependent on agriculture in countries where labor statistics are not available. - <sup>3</sup> Figures in brackets are the unweighted average personal expenditure on all items for all countries included in the group. - <sup>4</sup> The rising percentage takes account of the increasingly large subsistence sector in agriculture in the low income countries.

average gross output per man in these countries,<sup>25</sup> and this figure shows a roughly parallel rise, though the correspondence between the two series is only moderately close, mainly because of the effects on productivity of international trade.

	Percent
Thailand	28
Argentina	29
Australia	53
New Zealand	85

#### INTERNATIONAL TRADE

The six income groups in Table III-19 include both net exporting and net importing countries for farm products. It was pointed out earlier that countries with substantial export outlets commonly have a higher level of agricultural productivity than countries at a similar level of development which are self-sufficient or net importers. To obtain an indication of the magnitude of this enlargement of the market, estimates were made for a few agricultural exporting countries of the percentage of the total output sent abroad, using the same price weights as for FAO production indices. The results in round figures were as follows: gross exports as percentage of agricultural production 1956-60,

These figures are likely to be higher than those for most exporting countries, as all four countries are fairly sparsely populated. The figures for Australia and New Zealand are especially high, largely because of heavy exports of livestock products, including wool. They suggest that for Argentina and Thailand, with about 70 percent of output consumed domestically and 30 percent exported, exports increase agricultural outlets by rather less than 50 percent. For Australia it appears that the available market is roughly doubled by exports, and for New Zealand increased by nearly six times.

These are substantial figures, emphasizing the importance of exports to the countries concerned. It is worth noting, however, that these ratios are smaller than the potential growth of the domestic market in relation to the farm labor force as shown in Table III-19, where the increase from the lowest to the highest income group is more than 18 times.

<sup>25</sup> Aggregate production as calculated for FAO production indices divided by the number of male workers engaged in agriculture.

Even this range would be considerably exceeded if individual countries were compared.<sup>26</sup>

Similar estimates for the United Kingdom and Japan, as typical importing countries for farm products, show imports of all agricultural products as equivalent to about 106 percent and 46 percent respectively of domestic production. Thus, if these countries were to become self-sufficient, highly improbable if only for climatic reasons, outlets for farm products and hence farm productivity would increase by about 50 percent in Japan and rather more than double in the United Kingdom. Again these figures are well below the range of expansion of domestic markets from low levels as shown in Table III-19.

In general, therefore, estimates of the magnitude of exports and imports in relation to the domestic production tend to confirm the primary importance of the level of domestic demand in relation to the farm labor force as the principle economic factor determining national averages of labor productivity in agriculture.<sup>27</sup>

#### Migration of Labor from Agriculture

The findings of this chapter highlight the importance, both for the productivity of labor in agriculture and for industrial development, of a steady movement of manpower from agriculture to other sectors. But for this to happen, there must be a rapid increase in job opportunities for farm people in the nonfarm sector. The rate at which these opportunities occur in turn depends (a) on the original size of the nonfarm sector; (b) on the rate at which it grows; (c) the extent to which increased nonfarm employment is met by the natural increase of the nonfarm population itself.

In each respect, many countries now at an early stage of development appear to face a more difficult task than the countries which developed earlier.

While statistics are lacking, it is reasonably sure that many developing countries have a smaller nonfarm sector than most European and North American countries had at the beginning of the process of industrialization when the handicraft, mercantile,

and service sectors were already fairly large. At the same time most developing countries today have a much faster natural growth of population in both the farm and nonfarm sector than the countries which industrialized earlier had at the comparable stage.<sup>28</sup> It is, therefore, all the more imperative that they should achieve a very high rate of investment if economic development as a whole is to take place at the rates now considered minimal.

If the nonfarm sector is to absorb surplus labor from agriculture, there are evident advantages in industries with high labor requirements. The tendency, fostered in labor-scarce industrialized countries, for industry to become more capital intensive, and therefore to require less labor for a given output, must tend to retard this movement. Many developing countries make a point of installing only the most modern equipment, which in general requires rather little labor. They may be encouraged to do so by a lack of skilled industrial labor, as well as the wish to be competitive. But this trend must delay the attainment of a distribution of population between agriculture and other occupations favorable to higher agricultural productivity.

Much thought is now being given to the fuller use of underemployed rural manpower for such labor-intensive work as road building, rural construction, irrigation, etc. Such projects could often be organized on a seasonal basis, avoiding the harvest and other peak periods of agricultural work when with present farming methods the whole rural labor force may be fully extended. In the initial stages of such labor-intensive full-employment policies, good use could be made of the surplus food now available in some developed countries.

#### Development Within Agriculture

Most of the discussion in this chapter has been concerned with increased production for market. But there are also considerable opportunities for increases in productivity and living standards within

<sup>26</sup> Cf. Table III-11.

<sup>27</sup> The effect of the trade pattern, however, appears to account for the only moderate degree of correspondence between the two final columns of Table III-19. For example, the average productivity per man in the group \$800-1,000 is considerably increased by the inclusion of New Zealand.

<sup>28</sup> Current rates of population growth in most developing countries range from 2.0 to 3.0 percent annually, and are occasionally higher. In contrast the growth of population in European countries was usually under one percent annually and never rose above 1.5 percent during the period of rapid industrialization. In Japan the highest rate reached in any decade was 1.7 percent. And although rates of growth in the United States were much higher under the influence of immigration, averaging 3.0 percent in the first half and nearly 2.4 percent annually during the second half of the 19th century, this was under exceptionally favorable conditions for economic development.

the agricultural sector itself. The food consumed by farmers and their families is a part, and in less developed countries a substantial part of the total national product. If, by education and extension, including education in home economics, subsistence farmers were made aware of the basic elements of nutrition, they could greatly improve their own diets and standard of living at little or no cost, other than labor, by producing vegetables, fruit, even livestock products for their own consumption. The possibilities were noted in an earlier paragraph, "Lack of technical knowledge."

Some borderline opportunities for agricultural development, partly market and partly subsistence, are also worth mentioning. There are, for example, many ways in which farmers can improve the capital value of their holdings by their own labor, and raise output by methods which involve little in the way of purchased material, though their wide adoption may often require larger extension services, greater security of tenure and, as a rule, market outlets. Schemes for providing school meals or for giving supplementary food to nursing mothers and other vulnerable groups also offer opportunities. Such projects, which cost little or no foreign exchange and involve only transfer payments within the economy, can yield valuable dividends in improved nutrition and health and at the same time give a further stimulus to agricultural production.

All such projects would be valuable, contributing substantially to economic development. Though it must be recognized that, until a large nonfarm market emerged, agriculture would remain largely a subsistence sector, but an increasingly productive one, even though it could not match the levels of productivity possible in developed countries with a large majority of the population in nonfarm occupations.

While a high output per man in agriculture seems to be attained only in the later stages of economic development, there are a number of instances where a high output per hectare has been attained in countries at an early stage of economic development, and this obviously becomes increasingly possible with the growth of agricultural science.

This seems a point of considerable significance. The dynamics of economic development, reinforced by current population explosion, make it inevitable that for some decades to come a majority of the people in developing countries will be engaged in agriculture. But if they can be made aware, on the one hand, of the elements of nutrition and, on the other, of improved methods of farming they could with relatively little labor or expense increase their output sufficiently to realize an adequate diet for themselves and their families. And with an improved institutional structure they could also produce enough for a satisfactory level of nutrition for the nonfarm population.

## Chapter IV. - FERTILIZER USE: SPEARHEAD OF AGRICULTURAL DEVELOPMENT

### Introduction

The use of fertilizer increased during the 90 years following its introduction about 1850, at a fairly constant rate (apart from world war and economic depressions), reaching about 9 million tons<sup>1</sup> per year just before the second world war. After the war, fertilizer use increased more rapidly by an average of about 1 million tons per year to over 29 million tons in 1962.

Most of this increase occurred in areas of more developed agriculture like Europe, Japan, North America, and Oceania, where fertilizers have been used for many years and have proved their value, and where economic and social conditions were favorable for their greater use. In the past ten years, however, less developed countries, too, have been showing greater and greater interest in fertilizers. It is, of course, in these countries that populations are growing more rapidly, while hunger and malnutrition are widespread, and a large part of the population is ill-clad and badly housed. Consequently it is in these countries that the greatest increases in the production of food and fiber are needed, for which much larger supplies of fertilizer and manure are certain to be required. Thus it is in the less developed countries that there is now the greatest need and the greatest potentiality for a fuller use of fertilizers. The immense possibilities for sustained crop production increases which can be realized through the greater and more efficient use of fertilizers and manures have been amply demonstrated in many countries in all parts of the world. Rice in Japan, pastures in New Zealand and cotton in Egypt are notable illustrations. But further research and extension are necessary to establish the basic information needed on the most suitable types of fertilizers and the most economic rates of application in any particular environment.

In addition to increasing crop yields, there are other benefits which may result from the increased use of fertilizers. One of the most important is in widening the range of crops that may be grown efficiently, notably in areas where certain crops could not be grown formerly because of deficiencies of one or more soil nutrients. The success of Burley tobacco in many areas of the United States, for example, is a direct result of the introduction of the use of fertilizers for this crop. An even more striking example is sugar-cane production in Hawaii, which was made economically possible only as a consequence of the use of appropriate fertilizers. Another striking example of the wider range of production resulting from the use of fertilizers is their application to pastures and forage crops. Under some conditions of soil and climate, farms devoted to the production of cash crops have been transformed into crop-livestock farms in this way. In many cases, areas of farm land previously idle and abandoned have been converted to productive crop and pasture land through the introduction of fertilizers. Thus, in addition to raising productivity, the increased use of fertilizers in less developed countries can contribute to a more diversified production.

Changes in crops and in farming systems as a result of fertilizer use may have other effects. New crops may mean new opportunities for mechanization and for changes in the farm's labor requirement. It may also make it possible to add to income by increasing the farm capital in the form of livestock, buildings, and fencing.

Long-term effects of fertilizer on the soil are also important, particularly from the standpoint of soil conservation and fertility. More vigorous plant growth provides a protective as well as a productive cover for the land.

But the efficient use of fertilizers must usually

<sup>1</sup> Expressed as N + P<sub>2</sub>O<sub>5</sub> + K<sub>2</sub>O.

go hand in hand with the provision of other inputs. Irrigation, for example, may be a prerequisite, and so too may be the development of crop varieties which can utilize larger applications of fertilizers, or of methods of controlling diseases and pests in the more intensively cultivated crops. Experiments with wheat in Mexico provide a good example of the need for a combination of improved practices. In one instance on a deep alluvial soil deficient in available nitrogen, irrigation alone increased yields by only 5 percent, a fairly heavy application of nitrogen without irrigation water raised yields 3.7 times, while nitrogen and irrigation together raised yields no less than sevenfold. Another example is provided by a series of experiments with maize in India during the period 1950-58. Hybrid maize with no special treatment produced twice as much dry shelled grain per hectare as the best local variety. But with the application of 80 kilograms of nitrogen per hectare, the average yield was four times that of local varieties.

Within the limits set by environments, the use of fertilizer in a country is influenced largely by economic and social conditions. Unless economic incentives exist for the use of fertilizer, farmers will not approach optimum rates even though climatic conditions may be favorable. When, however, the relation between fertilizer prices and expected returns from crops suggests that the chances for economic returns are sufficiently great, heavy rates of fertilizer may be used even under relatively unfavorable natural conditions.

The extent to which a farmer can use purchased fertilizers and soil amendments also depends on his financial resources. Even if he knows how much fertilizer he can use profitably, he may not have the funds to buy it. This applies especially in less developed countries, where it may require govern-

ment action to make such funds available to him in the form of credit at reasonable rates of interest. Government action may also be needed to organize the efficient and timely distribution of fertilizer supplies. Many governments have found that policies and programs relating to fertilizer use have been powerful tools for guiding land use and the production of crops and livestock along desirable lines.

In this chapter an attempt is made to tell something of the contribution of fertilizer to agricultural production, to show fertilizer as a factor in technological advance in agriculture, especially in less developed countries, and to discuss the various physical factors affecting fertilizer requirements and the economic and social factors affecting its use.

The problem of establishing new ideas and production techniques is one of considerable magnitude and experience has shown that the first stage in changing from traditional methods is the acceptance of one or two simple new ideas. The use of fertilizers is a particularly effective "lead" practice because the response from fertilizer is usually strikingly visible — the differences in growth, color of the plant, and size of the crop or fruit are evident even to the eye of the untrained observer. Moreover, the farmer gets relatively quick returns from the use of fertilizer, particularly on annual crops. He can apply fertilizer to his crop and in a few months harvest and measure the increased production. Yet the outlay required is less than for many other improvements. While adequate credit for the purchase of fertilizer is a problem such credit is required for only a short time. Fertilizer use can therefore be considered a powerful factor in encouraging the adoption of many other practices which are necessary for efficient production (Williams and Couston, 1962).

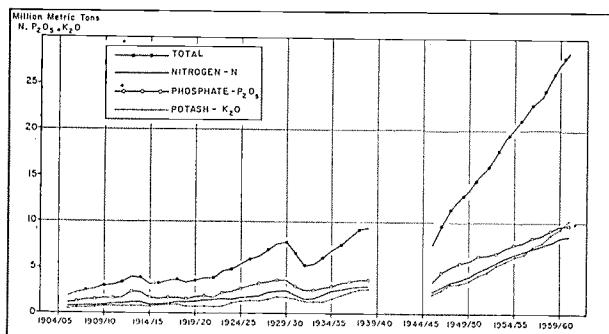
### Growth of fertilizer use

The commercial fertilizer industry had its inception a little more than a hundred years ago and the use of commercial fertilizers was introduced in most countries of the world about the beginning of this century.

World consumption increased from about 2 million metric tons around the beginning of this century to about 4 million tons just before the first

world war. It decreased by nearly 1 million tons during the period 1914-16 and then increased until about the time of the world economic depression. The curve shows a sharp decline during the economic depression of the early thirties, catches up again in 1933/34, and rises to a level of 9 million tons in 1938/39. At the close of the second world war, world consumption had fallen to a level of

FIGURE IV-1. WORLD FERTILIZER USE (EXCLUDING MAINLAND CHINA)



7.5 million tons in 1945/46. The consumption rose again with a much steeper rate of growth, leading to an increase of about 280 percent in 15 years. In the absence of complete data for consumption the entire series from 1905/06 to 1938/39 has been constructed on the fairly safe assumption that total world production equals total world consumption with a certain displacement in time.

In 1945/46, with a world cropland estimated at 1,100 million hectares, 7.5 million metric tons of all fertilizers (N,  $P_2O_5$ , and  $K_2O$ ) were used. In 1960/61, with only about 200 million more hectares of cropland, fertilizer use amounted to 28.5 million metric tons – an increase of 280 percent, while the area increased by less than 20 percent. Out of this total cropland of 1,300 million hectares (excluding Mainland China) a much larger proportion is fertilized now than in 1945/46, while the rates of application have increased in many areas. Over the 12-year period 1949/50 to 1960/61 the largest net increase in consumption of all fertilizers is shown by Europe (6,400,000 tons), followed by North America (with 3,450,000 tons), the Far East (2,040,000 tons), and U.S.S.R. (nearly 1,300,000 tons). During the same period net increases in Latin America and Oceania were 700,000 and 420,000 tons respectively, while those registered in Africa and the Near East were of the order of 250,000 tons. A portion of the increase can be attributed to increased use of fertilizer on grassland, particularly in Oceania. In Australia alone the use of fertilizer for this purpose increased from less than a million tons in 1953/54 to about one and one-half million tons in 1960/61.

Many factors contribute to the increase in crop yield, such as improved crop varieties, insect and disease control, irrigation, improved drainage and mechanization, but the use of commercial fertilizer is probably the factor most responsible. Consump-

tion of nitrogenous, phosphate, and potash fertilizers for the period 1949/50 to 1961/62 is set out by countries in Annex Tables 18, 19, 20, and 21. The figures for phosphate fertilizer shown in Annex Table 19 do not include ground rock phosphate; the amounts of this fertilizer used for direct application and in mixtures are shown in Annex Table 21.

Between 1949/50 and 1960/61 the world fertilizer economy continued to expand steadily, both production and consumption increasing by about 130 percent. First estimates for 1961/62 indicate a further increase of slightly more than 3 percent. Of the three main plant nutrients, nitrogen showed the largest increase in consumption and in 1960/61 exceeded for the first time that of phosphorus. The percentage of potash in the total consumption of all fertilizers has shown no change (30 percent of the world's total). Other developments have been the trend toward consumption of more concentrated fertilizers such as urea, concentrated superphosphates, and high-grade muriate of potash; the expansion of aerial top dressing in Oceania; and in the United States, the growth of fertilizer application in liquid forms.

World consumption of ground rock phosphate in 1960/61 (in terms of  $P_2O_5$ ) was 900,000 tons, an increase of 30 percent over 1955/56. The U.S.S.R. and the United States are by far the largest consumers, accounting together for more than 50 percent of the world's total supply. Of the remainder, nearly three fifths is reported to be used in Europe, but appreciable amounts are used in the Far East, Africa, and Latin America. Since 1937/38 the nutrient ratio for fertilizers in most countries has moved sharply in favor of nitrogen and toward the ratio of 1:1:1.

TABLE IV-1. - RATIO OF  $P_2O_5$  AND  $K_2O$  CONSUMPTION TO N CONSUMPTION

	$P_2O_5$			$K_2O$		
	1937/38	1949/50	1960/61	1937/38	1949/50	1960/61
Europe .....	1.72	1.36	1.06	1.53	1.32	1.07
U.S.S.R. ....	<sup>1</sup> 1.58	<sup>2</sup> 1.44	<sup>3</sup> 1.07	<sup>1</sup> 1.35	<sup>2</sup> 1.37	<sup>3</sup> 1.00
North America .....	2.10	2.04	0.90	1.29	1.11	0.73
Latin America .....	0.54	1.11	0.64	0.61	0.44	0.57
Near East .....	0.15	0.27	0.33	0.04	–	0.04
Far East .....	0.68	0.57	0.45	0.32	0.25	0.48
Africa .....	3.85	4.33	1.69	0.68	1.00	0.69
Oceania .....	22.41	24.00	26.67	1.13	0.50	3.33
WORLD .....	1.71	1.55	0.96	1.15	1.05	0.83

<sup>1</sup> 1940

<sup>2</sup> 1950

<sup>3</sup> 1960

It will be seen from Table IV-1 that the pattern of fertilizer consumption varies greatly from region to region. In Europe and in the U.S.S.R., for example, the three major plant nutrients, nitrogen, phosphorus, and potassium, have come to be used in nearly equal quantities, while in the Far East – where there is a large area of irrigated paddy – the emphasis has been on nitrogen, though in recent years the need for greater use of phosphorus and potash has been recognized. Because of soil conditions phosphate has remained the most widely used fertilizer in Australia and New Zealand, where the fixation of nitrogen by clover is very highly developed.

Annex Table 22 shows the intensity of fertilizer use in relation to arable land and total population. Striking features of this table are the concentration of fertilizer consumption in Europe, North America, and Oceania (75 percent of the world's supply of all fertilizers and only 27 percent of the world's total population) and the small proportion in Latin America, the Far East, Near East, U.S.S.R., and Africa (only 25 percent of the world's total on 71 percent of the world's arable land). The heaviest rate of application is found in Europe with a consumption of 84 kg of all fertilizers (N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O) per hectare of arable land, compared with 33 kg in Oceania and North America, 12 kg in the Far East, 10 kg in U.S.S.R., 4.7 kg in the Near East, and only 2.4 kg in Africa.

In Europe, although the average consumption of fertilizers in relation to arable land is high, there are great inequalities within the continent. The greatest intensity of application is shown by the Netherlands with a consumption of 456 kg/ha of all fertilizers, compared with 266 kg in the German Federal Republic, 102 kg in France, and about 30 kg in Hungary and Yugoslavia. It is relevant, however, that while in the Netherlands the density of population per hectare of arable land is very high, in the other countries it is comparatively low.

The United States uses nearly 95 percent of North America's total. Canada, although an important producer of grains, uses as yet relatively small quantities of fertilizers.

The intensity of fertilizer consumption varies widely between the countries of the Far East. In 1960/61, for example, fertilizer consumption per hectare of arable land in Japan (where the highest density of population per hectare of arable land is found), Ceylon, and India was 304, 39, and 2.3 kg respectively. China (Taiwan) and the Republic of

Korea have high rates of use, comparable with those of the western European countries.

As for Africa, South Africa, Rhodesia and Nyasaland account together for nearly 60 percent of Africa's consumption. In the Near East the greatest rate of application is shown by the United Arab Republic with a consumption of 87 kg of all fertilizers per hectare, followed by Israel with 81 kg. Large relative increases were recorded in some countries of Latin America, such as Mexico, Brazil, and Peru.

It should be borne in mind when considering Annex Table 22 that the figures on intensity of fertilizer consumption per hectare of arable land can be regarded only as approximate, since the definition of arable land varies widely; the figures for Oceania, for instance, are affected by the definition of arable land used in Australia, which includes all cultivated grassland whether permanent or not.

Moreover, whereas in Europe and Japan most of the arable land is more or less intensively farmed, in the United States, Canada, South Africa, Australia, and the U.S.S.R. (all with a low density of population) this is true for only a relatively small part of the land. In these countries much of the fertilizer is used on the more intensively farmed areas and little on the rest, so that the average rate is low, concealing the fact that rates for the intensively farmed areas are comparable with the high averages of Europe and Japan.

#### TYPES OF FERTILIZERS

The forms in which fertilizers are consumed provide many contrasts in usage. Chilean sodium nitrate, the only abundant source of natural nitrates, has been used for over 100 years and is still of great importance to Chile's national economy and, though to a much less extent, to the world's agriculture.

Chilean nitrate, which during the 19th century accounted for virtually all nitrogen fertilizer used, met growing competition from by-product ammonium sulfate, and to a lesser extent from calcium nitrate in the years immediately preceding the first world war. But it was not until the 1920s that it was seriously challenged by the more versatile production of the new synthetic capacity, of which the rapid growth had been greatly stimulated by the war itself.

Ammonium sulfate has remained the leading fertilizer in the Far East, Near East, the U.S.S.R.,

Latin America, and Oceania, but in Europe and North America it has been supplanted by ammonium nitrate. In the Scandinavian countries and in the United Arab Republic the preference is still for calcium nitrate, which can be produced by cheap electric power.

Consumption of high-analysis liquid fertilizers for direct application to the soil continues to increase rapidly in the United States. In the fertilizer year 1953/54, such liquid fertilizers, mainly anhydrous ammonia, accounted for 800,000 tons, or 53 percent of the total nitrogen production of the United States. The estimated figure for 1960/61 is 1,637,000 tons or 61 percent. This represents about one sixth of the total world production of nitrogen. However, only a part of the anhydrous ammonia, which constitutes most of this liquid fertilizer production, is applied directly to the soil or added to irrigation water. Large amounts are used for ammoniation of superphosphate and similar purposes. In 1959/60 anhydrous ammonia applied directly represented more than 20 percent of total nitrogen consumption in the United States and solutions and aqua ammonia another 10 percent. Besides cotton, on which it was first and is still largely used, anhydrous ammonia or solutions are used, to varying extents, on maize and other grain crops, sugar beets, tobacco, tomatoes, and other vegetable crops, and on temporary and permanent grassland.

Consumption of nitrogen solutions is increasing also in the U.S.S.R., Denmark, the German Federal Republic, Czechoslovakia, China (Taiwan), Israel, and Poland. Increasing interest is also being shown in the consumption of urea. Japan and the United States are by far the largest consumers of fertilizer-grade urea, followed by the Republic of Korea, India, Mexico, and Sudan. Much of the United States' consumption is as an ingredient of the large amounts of nitrogen solutions used in that coun-

try, while the greatest part of the Japanese consumption is in solid form and is believed to be used on the paddy crop. The increasing amounts of urea consumed in the Republic of Korea and India are believed to be used mainly on paddy, and in Sudan on cotton.

In the phosphatic group, single superphosphate is still the most popular fertilizer, but the proportion of concentrated superphosphate is rapidly increasing in Europe, North America, and in the Far East, at the expense of single superphosphate and basic slag. In the German Federal Republic, France, and Belgium, however, more phosphorus is consumed as basic slag than in any other form because of the availability of large quantities of this material from the operations of the steel industry. Basic slag, which in the fertilizer year 1905/06 provided almost 40 percent of the world's total consumption of phosphate fertilizers, now provides only 15 percent.

As for potash fertilizers, the dominance of muriate is world-wide, and in accordance with the trend toward greater concentration the share of higher grade, more highly refined muriate has shown a progressive gain over the lower grades.

The growing popularity of complex fertilizers, particularly in Europe and in the United States, has been a feature of the period.

This broad review of world fertilizer consumption indicates that the fertilizer economy continues to expand. This is illustrated by the number of large fertilizer plants which have been built in recent years or which are now under construction. It seems that even in countries where the application of fertilizers is well advanced, optimum use has still to be achieved. It appears, however, that the greatest prospect for increased fertilizer use — particularly that of nitrogenous fertilizers — is still in the Far East. Plans for self-sufficient production are reported from India, Pakistan, and Mainland China.

### Fertilizer use and crop production

That crop yields have increased greatly in the past 20 or 30 years is well known. This increase has been accompanied not only by a corresponding increase in the use of fertilizer, but also by a marked improvement in crop varieties, plant protection, cultural practices, and other factors. It is difficult therefore to make a quantitative separation of the

effects of fertilizer from those of other factors. Many experiments have been conducted however, which were designed to study the direct response of crops to fertilizer independently of other factors. Results selected from a great number of those experiments are presented in Table IV-2.

It is emphasized that these yields do not represent

TABLE IV-2. - EFFECT OF FERTILIZER ON YIELDS OF SELECTED CROPS

	Crop	Duration of experiment	Fertilizer (N + P <sub>2</sub> O <sub>5</sub> + K <sub>2</sub> O)	Yield/ha on checks	Yield/ha on fertilizer	Percent increase
		Years	Kg/ha	..... Kilograms.....		%
India .....	Tea	10	135	591	1 134	92
Germany, Fed. Rep. ....	Hay	10	240	2 560	8 740	146
India .....	Tapioca	1	370	2 510	25 310	197
Tanganyika .....	Pigeon pea	1	210 ( + manure)	581	1 840	217
United States .....	Wheat	4	200	659	2 285	247
Puerto Rico .....	Sugar cane	5	400	9 856	41 216	318

national averages, and are presented as examples of results obtained in experiments with fertilizers. They are, in some cases, higher than national averages, because the rates of application are higher than the average national fertilizer use, but are by no means beyond the reach of the farmer.

#### IMPORTANCE OF A BALANCED SUPPLY OF NUTRIENTS

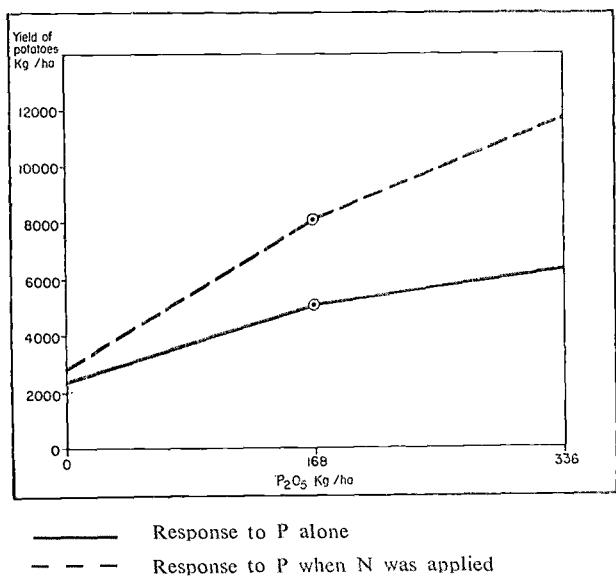
The spectacular increases in crop yields shown in Table IV-2 were obtained as a result of carefully planned experiments in which the primary nutrients, nitrogen, phosphorus, and potassium, were applied in a large number of combinations. The yields shown represent the response to the most favorable combination of the three nutrients. In fact the relationships between the concentrations of different nutrients in the soil and their uptake by the plant are quite complex. Fortunately, however, plants can make good growth under a rather wide range of conditions if enough of each nutrient is available. Some soils are seriously deficient in one or more elements, but a great number of soils furnish all nutrients at a relatively low rate. However, if conditions change so that the crop yield increases, the soil that once supplied balanced nutrients at a low level of nutrient supply may become deficient in some elements. Among the nutrient elements, potassium, calcium, and magnesium, it is not unusual to find that the decrease in the absorption of one nutrient will be roughly compensated for by an increase in the absorption of other nutrients so that the total equivalents of nutrient cations present in the plant tissue will remain approximately constant. This however, does not always occur. Many types of plants absorb potassium much more readily than calcium or magnesium; conversely some legumes absorb calcium as readily as potassium.

Calcium uptake, at least with some kinds of plants, is helped by boron. Molybdenum uptake is favored by phosphate and depressed by sulfate. Zinc deficiencies induced by phosphate have been noted. Excess of available iron can induce manganese deficiency, and excess manganese can induce iron deficiency and can retard uptake of calcium if the supply of calcium is low in the soil. The application of one or more plant nutrients may thus accentuate the deficiency of another. For example, when nitrogen and phosphorus fertilizers are added without potassium to a soil poor in available potassium, the plants in the resulting larger crop will contain a smaller percentage of potassium and show more pronounced signs of potassium deficiency.

Because of the low level of nearly all plant nutrients in soils of the humid tropics, many such examples may be found of nutrient imbalance brought on by applying only two or three nutrients.

Many soils are deficient in two or more nutrients. In such cases the addition of one nutrient may produce little or no increase in yield, but the addition of all the deficient nutrients produces a relatively large increase. An example is shown in Figure IV-2 which is based on data from an experiment in Ceylon where potatoes were grown on a soil deficient in both nitrogen and phosphorus. A dressing of phosphorus by itself increased the yield by about 4,200 kg/ha: a dressing of nitrogen and phosphorus together increased the yield by over 9,000 kg/ha. When the response to one nutrient is increased by the application of a second, there is said to be a positive interaction between them. In general, it is true that the nutrient element present in relative minimum is the one which limits crop production and that larger applications of other nutrients do not compensate for the deficiency of an essential nutrient.

FIGURE IV-2. RESPONSE OF POTATO TO FERTILIZER IN CEYLON, SHOWING POSITIVE NITROGEN X PHOSPHORUS INTERACTION



SOURCE: P. N. PONNAMPERUMA, Response of potato to fertilizers, manure, lime, and trace elements, *The tropical agriculture*, 114: 99, 1958.

#### SYMPTOMS OF NUTRIENT DEFICIENCY

Plants show characteristic deficiency symptoms when any essential nutrient is seriously lacking. Symptoms that can be detected usually include the kind of growth and the coloring and markings developed by various parts of the plant. The nature of the symptoms varies from crop to crop and with the degree of deficiency; it is sometimes confused by the effects of plant diseases and insect damage, and it may be complicated by the simultaneous appearance of two or three kinds of deficiencies. Long experience is required to diagnose the symptoms accurately and to write an effective fertilizer prescription.

A further complication in deficiency diagnosis is that recognizable symptoms usually appear only at an advanced stage of malnutrition and at a stage in the plant's growth when it is too late to correct the deficiency for the current crop.

Deficiency symptoms alone can therefore seldom suffice in diagnosing nutrient deficiencies but are useful along with other information, such as that obtained by chemical analysis of plant material and soil.

#### TOXIC EFFECTS OF CERTAIN TRACE ELEMENTS

For the best growth and development, plants must have enough of each nutrient element to avoid

deficiencies, but too much of any one can cause harmful toxic effects. Boron, copper, iron, manganese, molybdenum, and zinc are required by plants in extremely small amounts. Any addition of these elements beyond a narrow range of application is directly toxic to plants. Cauliflower, for example, grown on a sandy soil, may need 2 to 5 kg of borax per hectare but 10 kg per hectare would injure the crop.

#### RESIDUAL EFFECTS OF FERTILIZER

In general the entire cost of moderate soil treatment with nitrogen, phosphorus, and potassium has been charged to the crop being treated. With optimum treatments, however, the residual effects of fertilizer are considerable.

Nitrogen fertilizers have little or no residual value for the crop following that for which they are used, but the rate of application of nitrogen fertilizer to a given crop in the rotation will depend on the nature and fertilizer treatment of the preceding crops. The second of two cereal crops grown in immediate succession will almost certainly benefit from the application of a nitrogen fertilizer, but a cereal immediately following the plowed-up sod of a ley containing legumes may need little or no fertilizer nitrogen; it might even do harm by causing lodging.

On the other hand, phosphorus and potassium fertilizers, which are usually applied liberally to legumes, potatoes, and root crops, have much more lasting effects, and the dressings so used may well suffice to supply the needs for these nutrients of succeeding crops in the rotation. Table IV-3 provides a good example of the residual effect of potassium and phosphorus.

TABLE IV-3. - RESIDUAL EFFECT OF ANNUAL APPLICATIONS OF FERTILIZERS APPLIED IN 1951 AND 1954 ON YIELDS OF RICE IN 1955

Total fertilizer applied (kg/ha)			Yield of rice (kg/ha)
N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
0	0	0 (check)	1 444
70	0	0	1 609
70	50	0	3 272
70	0	320	1 877
0	50	320	2 839
70	50	320	3 382

SOURCE: Report, Department of Rice, Technical Division, Bangkok, Thailand, 1957.

## NUTRIENT REQUIREMENTS OF DIFFERENT CROPS

The approximate amounts of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O removed by certain crops are shown in Table IV-4. The values shown do not include the quantities contained in the roots. While removal will vary considerably, depending upon a number of factors, these data give an indication of the comparative removal among crops.

In the case of legume-hay crops such as alfalfa, clover, or soybeans, about three times more potassium than phosphorus is removed. The nitrogen removal is about equal to that of potassium. If legume seed has been properly inoculated and adequate lime, phosphorus, and potassium have been applied, the legumes will fix large portions of this nitrogen from the air. Maize, on the other hand, is a crop which removes large quantities of nitrogen in relation to the phosphorus and potassium. Much

TABLE IV-4. - APPROXIMATE REMOVAL PER HECTARE, OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY SELECTED CROPS (U.S.A.)

Crop	Yield	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
.... Kilograms per hectare ....				
Alfalfa.....	3 600	82	18	82
Brome grass .....	1 800	18	7	28
Coastal Bermuda .....	7 200	82	32	123
Red clover .....	1 800	45	7	36
Maize: grain .....	2 700	41	16	11
stover .....	2 700	28	11	43
Cotton: lint .....	230	0.6	0.2	1
seed .....	460	16	7	7
plants .....	920	18	7	11
Grasses .....	1 800	18	9	28
Lespedeza .....	1 800	36	9	18
Oats: grain .....	1 200	22	9	7
straw .....	1 800	11	4	32
Peanut (groundnuts): nuts .....	900	28	7	9
vines .....	1 800	36	4	36
Potatoes, Irish: tubers.....	10 800	36	14	66
tops .....	-	28	4	25
Potatoes, sweet: roots .....	5 400	14	9	32
vines .....	900	18	4	16
Sorghum: grain .....	-	22	11	7
fodder.....	1 800	18	7	28
Soybeans: beans .....	2 200	66	16	25
hay .....	1 800	41	11	36
Tobacco: leaves .....	700	18	3	18
stalks .....	700	9	2	9
Wheat: grain .....	2 200	22	11	7
straw .....	1 800	9	3	18

SOURCES: S. L. TISDALE and W. T. NELSON. Fundamentals of fertilizer application. *Soil fertility and fertilizers*, p. 319-353. New York, Macmillan, 1958.

potassium is contained in the stover, and if maize is harvested for silage, large quantities of this element will be removed.

While figures showing the nutrient removal cannot be used as a very accurate guide in determining the amount of fertilizer to apply, they are indicative of the differences that exist in nutrient content among crops.

## FERTILIZER USE AND CROP QUALITY

The plant nutrients which may be deficient in the soil for plant growth and which may be deficient in hay and pasture crops for animal growth are nitrogen, phosphorus, lime (calcium), copper, and magnesium. In a few areas cobalt is too low in hay and pasture crops for animal growth.

Where hay and pasture crops are low in phosphorus, broken bones, knocked down hip joints, and slipped horns in cattle are frequent. Cows suffering from a deficiency of phosphorus chew leather, wood, and decaying bones. High-producing dairy cows often have milk fever and other troubles when they eat hay and pasture low in lime. Lime (calcium gluconate) is used in the treatment of this disorder. On deficient soils the effect of fertilizers on the quality and palatability of forage is readily demonstrated by the livestock. They will graze the fertilized plots more often and more closely. They will also recover rapidly from disorders brought on by deficiencies. Their preference for the fertilized forage is attributed to the increased calcium, phosphorus, and protein content (Andrews, 1954).

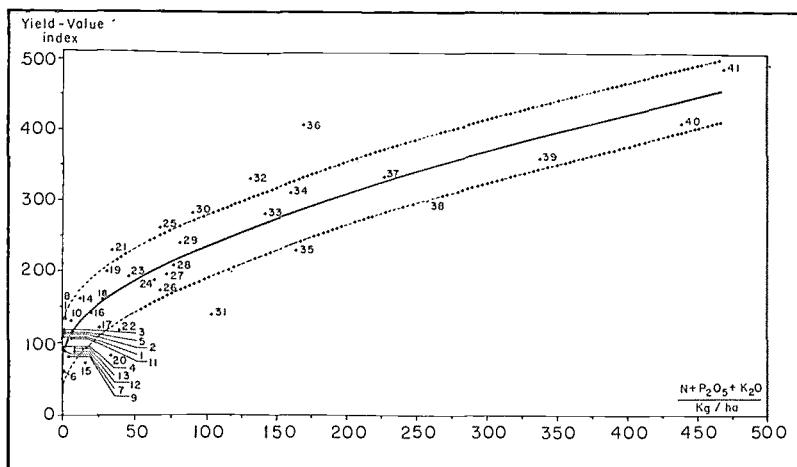
## CROP PRODUCTION LEVELS AND FERTILIZER USE

*Index of crop production per hectare in relation to fertilizer use*

That the proper use of fertilizer greatly increases crop yields is well established by field and greenhouse experiments, demonstrations, and individual farmers' experience throughout the world. The same sources show that full benefits from fertilizer use cannot be realized without the use of improved varieties of crops, better cultural practices, plant protection, and other improved methods of soil, water, and crop management. Consequently, the interpretation of the responses from fertilizer use in a specific field must be related to the conditions under which the responses were obtained. However, taken over a wide enough area and under conditions

FIGURE IV-3. CURVE OF AVERAGE RELATIONSHIP BETWEEN FERTILIZER USE AND INDEX CROP PRODUCTION (PER ARABLE HECTARE, 41 COUNTRIES, 1956-58)

1. Burma	21. Ceylon
2. Argentina	22. Australia
3. Thailand	23. Italy
4. Pakistan	24. Peru
5. Turkey	25. Egypt
6. India	26. Finland
7. Syria	27. Israel
8. Indonesia	28. Sweden
9. Philippines	29. France
10. Canada	30. Austria
11. Colombia	31. Korea, Rep. of
12. Mexico	32. Denmark
13. Brazil	33. United Kingdom
14. Chile	34. Norway
15. South Africa	35. China (Taiwan)
16. Yugoslavia	36. Switzerland
17. Spain	37. Germany, Fed. Rep. of
18. Greece	38. Japan
19. United States	39. Belgium-Luxembourg
20. Portugal	40. Netherlands
	41. New Zealand



SOURCE: M. S. WILLIAMS and J. W. COUSTON. *Crop production levels and fertilizer use*. Rome, FAO, 1962.

representing a full range of climatic and environmental factors, the relationship between average yields and the use of fertilizers may provide information helpful in estimating the contribution of fertilizers to increasing crop production and of the quantity of fertilizer required to achieve given levels of production. To examine the fertilizer crop production relationship, an analysis has been made relating an index of crop production per hectare to fertilizer use (Williams and Couston, 1962).

The most appropriate system for which information is available is an index relating price weights to aggregate crop production. For this purpose, the production of each recorded crop is multiplied by its regional price weight and these values are aggregated and divided by the total area of crops, to obtain an index of crop production per hectare. Such an index was calculated for 41 countries for the three-year period 1956-58. The relationship between this index and fertilizer use in terms of kilograms of primary plant nutrients per hectare of arable land is shown in Figure IV-3.

Seven of the eight countries with indices of less than 100 - Brazil, India, Mexico, Pakistan, the Philippines, South Africa, and Syria - used less than 20 kg of plant nutrients per hectare of arable land. The eighth country, Portugal, had an average use of about 34 kg/ha. Most of the countries where indices of crop production were high had relatively high average rates of fertilizer use per hectare of arable land, e.g., Federal Republic of Germany,

Japan, Belgium-Luxembourg, the Netherlands, and New Zealand.

Of the 41 countries included in the analysis, ten countries showed a rather wide divergence from the curve of the average relationship. Five of these (Ceylon, Austria, Denmark, Switzerland, and the United Arab Republic) had indices of value higher, and five (Portugal, South Africa, Australia, Republic of Korea, and China [Taiwan]) had indices of value lower than the range of plus or minus 45 index points from the curve of average relationship.

The divergence of these cases shows the importance of all the agents which contribute to production in any country and indicates the necessity of an analysis of local conditions in determining the effectiveness of fertilizer use in a given area. Ceylon and the United Arab Republic had relatively high indices of yield per hectare and relatively low average rates of fertilizer use (in the range of 34 to 70 kg) per hectare. Both countries have favorable growing conditions and produce some high value crops to which the results of agricultural research are applied, including high rate of fertilizer application. Much less fertilizer is used, however, for subsistence crops, which explains why the average rates of application in each country are relatively low. In Ceylon, tea in particular is heavily fertilized and this masks the low level of fertilizer used on food crops. In the United Arab Republic cotton and sugar cane receive heavy fertilizer dressings but the cereal and legume crops do

not. In addition, silt in the irrigation water from the flooded Nile contributes to the fertility of Egyptian soils by bringing in an annual supply of plant nutrients. Denmark and Switzerland had relatively high indices (in the range of 300-400), with medium rates (in the range of 100-200 kg) of fertilizer per hectare. These two countries likewise have relatively favorable growing conditions. They make extensive use of legumes and grasses which in recent years have been receiving increasingly heavy dressings of plant nutrients, and they are primarily concerned with livestock production which provides farm manure. In addition, imported feeds contain large quantities of nutrients which are returned to the soil as manure. For example, average imports of oilseed, meals, and other feeds into Denmark contain an estimated 70,000 tons of plant nutrient.

The five countries with relatively low indices of yield-value compared with fertilizer use - Portugal, South Africa, Australia, the Republic of Korea, and China (Taiwan) - have relatively unfavorable environmental conditions and the last two have a high proportion of low-value crops. In fact, the use of modern methods, including fertilizer, may have been responsible in part for overcoming the adverse conditions and giving production at the levels indicated in these countries.

The relationship indicates that fertilizers used along with other technological factors are essential for increasing the national level of crop production. If this is true, it must be because most arable soils are of limited fertility and that if water supplies are adequate the supply of plant nutrients is usually the most important factor limiting crop production. The observed relationship would not exist if half of the soils were so fertile that little or no fertilizer was required to achieve high levels of production. Soil scientists generally agree that as a result of major soil-forming factors, most soils are of low fertility. Certain soils of the temperate zone formed under grass and moderate rainfall are an exception. The level of fertility is usually lower in the tropics than in the temperate zone. In most soils, therefore, a deficiency of nitrogen, phosphorus, or potash, and frequently a combination of these, limit crop production. It is seen, therefore, that virgin soils are fertile only in a very limited number of cases. Since most arable soils of underdeveloped countries have a long history of cultivation, we should not be surprised to find a rather uniform status of low fertility and that crop yields tend to be stabilized at the low index of about 100.

The situation in India, as indicated by 170,000 soil tests in recent years, will serve to illustrate this point. The tests indicate that almost all soils are deficient in nitrogen, about 85 percent in phosphorus and 63 percent in potash. If these soil deficiencies were remedied crop yields would be substantially increased from the present low level perhaps up to 50-100 percent.

#### EXAMPLES OF THE CONTRIBUTION OF FERTILIZERS TO CROP PRODUCTION

Although measuring the contribution that fertilizers have made toward increasing the volume of farm output is a complex undertaking, an appraisal of the sources of increased production, as made recently in the United States, can serve as a guide for developing countries. The survey showed that practically all of the increase in output from 1870 to 1914 could be attributed to increased farm area. From 1914 to about 1941, however, mechanization was an important factor, as well as increased fertilizer use, improved seed, and more irrigation. After 1946, the adoption of improved methods was accelerated as well as the use of fertilizer. It is estimated that the use of fertilizers is responsible for about half of the increase in output per hectare (Durost and Barton, 1950).

Similarly, for India (Table IV-5) increased fertilizer use was estimated to be responsible for 4.6 mil-

TABLE IV-5. - INDIA: SOURCES OF INCREASED FOOD GRAIN PRODUCTION, SECOND FIVE-YEAR PLAN (1956-61)

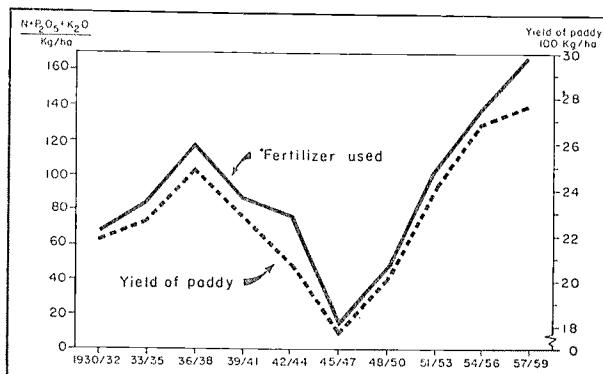
Source	Percent of increase attributable to this source
Fertilizer (organic and inorganic) .....	41
Irrigation.....	27
Improved seeds .....	13
Double cropping (due in part to irrigation)	10
Land reclamation and other improvements	9
<b>TOTAL .....</b>	<b>100</b>
Period	Production of food grain
	(million tons)
1949/50 .....	54.0
1955/56 .....	65.8
1960/61 .....	77.0
Average annual increase:	4.3%

SOURCE: Planning and agricultural production. *Eastern economist*, 3 February 1961. Foreign Agricultural Service, U.S. Dept. Agriculture.

lion tons out of the 11.2 million tons increase in food production during the second five-year plan.

As already stated, the division of increases in crop production per hectare into portions attributable to fertilizer and to other factors, such as improved practices, is extremely difficult if not impossible. When only average crop production values can be related to average fertilizer use for a number of countries over a period of years, it can be stated merely that a significant relationship exists between crop yields and fertilizer use; and it can be argued that more or less of this increase can be attributed to improvements in crop varieties, disease, insect, and weed control, and to improved general management. The essential role of fertilizer, however, is brought out by a comparison of fertilizer use and yield of paddy in China (Taiwan). Most of the development in the agriculture of Taiwan has occurred in the past 40 years. Increases in production per hectare have resulted from research and education programs, including the use of many improved practices and a high level of fertilization. The results in terms of paddy yields are presented in Figure IV-4 which shows an unusually close relationship between crop yields and ferti-

FIGURE IV-4. RELATIONSHIP BETWEEN YIELD OF PADDY AND FERTILIZER APPLIED TO PADDY IN PERIOD 1930-59 (BY 3-YEAR AVERAGES), CHINA (TAIWAN)



SOURCE: China (Taiwan) Provincial Food Bureau.

lizer use over a 30-year period. The interesting feature of this curve is that the yield fertilizer relationship is as close for a decrease in fertilizer use as it is for an increase. Although there may have been some relaxation in the standards of cultivation during the war years, the vital role played by fertilizers is clearly illustrated, particularly where the soils are of low initial fertility.

### Fertilizer use in forestry and fisheries

#### FOREST NURSERIES

In permanent forest nurseries, fertilizer use is an established practice. Since the plant is removed from the soil complete with root, and since there is no accumulation of litter, satisfactory growth of nursery stock can be obtained only through the use of fertilizer. The element requiring the most frequent replenishment is nitrogen, of which the requirement is quite high. The kind and amount of fertilizer to be applied are determined by means of a thorough soil analysis. Although the requirement varies with management and other factors, the average removal of nutrients per hectare from a conifer seed bed is 75 kg of N, 25 kg of P<sub>2</sub>O<sub>5</sub>, and 40 kg of K<sub>2</sub>O. During the second year of a transplant bed the corresponding figures for conifers are 110, 45, and 70 and for broadleaves 235, 90, and 140. These figures, based on spacings used in commercial nurseries in Germany, show that nitrogen removal exceeds that of common agricultural crops. Soil acidity must be regulated

according to the species as, for example, most conifers require higher acidity. Early beliefs that fertilized nursery plants were likely to be more difficult to establish at the permanent site have been largely disproved by experimental results.

Fertilizers are used in various other forestry operations of a special character, such as in seed orchards and seed stands to promote fructification, in Christmas tree plantations to improve foliage and color, and in many poplar plantations where nitrogen in particular appears to influence growth and appearance.

#### SILVICULTURE

In silviculture proper, that is essentially the growing of sizable areas of trees in stands on relatively long rotations, the use of commercial fertilizers is on the whole still at the experimental stage. Silvicultural management operates at extremely differing degrees of intensity, depending upon ecological,

economic, and social conditions in the area concerned. A high degree of intensity means a high investment per hectare, calculated to yield a high production; under such conditions it may be expected that fertilization will play an increasingly important role. On the other hand, where the investments have to be kept at a low level, as, e.g., in large areas of natural tropical forest, fertilization will not be found justified.

In traditional silviculture, amelioration and soil conditioning aimed at the establishment and maintenance of a good physical condition of the soil, by mechanical means as well as by application of organic material, and particularly by liming, have been practiced for many years where conditions appeared to indicate the utility of such measures. Commercial fertilizers, however, have not yet found any general application except for their use in heathland, moorland, and dune afforestation, and for erosion control afforestation in certain regions. On the other hand, interest in the matter is markedly on the increase, and the number of experiments laid out is impressive. A bibliography on forest fertilization compiled in 1956 listed 700 references, and many research institutes, organizations, and companies are now carrying out work in this field. It is natural that the majority of present experiments relate to the application of fertilizers at the planting stage or in very young plantations, and to their effect on the establishment and early growth of the plants. However, it is noteworthy that quite a few experiments have been and are being carried out in stands at the pole stage and even older.

The results registered so far clearly indicate the effect and utility of fertilizer application for the quicker and more complete establishment of plantations, as well as for the promotion of the growth of young plantations, on sites where one or more of the main nutrients are in deficit. There are also indications that the increment of stands at the pole stage and even older can be accelerated not inconsiderably on such sites. There are further claims that, e.g., the *Cryptomeria* pulpwood plantations in Japan, when fertilized at the time of planting, will produce the same volume in a 30-year rotation as otherwise obtained in a 40-year rotation, and that the economic profit from shortening the rotation by only 5 years may amount to more than \$2,000 per hectare. Fertilization of pulpwood and timber plantations is being semiofficially recommended to small owners as being of benefit to themselves as well as to the nation. In the state forests of

Baden-Württemberg, the outlay for fertilizers already amounts to DM 2.75 annually per hectare. In parts of Eastern Germany, fertilization of young plantations is recommended or even ordered.

A proper soil analysis should precede fertilization. Simplified methods, and even estimates based on the character of vegetation communities, may in part replace a proper analysis when first sufficient knowledge of the local pedology has been established.

In older stands of the temperate zones, the formation of a layer of raw humus frequently presents a problem. Several methods are known which aim at its transformation into nutrient or true humus, such as more intensive thinning, or liming with or without nitrogen fertilization, e.g., by introduction of *Leguminosae*. Mention should be made of a recently developed German technique for introducing gaseous ammonia into the raw humus. This results in a very rapid activation, and the method seems promising provided the technique can be improved to produce a complete and even activation without excessive leaching and without reducing the soil structure.

Experimental results are as yet too few and scattered for any more general conclusions to be drawn with regard to the economy of fertilizer application in silviculture, but there are strong indications that the scope is considerable in most places where soil conditions are far from optimum. The trend toward plantation silviculture which is apparent in both temperate and tropical regions will clearly broaden the scope for fertilizers, as the major part of the soils available for forestry are deficient in nutrients and as short rotations are frequently desired. In this connection, the price relation between units of fertilizer and units of wood produced is obviously an important factor. Over the last four or five decades, wood prices have risen much more sharply than prices of fertilizers, so that one cubic meter of wood may now buy two or three times as much fertilizer as before the first world war. This fact, together with the research findings gradually accumulating, may well change the economic outlook for forest fertilization.

In a general way, by increasing the vigor of the trees, fertilizers may be expected to improve the resistance of forest trees to such pests and diseases as primarily attack the less vigorous individuals. However, it will rarely be possible in practice to apply precisely adjusted doses to attain a perfect nutrient balance, and cases of decreased resistance

will occur because of overdosage or because the accelerated growth will by itself induce a lessened resistance. There are already a few such indications. Furthermore, fertilizers will stimulate weed growth and this may call for adjustment of technique. Finally, changes in the quality of the wood will occur, but it is not yet possible to gauge the importance which this will eventually have for the industry.

## FISHERIES

While the value of fertilizers in fish culture has been known for centuries, it is only in relatively recent years that much attention has been given to the determination of the kinds and amounts of fertilizer required to produce the desired results. Rule of thumb methods of determining requirements are not satisfactory since they do not provide reliable information. Much study therefore remains to be done, particularly with respect to methods of analyzing soil and water, and it is the responsibility of private firms as well as of governments to have the required research carried out.

Fertilizers increase fish yields indirectly by stimulating the growth of phytoplankton as well as zooplankton on which the fish feed. Although all three major elements are required, studies have shown that phosphorus is the element most likely to be deficient in fish ponds. In regions where nitrogen and potassium are deficient favorable responses will be obtained to these elements. There is a danger, however, that fish production will be reduced by the application of excess nitrogen which stimulates the growth of higher forms of aquatic plants and of weeds at the expense of the plankton.

With respect to phosphorus some workers believe that it is unlikely that any fish ponds exist in which a favorable response to this element would not be obtained. In the German Federal Republic increases in fish production of 76 to 158 percent have been reported. The usual application of phosphate is 30 kg/ha/year. The type of phosphate carrier recommended depends on the reaction of the water. Where the water is acid, basic slag is preferred, but where the water contains much sulfur, triple superphosphate is applied because of its low sulfur content. As an example of the increased yield of fish due to fertilizer, results of an experiment carried out in Malaya are presented in Table IV-6.

The productivity of fish ponds is further increased by the addition of limestone which neutralizes acid

TABLE IV-6. - EFFECT OF FERTILIZER ON FISH PRODUCTION (YIELDS ARE MEANS FOR SIX 0.5-HECTARE PONDS, STOCKED WITH 750 *Tilapia*, 40 *Pontius javanicus* AND 8 GRASS CARP FINGERLINGS)

N	Treatment			Yield of fish in 6 months
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	Cow dung	
..... Kilograms per hectare .....				
0	45	0	0	418
28	22	0	0	317
0	0	0	15,000	300
0	22	0	0	288
0	22	17	0	272
Unfertilized check				97

SOURCE: C. F. HICKLING. *Fish culture*. London, Faber and Faber, 1962.

waters and supplies calcium as a nutrient in soils which may be deficient in this element.

Most areas rely on organic fertilizers which are rather cumbersome to use because of the great quantities required. Green manure, used in some brackish water ponds of Java, consisting of grass and mangrove leaves, requires an application of 1,700 kg/ha. It is usually applied in heaps and allowed to rot gradually. Green manure, while supplying essential elements, also provides a good substrate for development of insects, worms, and algae.

Animal manures are also used in fish farming. In some places the animal stalls are built over the fish ponds, so that the manure falls directly into the ponds. Animal manures produce good results. Their main disadvantage is that such large quantities as 5 to 7 tons are required to supply the phosphorus provided by 100 kg of superphosphate.

In some areas liquid manure from stables or pigsties is utilized by having channels leading to the ponds. This liquid manure is an effective stimulant to plant growth, but must be used sparingly since an excess can cause rank plant growth and deoxygenation of water.

Night soil is used in some areas, but in many places meets with strong objection from consumers of the fish products. Also, with increasing sanitation and sewage disposal, night soil is decreasing in importance as a source of nutrients.

The use of inorganic fertilizer, however, is being recommended in place of green or animal manures because of the advantage of cheapness, ease of handling, and choice of formulas. This also makes more green and animal manures available for use on the soil where they make their greatest contribution.

## Physical factors affecting response to fertilizer

### SOIL CHEMICAL PROPERTIES

#### *Plant growth*

All higher plants have the same basic requirements for growth, though in widely varying amounts or degrees. These requirements are light, a suitable temperature, water, air, and certain nutrients. Sixteen elements are known to be essential for green plants. Refinement of technique may increase this number. Carbon, hydrogen, and oxygen make up the carbohydrates including cellulose. In addition to these three, nitrogen, phosphorus, and sulfur are the elements of which proteins are composed. Besides these six, ten other elements are known to be essential for plants. They are calcium, magnesium, potassium, iron, manganese, copper, boron, zinc, molybdenum, and chlorine. Each of the sixteen elements plays a specific role in the growth and development of a plant and, when present in an insufficient quantity, growth and hence crop yields may be seriously reduced. Some of them can be toxic to plants or animals if present in excessive quantities.

From the air and water, plants take carbon, hydrogen, and oxygen. By the process of photosynthesis in the leaves and later transformations within the plant, these are combined into a number of compounds: sugar, starch, cellulose, proteins, lignin, and a host of intermediates essential for growth.

Plants take most of their supply of the other essential elements from the soil. These nutrients are divided into three classes on the basis of the amounts required. The major or macronutrients are nitrogen, phosphorus, and potassium.

Nitrogen, a constituent of proteins, is taken up from the soil as ammonium or nitrate ion. Indirectly plants may also receive nitrogen derived from the air by nitrogen-fixing organisms that grow in nodules on the roots of legumes. The great reserve of nitrogen in the soil is the soil organic matter which, on decomposition, yields ammonia and nitrate.

Phosphorus is essential for all plant growth processes, root development, and the synthesis of proteins, fats, and carbohydrates. It occurs as phosphate in primary minerals (apatites), in the soil solution, in complexes with iron and aluminum oxides, and in organic matter.

Potassium functions in the photosynthesis and the synthesis of protoplasm, the essential living part of

all plant and animal cells. In many plants sodium, although not an essential nutrient element, can perform at least some of the functions of potassium. Potassium occurs in primary minerals and in the clay fraction of the soil. A part of the potassium in the clay is held in a form which is readily available to plants.

The secondary nutrients are sulfur, calcium, and magnesium, which occur in the plant in smaller quantities than the macronutrients. Sulfur is a constituent of some amino acids and performs an indispensable function in plant metabolism. It occurs in the soil largely in organic matter and, like nitrogen and phosphorus, is released in a form available to plants as the organic matter decomposes.

Calcium is a constituent of the cementing materials between cell walls. Lack of calcium prevents the normal growth of root tips and buds and the functioning of cells. It occurs in the soil as chalk, gypsum, limestone, and in other primary minerals. Like potassium it is held in a form available to plants by the clay fraction of the soils. The application of lime, however, is usually made to correct acidity rather than to supply calcium as a nutrient.

Magnesium is a constituent of chlorophyll, the green coloring material of higher plants which corresponds to hemoglobin in the blood of animals and is essential for photosynthesis. It also aids in some enzymatic processes in the plant and accumulates along with phosphorus in developing seeds. The form available to plants is held like potassium and calcium by the soil clay. The reserve is in the form of carbonate (dolomite) and in primary minerals.

The essential micronutrients (also called trace or minor elements) are boron, zinc, copper, manganese, molybdenum, and chlorine. A micronutrient is commonly a constituent of an enzyme system or of some other key substance in plant metabolism. Molybdenum, for example, is required for the transformation of nitrates into amino acids in plants and for the fixation of atmospheric nitrogen by legume root nodule bacteria. Deficiencies in the supply of these elements to crops may be due to their absence or scarcity in the soil or to certain soil conditions which make them unavailable. Deficiencies of the first five are more common in naturally calcareous or in overlimed soils; molybdenum deficiency is most common on very old acidic leached soils.

Available nutrients are those which the plant can

TABLE IV-7. - PLANT NUTRIENT RELATIONSHIPS TO SOIL REGIONS

BLACK, BROWN AND DARK GRAY SOILS OF GRASSLAND (TEMPERATE AND TROPICAL)	<i>Prairie soils, Degraded Chernozems, etc.:</i> Both are fertile soils but the latter are less than the former; phosphorus is usually needed. When first cultivated these soils have abundant nitrogen, but after much use nitrogen fertilizer is required for most crops.	RED SOILS OF FORESTS AND SAVANNA LANDS (WARM AND TROPICAL)	<i>Gray-Brown Podzolic soils, Brown Forest soils, etc.:</i> The fertility of these soils is lowered after a few years of cropping, unless fertilizers are applied; they are leached, acid, relatively poor in available plant nutrients; they are highly responsive to lime and fertilizer and support a wide range of crops.
	<i>Chernozems (Black) and Reddish-Chestnut soils:</i> Fertile soils, but continued grain growing will deplete the nitrogen and phosphorus. Intensive cultivation through irrigation will increase fertilizer requirements and may even induce deficiencies of trace elements.		<i>Latosols (Red Lateritic, Reddish-Brown Lateritic, etc.) and Red-Yellow Podzolic soils:</i> These tropical soils are strongly weathered and leached and therefore are low in plant nutrients. They also have a low nutrient-holding capacity, but added soluble phosphates are changed to relatively insoluble forms not easily available to plants. Many of these soils are benefited by liming, but it is easy to overlime and thus upset the balance of nutrients.
	<i>Chestnut, Brown and Reddish-Brown soils:</i> Moderately high in fertility but not highly productive without irrigation. When irrigated, the crops respond well to phosphorus and nitrogen. Deficiencies of trace elements such as zinc and iron occur on these soils under intensive cultivation.		<i>Red-Yellow Mediterranean soils:</i> These soils are not as strongly leached as the Latosols. They require much application of nitrogen and phosphorus, but are well supplied with lime. Potassium is required in small amounts. Deficiencies of trace elements are fairly common.
	<i>Dark Gray and Black soils of tropical savannas:</i> Medium in productivity without irrigation; high with irrigation. Most of these soils require nitrogen and phosphorus fertilizer but are high in calcium and magnesium.		<i>Organic soils, Bog and Half-Bog soils:</i> These soils usually occupy wet or swampy depressions or flats. For good production, nitrogen, phosphorus, and potassium are required. Deficiencies of trace elements are common, particularly of manganese and copper. With water-table controlled and with proper fertilizer dressings these soils can give high yields of crops.
LIGHT GRAY AND RED SOILS OF DESERTS (TEMPERATE AND TROPICAL)	<i>Sierozems (Gray), Desert and Red Desert soils:</i> Agricultural use is limited to irrigated places. Most of these soils (except the very sandy) are well supplied with certain nutrients but are low in organic matter and nitrogen and often the mineral nutrients are poorly balanced. With irrigation nitrogen and phosphorus must be applied, and deficiencies of iron and zinc are common.	ORGANIC SOILS (NOT SHOWN ON THE MAP)	These are soils which are now occasionally flooded or have been subject to flooding very recently. The fertility of these soils is directly related to the material from which they are formed; even though unleached and relatively fertile, they require nitrogen, phosphorus, and potassium for high yields.
	<i>Podzols, Gray-Wooded soils (with much Bog):</i> Podzols require lime and fertilizers containing nitrogen, phosphorus, and potassium. The Gray-Wooded soils are deficient in nitrogen, phosphorus, potassium, and sulfur. Many of these soils are too stony, sandy, swampy, or hilly for crop use.		
GRAY AND BROWN SOILS OF FOREST LANDS (TEMPERATE)		ALLUVIAL SOILS	

readily take up. Their amounts are not closely related to the total nutrient content of the soils. Their nutrient status may be high for one nutrient and low for another. They can vary independently and be out of balance.

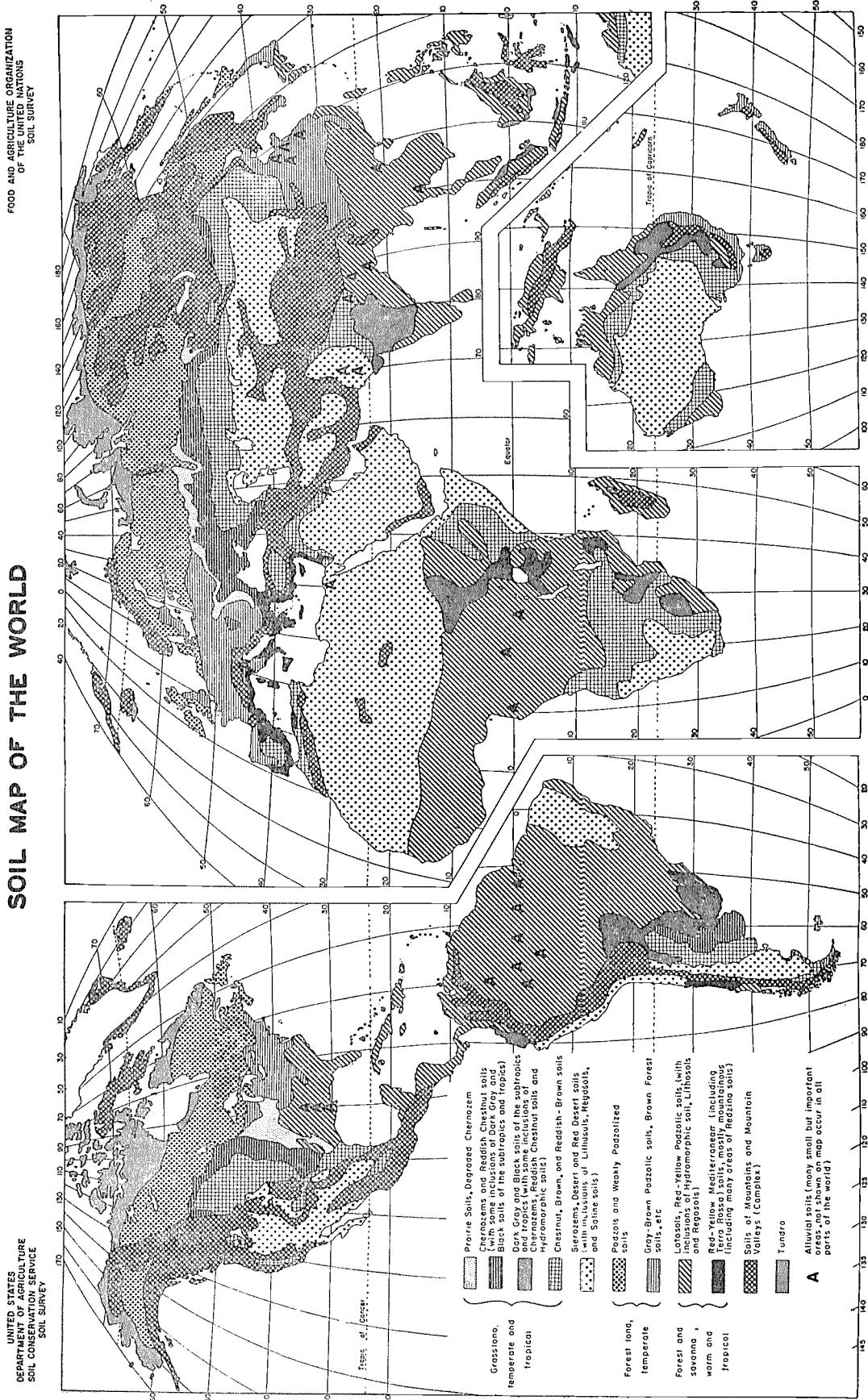
#### *Fertility of broad soil groups*

Some soils have improved and some have deteriorated under man's use. Their natural fertility, however, is a function of the material from which they were derived and the conditions of climate and vegetation under which they developed. On the map (Fig. IV-5) are shown broad groups of soil that occur in the principal sections of the world.

Although each of these groups contains many thousands of local kinds of soil having important differences, the broad soil regions shown on the map are related to other geographic factors, especially climate and native vegetation. Under natural conditions, most of the soils of the humid parts of the world have forest vegetation, those of dry regions have desert shrubs, and the zones of intermediate moisture have grass vegetation. Soils developed under these three kinds of plants differ strikingly in their fertilizer requirements. In addition to climate and vegetation, the important broad factors in soil formation are the local conditions of relief, geological material, and age.

A summary of the broad soil groups of the world is presented in Table IV-7.

FIGURE IV-5.



### *Soil reaction (pH)*

Soil reaction is an expression which describes the degree of acidity or alkalinity. It affects the availability of nutrients and hence the fertilizer requirements in various ways. Activity of most soil microorganisms is favored by a soil reaction near neutrality or slightly on the acid side. Since nitrogen, sulfur, and part of the available phosphorus come from organic matter decay by microorganisms, the availability of these nutrients is favored by a neutral soil reaction. The root nodule bacteria of legumes commonly grown in the temperate zone do best in neutral or slightly alkaline soil; so nitrogen fixation is favored in such soils. The availability of soil phosphorus, of applied superphosphate, as well as the ability of roots to absorb phosphorus are sharply reduced in acid soils. Also, in very acid soils fertilizers are less effective because the growth of plants is reduced by toxic amounts of aluminum and manganese. The liming of acid soils not only removes this toxicity but also increases the availability of phosphorus and stimulates bacterial activity. There is, however, a danger of overliming. The alkaline side of neutrality also presents certain difficulties, such as reduced availability of phosphorus and potassium. The availability of phosphorus from rock phosphate is less in alkaline soils, as well as the availability of certain minor elements such as boron, iron, and manganese. Calcareous soils also tend to increase the loss of nitrogen as ammonia from manure and from ammonium and urea fertilizers left unincorporated on the soil's surface.

### SOIL PHYSICAL PROPERTIES

The more the concept of soils as standing room for plants is accepted, the less important the original fertility becomes and the more important the physical properties become. There are certain plant-air-water relations required for optimum growth, and a soil must be in a certain physical condition for these relations to exist. The two soil properties which determine the extent to which this ideal physical condition exists are texture and structure.

Texture refers to the size of the individual particles which constitute the soil. These particles are divided, on the basis of size, into sand, silt, and clay. Coarse-textured (sandy) soils are usually poorer in available nutrients, because they are less retentive. They are also poorly buffered and must be limed more frequently than finer-textured soils

(clays). (A well-buffered soil is resistant to changes in pH.) Their water-holding capacity is lower, which makes them more subject to drought. On the other hand, finer-textured soils present more of a problem from the standpoint of drainage. However, fine-textured soils are more manageable if their structure provides the porosity required for the removal of excess moisture.

Structure refers to the aggregation of the soil primary particles into more or less stable secondary particles or crumbs which provide the same porosity as coarse primary particles. In general, the most manageable soils are those in the middle of the textural range, the loams.

The really important part, however, played by texture and structure is their control over certain properties which have a more direct effect on plant growth and therefore on fertilizer requirement. These are: (a) mechanical impediment due to impermeable layers or "pans." When the pan is close to the surface the soil declines in fertility more rapidly because nutrients cannot be brought up from below the impermeable layer. If such soils are not well supplied with surface water during the growing season there is a risk of crop failure from drought, but if they are well supplied with water their fertilizer requirements are high because of the restricted root range. These soils have certain advantages, however, e.g., in wet rice production. (b) Soil water. With many land plants growth is proportional to the amounts of water present; it is restricted both at very low and very high levels of soil moisture. Water is required by plants for the manufacture of carbohydrates, the hydration of protoplasm, and as a vehicle for the translocation of foods and mineral elements. Internal moisture stress causes reduction both in cell division and cell elongation, and hence in growth. Soil moisture influences growth indirectly through its effect on soil microorganisms. At extremely low or extremely high moisture levels the activity of the nitrifying bacteria is inhibited, with the result that the plant may have at its disposal a reduced supply of available nitrogen and other nutrients. It has also been observed that absorption of nitrogen and potassium by plants is reduced by high moisture tensions and that utilization of applied fertilizers depends largely on an adequate moisture supply.

These points are of particular importance in the consideration of fertilizer use in any balanced farm program, for the application of fertilizer at rates inconsistent with the supply of available moisture

is unwise and uneconomical. The converse is also true, for, under conditions of high rainfall on soils that are subject to excessive leaching, applied fertilizer may be removed in drainage waters before being used by the crop unless applied properly and in adequate amounts. Most common field crops, with the exception of rice, require a rooting medium that contains adequate atmospheric oxygen. Respiration, which depends on the availability of oxygen, is associated with the absorption of mineral nutrient elements by plants. Aeration is favored by a coarse-textured soil or a fine-textured soil with open granular structure. Such conditions permit the rapid exchange of soil and atmospheric gases necessary for the maintenance of an adequate supply of soil oxygen. Soil moisture may affect plant growth indirectly through its effect on soil aeration. Even in coarse-textured open soils the land may become flooded to such an extent that the entire pore space is filled with water. In such cases the roots of upland plants are unable to respire normally. A further effect of wet soils on microorganisms arises from the fact that wet soils tend to be cold. That is, the higher the moisture content of a soil, the higher is its heat capacity. This means that wet soils warm up more slowly during the spring months. Since relatively low soil temperatures depress microbial activity, nutrient availability dependent on this activity will be correspondingly depressed. On the other hand, boron deficiency of many soils is intensified under extremely dry conditions.

#### ORGANIC MATTER

Organic matter, as used in a discussion of soils, has a very broad meaning because it includes all materials of vegetable and animal origin developing in or applied to the soil, regardless of the stage of decomposition. Thus the term includes the highly decomposed and colloidal soil fraction known as humus, as well as the roots and tops of plants containing much easily decomposable carbohydrate and protein material and, in addition, the bodies of microorganisms, worms, insects, and other animals, and also animal manures and similar materials applied to the soil.

#### *The role of organic matter*

It is well understood that the portion of the organic matter that has reached the humus stage con-

tributes most to the moisture-holding and nutrient-retaining capacity of the soil. On the other hand, products which are released during decomposition are important sources of nutrients in a form available to plants and of cementing materials which contribute to the stability of soil structure. As the organic matter decomposes, considerable quantities of carbon dioxide and some organic acids are produced. The carbon dioxide, when dissolved in soil water, together with the organic acids, reacts with the soil minerals and helps to bring into solution more plant nutrients. Humus, a dark-colored stable material, is that part of the organic matter that remains after it has completely lost its original identity through decay. This is the material which (a) retains in a form available to plants the basic plant nutrients such as calcium, magnesium, potassium, and ammonium; (b) contributes to soil tilth by promoting soil structure; (c) improves the water-holding capacity of soils. Organic matter when used as a mulch helps to prevent evaporation, soil wash, blowing, baking, and crust formations. It provides a medium for the microorganisms which exist in tremendous numbers in the soil and performs such activities as fixation of atmospheric nitrogen and mineralization of organic nitrogen.

#### *Sources of organic matter*

The most important source of organic matter in a particular soil is the vegetation which grows on it; and the system of cropping establishes a rather definite level of organic matter in the soil which is not altered significantly by green manures, stable manures, or commercial fertilizers so long as these are applied on an economical basis. Thus the organic matter of prairie soils is twice as high as that of soils on which forest trees grow.

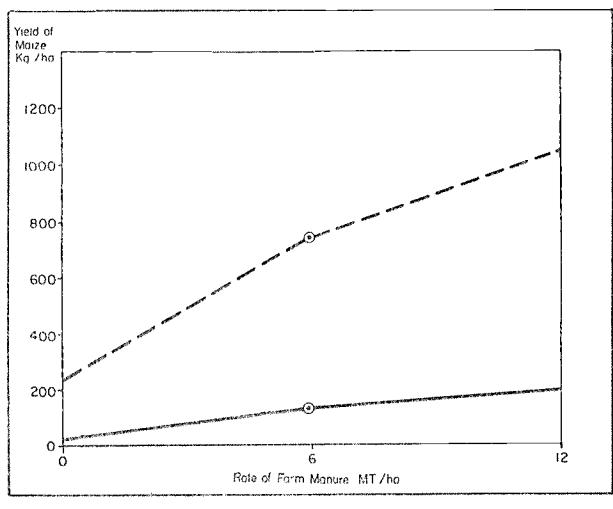
Another factor which controls organic matter content is temperature. As a general rule, for each decrease of 10°C the organic matter of the soil increases two or three times (with other factors remaining constant). Animal manures, green manures, crop residues, sewage, etc., are therefore applied to the soil primarily as a source of nutrients and for their beneficial effect on soil physical condition, rather than in the hope of maintaining soil organic matter at a high level. In any case, apart from the contribution of humus to the nutrient and moisture-retaining capacity of the soil, most of the beneficial effect from organic matter occurs during the early

stages of its decomposition. It is at this time that the gums, waxes, and other bacterial by-products are produced which are effective in cementing soil particles into stable aggregates and it is also at this time that the highest rate of release of nutrient elements takes place.

(a) *Animal manures* are the solid and liquid excreta of livestock, generally mixed with a certain amount of litter such as straw or peat which has been used as bedding for the animals. The importance of animal manures as a source of plant nutrients and organic matter cannot be overemphasized. Not only the manure produced in the stables, but also the droppings and urine of grazing animals must be considered. In many parts of the world the farmers rely solely on animal manures for the maintenance and improvement of soil fertility. On livestock farms many crop residues that are not suitable for other uses can be utilized in feeding and bedding livestock and the manure left on the farms by the animals is a valuable by-product. Fertilizers should be considered as supplementing animal manures on this type of farm.

The complementary roles of fertilizer and farm manure are well illustrated in Figure IV-6. An application of fertilizer was required for the realization of the full benefit of the manure. This is

FIGURE IV-6. EFFECT OF FERTILIZER ON RESPONSE OF MAIZE TO FARM MANURE



— Response to farm manure alone  
- - - Response to farm manure when fertilizer was applied

SOURCE: A. C. EVANS AND H. W. MITCHELL. Soil fertility studies in Tanganyika. *East African agricultural and forestry journal*, 27: 189, 1962.

probably because the fertilizer supplied phosphorus whose content is relatively low even in well-preserved manure. In many cases, however, nitrogen and potassium are required as well.

On the average, fresh horse and cattle manure contains 20 to 25 percent dry matter, 0.30 to 0.60 percent nitrogen, 0.20 to 0.35 percent  $P_2O_5$ , and 0.15 to 0.70 percent  $K_2O$ , besides significant amounts of other nutrients. These figures are approximate because manures differ widely in their composition, depending on such factors as type, age, and individual characteristics of animals, milk production (with cattle), amount and digestibility of fodder and concentrates fed (the manure of animals subsisting on roughage is poorer in plant nutrients than that of those receiving high-concentrate rations), the amount and type of litter, the time and type of storage, and the method of handling.

Compared with commercial fertilizers on a unit-weight basis, animal manure is low in plant nutrients, especially in phosphorus, that is, it is customarily applied at much higher rates than fertilizers – probably 50 to 100 times higher.

The availability to plants of potassium in manure is equal to that in fertilizers. The availability of manure phosphorus is also high, of the order of 60 to 80 percent. On the other hand, only a fraction of the nitrogen in manure is soluble and immediately available like the nitrogen in most fertilizers. Much of the nitrogen in manure is in organic forms that are only slowly mineralized over a period of years. As a result, the effect of manure tends to be longer lasting than that of fertilizers. In temperate and cold climates there is a cumulative effect with repeated applications of manure, but in hot regions the residual effect of manure is much less and the organic matter content of the soil is not increased by repeated manure dressing. The nitrogen of the urine which represents roughly 50 percent of the nitrogen excreted is present in the form of simple organic compounds. These compounds are rapidly decomposed by microorganisms to ammonia, which is readily volatilized. As a result the conservation of urine nitrogen is one of the major problems in handling animal manure. On many farms, it is lost through careless handling.

Although, in certain circumstances, some rotting with consequent loss of organic matter may be desirable, the plant nutrients and organic matter are conserved best if the manure piles are thoroughly compact, moist but not too wet, and under shelter. Manure should be kept in the same pile until it

can be applied to the land. Moving it from pile to pile results in much loss of organic matter and nitrogen. Moreover, well-compacted and sheltered manure piles are less likely to become breeding places for flies.

Accumulation of manure under the feet of animals under cover, bedded with just enough litter to absorb the liquid, is one of the most efficient and practicable ways of preserving manure.

Fresh manure containing much coarse cellulose litter, such as straw, may exert temporary ill effects. An abundance of fresh energy-giving carbohydrates as in straw, stimulates the growth of micro-organisms. If these become very numerous they absorb in their own cells much of the nitrogen in the fresh manure, and the amount of nitrogen immediately available to plants may be greatly decreased. But once the material has been decomposed most of the bacteria die, once more releasing the nitrogen in forms available to plants. These temporary ill effects can be partly or wholly overcome by plowing under fresh strawy manure some time before the crop is planted. One advantage in favor of well-rotted manure, however, is the fact that many weed seeds are killed by the heat generated in the process of decomposition.

(b) A *compost* is a mixture of partially decomposed organic materials of plant or animal origin, or both, and may also include substances such as ash, lime, and chemicals. After composting, plant or animal refuse loses its original structure and undergoes drastic biochemical changes similar to those occurring in the rotting of farmyard manure. Compost resembles ordinary farmyard manure in appearance and in its effect on the physical soil properties. As a source of plant nutrients its value will depend largely on the composition of the materials used in its preparation.

In some countries compost is a highly important source of plant nutrients. In Japan, for example, when supplies of fertilizer were low in 1946, it provided 40 percent of the nitrogen, 48 percent of the phosphate, and 54 percent of the potassium applied to the soil. Compost has a special advantage in tropical countries where fertilizers are often scarce or very expensive. Soils may be deficient in several nutrients and organic matter is difficult to maintain in the soil. If compost is made from a wide variety of crop residues it is likely to contain the essential elements in a reasonably balanced supply. Compost can be prepared from a variety

of refuse materials available on farms, in village surroundings, or in urban areas. On farms it can be made from straw, sugar-cane refuse, chaff, rice hulls, forest litter, hedge clippings, weeds, or miscellaneous crop residues, by piling it up in alternate layers with manure.

In some countries solid urban refuse is composted. This material comprises all soft waste material that is discarded into dust bins, including garbage and street sweepings, and may also include industrial wastes. In some cities, composting of town refuse with night soil is carried out by placing alternate layers in trenches and allowing them to rot for five or six months.

There are several reasons for composting plant and animal refuse instead of applying them direct to the soil. The incorporation with the soil of large quantities of coarse plant residues, such as straw and stalks which are rich in carbon and poor in nitrogen and phosphorus, may have temporary ill effects as mentioned above. The partial decomposition of such residues in the compost pile before application to the soil prevents these ill effects. The major portion of the nitrogen and part of phosphorus contained in the materials used for composting are in organic combination. These are gradually changed to forms available to the plant during decomposition in the compost. Active fermentation, during which the temperature of the compost heap should rise to 60° or 80°C, also helps to destroy weed seeds, pathogens, and fly maggots which may be present in the organic refuse.

(c) *Night soil* is human excrement, solid and liquid. In China it has been used in direct application to land for more than 2,000 years and has been one of the chief factors in the maintenance of China's soil fertility. In Japan, in 1951, night soil supplied 16 percent of the total nitrogen, 5 percent of the total phosphorus, and 12 percent of the total potassium applied to the soil. In India it is applied to a limited extent directly to the soil and to a larger extent is utilized in making compost.

From a hygienic standpoint it is advisable to have a certain minimum storage time. This is of importance as a means of destroying pathogenic bacteria and parasitic worms.

(d) *Sewage* is another important source of plant nutrients. Practices of treating and ultimately disposing of sewage vary widely. Much sewage is emptied into natural bodies of water without any

preliminary treatment. Some untreated sewage is used for irrigation. On the other hand, sewage may receive some treatment to remove the greater portion of the solid material. The coarse solids are removed by screening and are generally burned or buried. Fine solids and dispersed colloidal material, which are removed by sedimentation or precipitation, give rise to sludges. Activated sludges are of special value as fertilizers. The loss of nutrients, however, is quite high unless raw sewage or sewage effluent is used for irrigation.

Sewage irrigation can be practiced under certain conditions, in which case benefit is derived from the sewage as a source of irrigation water as well as a source of nutrients.

#### NITROGEN FROM LEGUMES

Elemental nitrogen occupies about 78 percent of the air by volume. A group of bacteria called nodule or symbiotic bacteria can utilize this free nitrogen. Nodule bacteria use both the carbohydrates and minerals contained in the host plant and, in turn, fix atmospheric nitrogen. This nitrogen may be utilized by the host plant, excreted from the nodule into the soil and be used by other plants growing nearby, or it may be released by decomposition of the nodules after the legume plant dies or is plowed under.

The amounts of nitrogen fixed depend upon the nature of the soil and the legume. On a sandy soil low in organic matter, a well-inoculated legume must fix most of its nitrogen. *Crotalaria*, a common summer legume used on such soils, may fix as much as 200 kilograms of nitrogen per hectare. *Sericea lespedeza*, however, under the same conditions fixes only 100 kilograms. If the above-ground parts of a legume are removed for hay, the nitrogen in the soil may be depleted, but generally not to such an extent as if a nonlegume were grown. On a given soil type the amount of legume growth, and hence the amount of nitrogen fixed, will depend upon how well the soil is supplied with lime, phosphorus, potassium, and other essential elements.

One of the more important reasons for including legumes in a rotation has been to supply nitrogen. With the development of the synthetic nitrogen industry and the manufacture of inexpensive nitrogen fertilizers, agriculture is less dependent upon legumes for a supply of this element. The selec-

tion of the program the farmer should follow becomes a matter of economics and should be the one giving the greatest return on the investment. Whether legumes are to be relied upon as the principal source of nitrogen depends upon the use to be made of the legume crop, its effect on soil productivity, and the effect its probable failure will have on the soil fertility program. In certain countries, however, where commercial nitrogen is not available, a cropping system including legumes is essential to supply the nitrogen needed for growth of nonlegumes.

#### GREEN MANURE

Green manuring is the practice of growing crops especially for incorporation into the soil. Turned under, they add organic matter; they return to the upper soil plant nutrients taken up by the crop from deeper layers; they improve the structure of the soil, facilitating penetration of rain and decreasing runoff and erosion; they hold nutrients that would otherwise be lost by leaching; and when legumes are used they provide additional nitrogen for succeeding crops. Legumes, nonlegumes, or mixtures may be used for this purpose, quickgrowing crops being preferred. Where bulk is of first importance, such crops as rye, sorghum, or mustard may be better than legumes. Often, however, nonleguminous crops do not contain sufficient nitrogen to provide for their decomposition by soil microorganisms, which consequently draw on soil nitrogen to the detriment of the following crop. A legume, on the other hand, contains more than enough nitrogen for its decay, and the excess becomes available to the following crop. Green manure crops frequently benefit from fertilizers which get them established and promote good growth and decomposition.

#### CLIMATE

Climate is an important factor in determining the character of the soil. It also determines the geographic limits within which certain crops may be grown. Within these limits, however, climate and weather factors such as temperature, rainfall and its distribution, evaporation, and length of day and growing season affect fertilizer use.

### *Temperature*

As mentioned above, cool conditions are not conducive to rapid rates of nitrification of organic nitrogen; therefore more nitrogen is required than under warmer conditions. Within a given area many plants will show deficiency symptoms, especially of nitrogen, in seasons which are cooler than normal. In fact, all three primary elements are required in larger amounts in an abnormally cold season. It is known that temperature directly affects the plant functions of photosynthesis, respiration, cell-wall permeability, absorption of water nutrients, transpiration, enzyme activity, and protein coagulation.

The effect of temperature on growth may be manifested through its effect on mineral-element absorption. The results of numerous experiments have indicated that, with a number of plant species, the absorption of nutrients by roots is retarded at low temperatures and accelerated by higher temperatures. Temperature also exerts its influence on plant growth indirectly through its effect on the microbial population of the soil. The activity of the nitrobacteria and other organisms increases with a rise in temperature. This increased microbial activity may also result in the release of certain mineral nutrient elements from soil organic matter and plant residues. As a general rule this activity increases approximately two or three times for each  $10^{\circ}\text{C}$  rise in temperature. This accounts for the corresponding decreases in soil organic matter mentioned above. Thus, in the tropics decomposition is so rapid that mineralized elements are lost readily through leaching unless there is an actively growing crop to absorb them.

### *Light*

The quality, intensity, and duration of light are all of importance. Studies have shown that the full spectrum of sunlight is generally most satisfactory for plant growth and that most plants make good growth at light intensities less than full daylight, but total dry weight is generally greatest at light of high intensities. Even though the light quality and intensity matter little from the farmer's standpoint, the duration of the light period is important. Plants have been classed as short-day, long-day, or indeterminate plants. Generally it would be expected that crops growing under long-day con-

ditions in the higher latitudes would require more fertilizer nutrients. For example oats and potatoes produce higher yields and hence utilize greater quantities of plant nutrients under long-day conditions. Moreover, long-day regions often coincide with regions of short growing season and therefore full-season crops need to absorb their nutrients in a shorter period of time. Conversely, short-day regions often coincide with regions of long growing season. Under the short-day conditions, however, as in the tropics, the relationship between light intensity and fertilizer uptake is somewhat complex. For example, the results of an experiment with cocoa conducted in Trinidad (Ignatiff and Page, 1958) give an indication of this relationship. Under heavy shade only small response to fertilizer was obtained. With a range of increasing light intensities the response, particularly to nitrogen, first increased, then decreased, with maximum response being obtained under about 50 percent shade. Under full sunlight, response to fertilizer was reduced.

### *Rainfall and evaporation*

A very close relationship exists between the continuous availability of soil moisture and the response of a crop to fertilizer applications. If soil moisture becomes a limiting factor during any stage of growth of a crop, the addition of fertilizer under such conditions may even affect the yield adversely because the resulting more vigorous early growth while moisture is still available in the soil may cause the limited water supply to be exhausted more rapidly.

Except under irrigation, the amount and distribution of rainfall influences not only the choice of crops to be grown but also the practicability of fertilizer use. High precipitation usually results in leached soils poor in plant nutrients, whereas with less precipitation weathering and leaching are usually less and the soil nutrient content is usually higher. In general, then, higher fertilizer requirements can be expected in areas of higher rainfall because the yield potential is usually higher. With more adequate water supplies, the soils are inherently less fertile and more of the applied fertilizer is washed out of the soil. Generally, rainfall distribution and annual temperature are interrelated so that more of the rain falls during the warmer season. In the higher latitudes this is responsible for the vigorous growth of crops during the spring and summer,

but at low latitudes, especially in the arid and semi-arid tropics, this leaves several months of the year with insufficient rainfall for crop production even though the temperature would permit good plant growth. Supplementary irrigation during this period would permit greatly increased crop production and would increase fertilizer needs.

The total moisture available for crop use is reduced by evaporation. Hence, the yield potentials are reduced and the need for fertilizer is lower in areas with a high evaporation rate unless this is offset by irrigation. In areas of permanently moist subsoils, excessive seasonal evaporation losses may be overcome by using fertilizers to promote vigorous growth.

#### SOIL MANAGEMENT

Soil management includes not only the use of fertilizers, manures, and crop rotations, but also cultural practices, drainage, irrigation, and water conservation. Management of the soil may alter its properties to such an extent that two fields with the same type of soil but under different management may require very different fertilizer treatments. One field may have been used to grow cereal crops for many years, without manure or fertilizers. An adjacent field of the same acid soil type may have been used over the same period under a system of management which included a rotation of legumes and cereal crops and the use of manure, fertilizers, and lime. If the same cropping system is to be applied to both fields it is obvious that treatment required for the two fields will differ widely. Again, two fields of the same soil type may have the same slope and drainage. One has been managed to prevent loss of soil by erosion, the other through mismanagement has lost much of its original surface soil. A much more rigorous program of soil management and fertilizer dressings is required on the eroded field to restore it to usefulness than on the field which has been consistently well handled. Some of the measures used to prevent erosion create differences in fertilizer requirement. This is true of shelterbelts, which have been shown to increase the humus contents of soil and yields of grain of distances up to 250 meters from the belt.

#### *Control of weeds and diseases*

There are many biotic factors that may limit plant growth. These factors present a constant hazard to farming operations and constitute a po-

tential threat to crop yields and may cause a complete crop failure. Heavier fertilization may encourage greater vegetative growth and better environmental conditions for certain disease organisms. For example, heavy rates of nitrogen on wheat may encourage greater infestation of mildew, but the increased yields usually offset any detrimental effect of the mildew. Certain diseases may result in a greater fertilizer requirement by the plant. Root knot nematode attacks the roots of certain crops and impairs the absorbing mechanism and this necessitates a greater concentration of nutrient elements in the soil to provide reasonable growth. Another aspect of diseases related to fertilization is that a plant in a state of balanced and adequate nutrition is usually more vigorous and hence more resistant to certain diseases. Likewise, the breeding and use of disease-resistant varieties or hybrids may increase the responses from adequate fertilization (Tisdale and Nelson, 1958).

Closely allied with disease is the problem of insects. Infestation of insects may limit plant growth and the degree of control may be responsible for the success or failure of a farming enterprise. Heavier fertilization may encourage certain insects through greater vegetative growth. The cotton boll weevil is an example. On the other hand, vigorous growth, stimulated by fertilizer, enables certain crops to withstand attack by insects (an example is the striped cucumber beetle).

Weeds likewise may limit crop growth if uncontrolled. They compete for nutrients, water, and even light if allowed to grow. Control of weeds, however, can be combined with fertilization of the crop as with calcium cyanamide. This material, when incorporated into the soil before seeding or planting, aids in controlling weeds and certain soil-borne disease. Calcium cyanamide is also used as a herbicide. Though toxic when applied as a dust to the foliage of broadleaved plants, cyanamide can be used as a top dressing for grass, when it acts as a weed killer as well as a fertilizer.

#### FERTILITY REQUIREMENTS OF DIFFERENT CROPS AND VARIETIES

The differences among crops in their nutrient requirements depend upon difference in actual uptake of mineral nutrients, difference in the ability of crops to obtain nutrients from the soil, and symbiotic relationships.

In the first case may be cited the comparison of the total uptake of nutrients by a crop of oats as compared to that by a crop of maize. A good crop of oats may utilize only 80 kilograms of nitrogen per hectare, while maize will utilize 140 kilograms. Usually heavy crops of a legume such as lucerne will absorb and remove much more phosphorus, potassium, and calcium from soils than will cereals or grass crops. Root crops are also noted for their relatively high needs of phosphorus and potassium. In general, the crops in a particular family which give the highest yield of dry matter per unit area require the highest nutrient supply.

The differences among crops in ability to absorb nutrients from the same medium may depend both upon the size of the root system and the inherent characteristics of the roots themselves. A large ramifying root system is of importance in absorbing available nutrients and water from deep soil horizons as well as in exploiting supplies in the plow layer.

An example of symbiotic relationships between plants and microorganisms is given by the independence of soil nitrogen shown by well-inoculated legumes. Legumes can grow on soils too low in available nitrogen to sustain growth of other crops.

#### Varieties

The importance of genetics in the growth of agricultural crops is well known. This is shown by the large increases in yields that have accompanied the use of hybrid maize and other improved crop plants. It is obvious that a hybrid maize producing 9,000 kg per hectare will require about 50 percent more plant nutrients than one producing 6,000 kg. This important fact has often been overlooked when a shift to the higher yielding variety is made. In fertile soils the new variety will deplete the soil more rapidly and eventually problems will arise if nutrient supplements are not made.

A number of workers have demonstrated that some varieties of crops respond differently from others to plant nutrient applications. At one time, in fact, varieties of maize recommended for poor soils were entirely different from those suggested for the more fertile soils. Now the trend is to supply adequate plant nutrients on the low fertility soils.

The degree of intensiveness of agriculture is a large factor in determining amounts of fertilizer used. Where land values and yield per hectare are low, as on arid or semiarid range land, the use of fertilizer is likely to be uneconomic. With high value crops such as vegetables, fruit, and tobacco, the cost of fertilizer is a relatively small item. In such cases the relationship between fertilizer cost, yield response, and crop prices is such that large quantities of fertilizer may be applied. Rates of  $P_2O_5$  up to 300 to 400 kilograms per hectare may be applied to potatoes, while the crop will remove less than 100 kilograms of this nutrient. Continued fertilization such as this will build up the fertility level of the soil to the point where crops such as maize, soybeans, or small grain, which have more extensive root systems, will not respond to applications of phosphorus or potassium. Nitrogen is usually needed by maize or small grain, however. This greater production and more efficient use of fertilizer can be achieved when crops are grown in sequence rather than by growing the same crop year after year on the same land. Such crop sequences are usually called rotations. Sometimes, however, the same crop is most economically grown at least for several years in the same place (monoculture). Sugar cane, wet paddy, tree crops, and leys are examples. With rotations, however, more efficient use of fertilizer is achieved through (a) increased organic matter and nitrogen supply; (b) growth of crops capable of feeding at various soil depths; (c) growth of crops that differ in the amounts of different plant nutrients which they require; (d) greater possibility of keeping soil under suitable crops most of the year; (e) control of runoff, erosion, and leaching; (f) control of pests and diseases.

In livestock farming the crops are consumed by animals, the rotations based on the use of grass-legume sods for pastures or for hay. Livestock on pasture returns at least 75 percent of the nitrogen, 80 percent of the phosphorus, and 90 percent of the potassium to the field. Of course, some of the nitrogen will be lost by volatilization and only 10 to 20 percent of the field will actually be covered each year with manure by the grazing animals. For livestock systems requiring the purchase and consumption of large quantities of feed in addition to farm-produced grain and roughages, the total fertilizer requirements may be slight. In many cases, however, particularly where grain-hay or straw

are removed, not more than 50 percent of the plant nutrients will be returned to the soil in manure. The legumes in such a system of farming tend to give a net increase in nitrogen. They do not add

any new phosphorus or potassium to the soil, however, and the total amount in the soil gradually decreases unless it is replaced by the addition of mineral fertilizer.

### Economic and social factors affecting the use of fertilizers

Some knowledge on the part of farmers of the methods of using fertilizers and their effects is, of course, a precondition for using fertilizers. However, knowledge by itself is not enough. Certain economic and social factors are also important, for example:

1. The price relationship between fertilizers and the crops to which they are applied, together with the market outlook for these crops, which largely determines the profitability and incentive for using fertilizers.
2. The level of incomes of farmers and the availability and cost of credit; these largely determine whether farmers can afford the initial outlay for fertilizers.
3. Conditions of land tenure, which if unfavorable may greatly reduce the incentives to use fertilizers.
4. Adequate distribution facilities to ensure that supplies of fertilizers are available to farmers at the right moment.

These factors are discussed in turn below. Their relative importance will naturally vary with the circumstances of the particular country, and they are to a considerable extent interdependent. It is worth emphasizing, however, that each of them can be influenced by government action if the policy of the country is to stimulate the use of fertilizers as a means of increasing agricultural production. Yet another factor which may influence the consumption of fertilizers is the relation between land and population, for cultivation naturally becomes more intensive when land is scarce.

#### PRICE RELATIONSHIPS BETWEEN FERTILIZERS AND CROPS

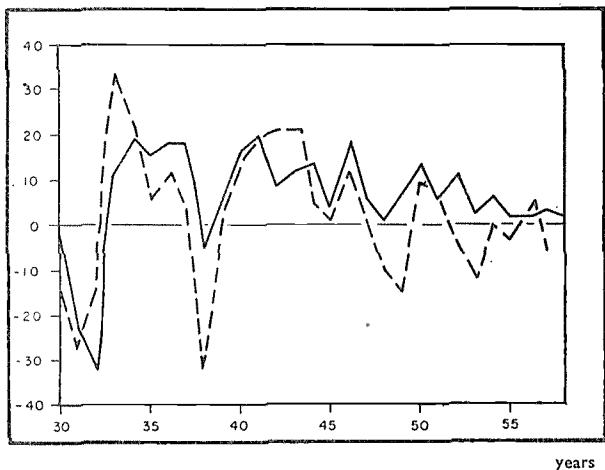
The relation between the cost of fertilizers and the value of the increased output to be expected from their use is probably the most important single

economic factor influencing fertilizer use, certainly in the economically more developed countries. This is largely determined by the ratio between the price of fertilizers and the price of the crops to which they are applied. The close relationship between the two in the United States is clearly evident in Figure IV-7, which compares annual changes in the quantity of fertilizers and lime used with annual changes in the ratio between prices of fertilizers as a whole and crops as a whole.

A straightforward comparison of prices, however, oversimplifies the issues. A good many other factors also affect the profitability of using fertilizers, and the rate of application likely to give the largest economic return, including:

1. The expected increase in output from each increment in fertilizers applied (at relatively high

FIGURE IV-7. EFFECT ON FERTILIZER USE OF RATIO OF PRICE RECEIVED FOR CROP TO COST OF FERTILIZER, UNITED STATES



Annual changes in fertilizer and lime weighted by 1935-39 average prices for the period 1930-39; and at 1947-49 average prices from 1940 on.

— Ratio of prices received for all crops to prices paid for fertilizer (excl. lime)

SOURCE: *Productivity of agriculture: United States, 1870-1959*. Washington, D. C.: U. S. Department of Agriculture. Technical Bulletin No. 1238, 1961.

rates of application there is naturally a diminishing return).

2. The price of the crop.
3. The cost of the fertilizers and of applying them.
4. The additional cost of harvesting and marketing the larger crop.
5. The residual value in later years of the fertilizers applied.

In principle all these factors should be considered by farmers, or by extension workers in advising them, in deciding the most appropriate rate of application of each type of fertilizer, and many attempts have been made to develop formulas for estimating the combination of fertilizers which should give the greatest economic return. In practice such formulas can give only a rough guide, for at the time the farmer buys his fertilizer only one element, the cost of the fertilizers, is accurately known. An average figure, based on farm trials, is used to estimate the probable increase in output, but the actual response varies greatly with the weather, and in turn affects the cost of harvesting and marketing. The price of the crop when it is harvested some months later can also only be an estimate, unless a fixed support price is effectively implemented. The price, for example, may be substantially reduced on a free market if favorable weather or the widespread use of fertilizers leads to a sharp rise in output. A farmer thus has to be rather cautious, and to allow a fair safety margin before increasing his expenditure on fertilizers.

A good deal, however, can be done by government action to reduce the risk and to increase farmers' incentives for using fertilizers. As indicated above, an effectively implemented support price removes one major uncertainty, and the general adoption of price supports for the main crops in North America, western Europe, and Japan goes far to explain the much increased use of fertilizers in these regions in recent decades. Even a fairly low support price, provided the farmer can count on receiving it, removes a large element of risk, and the higher the price the greater naturally the incentive to higher output.

While price supports provided a strong indirect stimulus to the use of fertilizers, several governments, notably in western Europe during the postwar food shortages, also resorted to subsidies to reduce the cost of fertilizers (coupled with propaganda through the extension services) as a direct means of encouraging their use. The United Kingdom

and Norway are examples of countries which achieved a sharp increase in fertilizer use by such means. In the United Kingdom a subsidy was given also for lime, to improve the productivity of large areas of pasture, and included the provision of low cost services for mechanically spreading the lime.

The main question which arises here is how far the above measures, which resulted in a sharp increase in fertilizer use in the more industrialized countries, are applicable in less developed countries, where increased food production is badly needed. Most less developed countries have in fact adopted measures of price stabilization, but until recently these were usually aimed primarily at the protection of consumers, and less attention was paid to ensuring that the farmer received a certain minimum price. This attitude is now changing and more of the less developed countries have come to appreciate the importance of giving some security of return and incentive to farmers if production for the market is to keep pace with the rapid growth of population and urban demand. But the organizational problem of assuring a minimum support price to millions of scattered farmers is particularly difficult in view of deficiencies of the marketing system in most less developed countries, the weak bargaining position of the farmers, their frequent indebtedness, and in some cases the system of land tenure. These problems are now beginning to be tackled, but few of the less developed countries have yet solved them satisfactorily.

To the farmer, the prices that are significant are those he actually pays for fertilizer, including the expense of transportation to his farm and the prices he receives for his products. Because of inefficient distribution and marketing systems common in less developed countries, as well as the other problems mentioned above, these prices are often markedly different from wholesale prices or market prices, in each case to the disadvantage of the farmer, thus lessening the incentive for him to use fertilizer.

As to the level at which farm prices are stabilized, few less developed countries can afford a relatively high support price, though these are common in western countries mainly as a social measure to reduce disparities between farm and nonfarm incomes. Such price supports involve transfer payments from the nonfarm to the farm sector, whereas in less developed countries agriculture as the main part of the economy must provide resources for the development of other industries. But reason-

able stability of farm prices, even at a fairly low level, which involves no subsidization from other sectors, would put most farmers in less developed countries in a considerably better position than they are at present, would increase their incentive to produce more for the market, and hence to make greater use of fertilizers.<sup>2</sup>

Similarly, less developed countries can seldom easily afford direct subsidies to reduce the cost of fertilizers, including the cost of distribution, though this would be less costly than high support prices and would be worth considering, e.g., where a country has to devote an appreciable share of its scarce foreign exchange to food imports. In some less developed countries where the attainment of production targets in agricultural development programs hinges on a significant increase in yields per hectare, governments have, in fact, tried to popularize the use of fertilizers by distributing them at reduced prices or even free of cost. In Burma, Ceylon, India, Malaya, Pakistan, the Philippines, and Senegal certain fertilizers are sold at subsidized prices, and in Indonesia they were for a time distributed free of charge to paddy farmers in some areas. In Uruguay a subsidy is paid on the price of fertilizers while imported fertilizers are free of duty and surcharges. Distribution of chemical fertilizers at cost price in the Republic of Korea and El Salvador has been attempted to increase their use. The somewhat low level of fertilizer consumption in most of these countries (Annex Table 22) suggests, however, that only a limited percentage of farmers have been able to avail themselves of these facilities.

In general a more promising approach, and one being more widely adopted, is to control the distribution of fertilizers which, if left to the free market, adds greatly to their cost in many less developed countries. Problems of distribution are discussed further in a later section as is also provision of credit at reasonable cost for the purchase of fertilizers.

A rather widespread characteristic of fertilizer use in less developed countries is that they are much more commonly applied to cash crops, especially those produced for export, than to basic food crops. This probably reflects the more profitable

prices usually obtained by farmers for cash crops and export crops than for basic food crops, despite the long term decline of prices of agricultural products on world markets since about 1950. Other factors may well be the more progressive methods of many producers of cash crops (especially large-scale plantation producers), their easier access to credit, and the orientation of their production more toward the market than for home consumption.

In some countries attempts have been made to influence the pattern of farm production by the controlled distribution of fertilizers, or by the provision of credit for fertilizers to be used on specified crops. In the Philippines, for example, where fertilizers are largely applied to sugar cane, the fertilizer subsidy was restricted from 1956 onward to fertilizer applied to paddy lands. This would indeed appear an effective way of encouraging preferentially the production of certain crops. Experience has shown, however, that unless the crops to be encouraged are also those to which it is profitable to apply fertilizers, farmers will tend to use them for other crops, or resell fertilizers provided for food grains to growers of crops, for which price relations are more favorable.

#### AVAILABILITY OF CREDIT

Credit is another factor which influences considerably the use of fertilizers. In more developed countries credit from commercial banks, agricultural lending institutions, and merchants are relatively easily accessible to farmers, and because of the competition between them their charges are seldom excessive. In many of these countries agricultural co-operatives not only provide credit at favorable terms, but also organize the distribution of fertilizers and in a few instances manufacture them in co-operatively owned plants.

In the less developed countries usually only estates or large-scale farm operators growing export crops are able to get credit directly from private credit institutions or from the fertilizer trade. The small-scale farmer who cultivates mostly food crops for domestic markets has to rely on government-owned or sponsored credit sources, except where there is a functioning system of co-operatives. And since credit from these sources is usually scarce, he has all too often to borrow from the general merchant, moneylender, or from his landlord, often at very high rates of interest which greatly reduce the prof-

<sup>2</sup> For discussion of problems of farm price stabilization in less developed countries see *Report of the FAO/ECFAFE Centre on policies to support and stabilize agricultural prices and incomes in Asia and the Far East*. Rome, FAO 1958, and *Report of the FAO/ECFAFE meeting on marketing aspects of implementing food and agricultural price stabilization policies in Asia and the Far East*. Rome, FAO, 1963 (in press).

itability of using fertilizers, even though the loans may be for no more than a few months. In the less developed countries where a great majority of farmers are almost without liquid resources and lack acceptable collateral to borrow from banks the wider availability of government-sponsored farm credit at reasonable rates of interest is an essential prerequisite for the extended use of fertilizers. An FAO report on the use of fertilizers in the Far East states:

The perennial problem of lack of credit combined with high interest charges continues to plague the growers in the Region. A solution to this problem is crucial to the future expansion in fertilizer use. In this connection it is worth drawing attention to a system in operation in Taiwan whereby fertilizers are supplied through distribution agencies on the condition that payment be made in rice at a fixed ratio, after harvest, through the same agencies (FAO, 1960).

The China (Taiwan) system is considered more fully below in connection with distribution problems.

#### LAND TENURE

It should be emphasized that in some systems of share cropping, still prevalent in many less developed countries, under which the landlord provides only the land while the tenant is responsible for labor and other inputs, the incentive to use fertilizers or indeed to adopt other improved methods of farming is greatly reduced. It is evident, for example, that if the tenant provides all the fertilizer, but shares the crop with the landlord on a fifty-fifty basis his net return will be only half that of an owner farmer who benefits from the whole of the increased output. Tenants paying a fixed rent would not be inhibited from using fertilizers on this account, since, like owner operators, they would receive the whole of the resulting increase in output. Even so, insecurity of tenancy may reduce their incentive to use fertilizers, especially those (e.g., phosphates) where an appreciable residual value may be carried over to the next season.

#### ADEQUATE DISTRIBUTION FACILITIES

All the factors discussed so far can become operative only if adequate facilities make it possible that fertilizers reach the cultivator at the right time. Such facilities include the provision of an adequate supply of the right kind of fertilizers, a network of distribution centers in the rural areas, means

of moving the fertilizers to the farm gate (roads, vehicles) at the proper time. These things are taken for granted in more developed countries and are carried out with reasonable efficiency by private enterprise or by farmers' co-operatives. In less developed countries they are generally lacking or are so costly as to hamper the general use of fertilizers, making the organization of an effective system of distribution a prerequisite for their introduction or for extending their use.

In some countries the government itself has attempted the task, e.g., through extension services or community development projects. This method may have merit when fertilizers are first introduced in that the extension worker can instruct the farmer in their use, but it imposes a heavy routine task upon the extension worker which necessarily restricts the time available for the advisory work which is his real task. The practice was criticized on these grounds in the report on Indian food problems sponsored by the Ford Foundation (Government of India, 1959), though at the same time the problem of distribution facing governments in less developed countries was fully recognized:

Among the more onerous distractions from the primary educational job for the village level worker and other extension officers are the service tasks such as the procurement of seed and fertilizers, collection of fees... etc. It is a temptation to say that the extension worker should slough off these chores, but often alternative ways of handling them are not available... Often the services are of such a crucial character that withdrawal may cause failure of the program. We can only conclude under the circumstances that such vital service activities be continued only for as short a time period as necessary, and that immediate steps be taken to develop other provisions for rendering these necessary service functions.

Farmers' purchasing co-operatives can very efficiently organize the distribution of fertilizers. They are, for example, widely used for this purpose in, e.g., the United States and are particularly successful in Japan where about three quarters of farmers' purchases of fertilizers are made through a network of general purpose co-operatives. The system used there appears to have contributed substantially to the heavy utilization of fertilizers in Japan.

On the side of purchasing, the co-operatives are most successful for fertilizers, fungicides, and pesticides, in each case handling about three quarters of the national business. Countries wishing to promote the use of fertilizers by their own farmers may find it of interest to study the Japanese method of organizing and financing their distribution. Advance orders are placed by farmers with their buraku<sup>[9]</sup> and village co-operatives.

<sup>[9]</sup> Buraku: a hamlet often with a branch of the larger village co-operative.

In placing his order the farmer applies for a loan against the security of the proceeds of his coming rice crop (which must be marketed through the co-operative). With this loan, credited to him in his account with the co-operative, he pays for the fertilizers when received. The co-operative in turn issues a promissory note to the prefectural credit federation, using the farmers' loan certificates as collateral. The prefectural credit federation discounts these promissory notes at the Central Co-operative Bank for Agriculture and Forestry, who when necessary uses them to obtain loans from the Bank of Japan. Thus the individual co-operatives and the prefectural association need virtually no funds to handle fertilizers, while the co-operatives are able to offer large and secure orders to fertilizer manufacturers. When each individual farmer's rice is finally marketed through the co-operative his loan is paid off as a first charge against the proceeds. Co-operative prices for fertilizers are not, as would be expected, greatly different from those of private merchants. But this system assures them a major part of the business, makes fertilizers easily available to farmers, and probably goes far to account for the rapid expansion of fertilizer sales in Japan (FAO, 1963).

Such general purpose co-operatives seem well adapted for the very small-scale farms commonly found in Asian and other less developed regions. They are economical of management and permit a larger and more economic scale of operations than would be possible with single purpose co-operatives.

Reference was made earlier to the direct exchange of fertilizers for rice practiced in China (Taiwan). This is organized through the farmers' associations, originally modelled on the Japanese co-operatives, which, like these co-operatives, act as government-buying agencies for rice, and collect also the rice

paid in kind for land tax and for the installment purchase of land distributed under the land reform. Until recently the exchange was of one bag of ammonium sulfate for one bag of rice, though it has since changed slightly in favor of the farmer. At this rate the exchange was profitable to the government, which could import ammonium sulfate for less than the cost of rice, and profitable also to the farmer who could normally count on producing three or four additional bags of rice for each bag of fertilizer applied. The system was originally introduced largely to aid the collection of rice for the ration, but would appear to be equally applicable if a government required rice for a buffer stock for stabilizing grain prices. It has the advantage of obviating the need for cash credit; it also eliminates the risk of loss from a drop in the price of rice which is likely to occur at harvest time when loans are due. Its successful operation, however, clearly requires a network of distribution points within easy reach of most farmers.

All these government actions, however, will not have a lasting success unless they are accompanied by public efforts to educate the farmers as to the use of chemical fertilizers. A well-organized and competent extension service is indispensable in any governmental program for introducing or expanding the use of fertilizers.

## Advising the farmer

### ASSESSING FERTILIZER REQUIREMENTS

It is evident that even a good and alert farmer can go only a certain distance on his own in planning the most efficient management of his land, including the most efficient use of fertilizers. Some of his problems can be solved only with technical help. In many countries this help can be obtained through public services established for the purpose. In some countries all or nearly all of the required services are in operation; in others only some of them; in still others, for various reasons, there are no organized services to assist farmers with their soil fertility problems, or the work has barely begun (fertilizer salesmen offer technical advice to farmers in some countries). Where few or none of the necessary services exist, their organization will require much time, money, and effort. The tech-

niques employed by some countries, briefly outlined below, may be helpful.

### *Soil classification*

Soil surveying and mapping are conducted in many countries. The detail with which this work is carried out varies from country to country and from area to area within countries.

As is well known, soils differ widely in their fertilizer requirements and in the way crops grown on them respond to fertilizer treatment. By classifying the soils, by conducting surveys and mapping the different soil areas, a systematic knowledge can be gained. Such knowledge is of great value in selecting the most suitable sites for field experimentation. Furthermore, if the soil survey has been

conducted in sufficient detail, the information gained will be very useful in advising the individual farmer.

Once the soils have been classified and surveyed, and the results of the surveys have been integrated, not only has a better knowledge been gained of their properties, but it becomes possible to outline accurately the areas with similar soils and, hence, those likely to require similar management and fertilizer use.

#### *Field experimentation*

There are a number of ways of determining what fertilizers should be applied to what soils and crops, but the method of field experimentation, laborious and time-consuming though it may be, remains the most reliable.

Yet, usually, fertilizer recommendations need to be based upon the individual soil types, rather than upon a district as a whole. In most places, even the local soil types may differ widely in their requirements for supporting optimum growth.

Thus field experimentation of principal soil types, including trials with animal manures, commercial fertilizers, and soil amendments, should be the basis of the soil fertility program of any country. These trials, whether conducted by agricultural colleges, experimental farms, or other organizations, are the first stage in the process of applying in practice the scientific research conducted in laboratories and greenhouses at the universities and other research institutions. They should be carried out in close co-operation with laboratories which, by analyzing soils and crops, can help to interpret the field results. The importance of field trials has on the whole been widely appreciated; during the past century a great many countries have established such experiments.

In addition to the more formal trials carried out on institutional fields, simple fertilizer tests on a large number of ordinary farms scattered over an area have great value. Such tests are particularly useful in places where little or no fertilizer has been used, because they indicate very quickly what crop response can be had from fertilizer treatments on a variety of soil types. They can also be of considerable value as demonstrations.

Unfortunately, in some countries these tests have been misunderstood. Their purpose, as has already been stated, is to give a reliable indication of the kinds and amounts of fertilizer needed for different

crops on a variety of soils. The use of this method has been opposed by some on these grounds:

1. Reliable results cannot be achieved unless the tests are conducted on experimental farms under full control of trained personnel. This is said to be particularly true in countries where the rural population is not too enlightened.
2. Unsatisfactory results of fertilizer tests, at least from the farmer's viewpoint, especially if he has sustained some financial loss, might prejudice the whole program and might even arouse suspicion of any advice given by government agents.
3. Testing and demonstrations should be treated separately.

These criticisms are understandable but are not entirely justified. In fact, experience in many countries has shown that cultivators, once they understand the purpose of the simple fertilizer tests, are ready to assist in carrying them out and to give the test plots the necessary attention. The extent to which these tests have been adopted is an indication of their success. In Ceylon, for example, simple experiments on farmers' fields were started in 1955 and have been continued on an increasing scale; in the four years from 1955 to 1959 over 2,600 experimental plots were laid down. In India over 35,000 trials were conducted between 1950 and 1960. The tests have proved to be equally popular in Japan, Malaya, East and West Pakistan, the Philippines, Sarawak, Senegal, Thailand, Viet-Nam, and other countries.

In less developed countries the introduction of fertilizers may necessitate changes in cultural practices and the introduction of better crop varieties to derive the full benefit from the high soil productivity and better rotations. All these changes will require careful preliminary field experiments on the principal soil types. It is too frequently assumed by workers from advanced countries that the agricultural methods of underdeveloped regions are totally inadequate and can easily be improved. Quite often, however, indigenous agricultural practices depend upon principles which are not yet fully understood by scientists and need experimental analysis. Hasty conclusions have often proved to be wrong. Local methods may be quite rational in the circumstances in which they are used, and important improvements might be possible only by changing the general social conditions – a far more

difficult task than the introduction of up-to-date agricultural techniques (Ignatief and Page, 1958).

A number of methods quicker than field experimentation have been devised to estimate the fertilizer requirements of crops on different soils. With soil classification as a base, these methods make it possible to extend knowledge gained on experimental fields to the fields of individual farms.

There is, however, no single procedure which is sufficient to determine fertilizer requirements over extensive areas. Approaches to the problem include soil surveys, long-term experiments on important kinds of soil, exploratory plots on farmers' fields, chemical analysis, and foliar diagnosis techniques. From among these a local system should be developed which takes into account the soils, the farming system, the skill of the farmers and of the advisory staff in the particular area. A number of these activities are described below.

#### *Vegetative tests*

The pot-test method of studying soil fertility has been used extensively. In this method, which is similar in principle to the field-plot test, soil is placed in pots of about 4-liter capacity. The soil samples are treated with different fertilizers; they are planted to a suitable test crop, and the responses are carefully noted. Although much valuable information is obtained in this way the results of tests cannot be applied directly without further study under field conditions.

#### *Chemical soil analysis and quick tests*

Methods for assessing by chemical analysis the nutrient status of soils have been the subject of numerous investigations. The principal objective of such a test for available nutrients is to extract by some chemical means a quantity of the particular nutrient which is proportional to that which the plant will be able to remove.

Although chemical extractions are devised quite easily, it is another matter to select one, the results of which correlate well with plant response to fertilizer in the field. Without good correlation a chemical test means nothing, but where a good correlation exists it is possible to make recommendations for economically optimum fertilizer applications on the basis of a chemical soil test. The necessary

correlations are established through a series of field experiments with fertilizers on the same soils.

In recent years, chemical "quick tests" for the estimation of the lime and fertilizer needs of soil have largely displaced vegetative and biological tests in many countries. In essence they are simplifications, for rapid practical use, of much longer and more exacting laboratory procedures designed to indicate available nutrients in the soil. Because of their speed and low cost, they make it possible to test several soil samples from each field on a farm. This is highly desirable because of the great variation in fertility that is possible in a single field. Development of more satisfactory quick tests has been greatly expedited by advances in analytical chemistry and a more exact knowledge of the forms of nutrient elements in the soil.

However, to be of value in estimating fertilizer requirements, any chemical soil analysis, as has already been indicated, must be calibrated against the results obtained in experimental fields on the same kind of soil, because the actual availability of nutrients in the soil depends on many factors beyond those involved in quick chemical tests.

#### *Deficiency symptoms*

Another method of diagnosing fertilizer needs is by means of the so-called hunger signs of plants which can be discerned with the eye. A decided lack of any plant nutrient usually results in the development of easily observed and rather specific abnormal colors, markings, and growth abnormalities. Recognition of these symptoms is probably the oldest method of diagnosing fertilizer needs, for undoubtedly at an early date man correlated certain crop appearances with nutrient deficiencies and manure requirements. Much study has been given to this subject in recent years, and it is now possible for a skilled person to make valuable diagnoses. Colored illustrations of nutrient deficiency symptoms in various economic plants are available in pamphlets and books.

Useful as it may be, a diagnosis by nutrient deficiency symptoms has, however, certain drawbacks. The nature of the symptoms varies from crop to crop and with the degree of deficiency; it is sometimes confused by the effects of plant diseases and insect damage, and it may be complicated by the simultaneous appearance of two or more kinds of deficiencies. Climatic factors are also involved, for plants may show visible symptoms in dry years

but none in wet ones. Often the symptoms become clear only after it is too late to correct the deficiency for the current crop. To overcome these handicaps, a plant tissue analysis can be quickly made for elements suspected of being lacking; these tests usually show a lack before visible symptoms appear.

#### *Chemical analysis of plant tissue*

In a number of countries extensive use is being made of chemical analysis of plant material, and by this means critical nutrient levels in the plant have been established for a number of crops. The value of this method is based on the assumption that critical nutrient levels in the plant are independent of soil conditions and other factors. Also, deficiencies detected by this means can be corrected during the growing season. It should be borne in mind, however, that the interpretation of the results of plant analysis is not a simple matter. Factors such as interactions of nutrients, age of the plant, concentration of nutrients in the soil, and the part of the plant used for analysis have an effect on the concentration of any particular element in the material analyzed.

#### *Tracer technique*

During the past 20 years, use has been made of radioactive and nonradioactive isotopes of nutrient elements for determining more accurately the soil/plant relationship. A discussion of this technique is outside the scope of this publication, but mention is made of it because it has proved to be another useful tool in the hands of soil and biological scientists.

#### EXTENSION AND ADVISORY SERVICES

Soil fertility and fertilizer practices tested on pilot research farms can also be used on demonstration farms. Upon the suggestion of extension and advisory people, some farmers may agree to try the improved practices on their own farms, with their own labor and capital. Such demonstration farms should also be selected so as to represent the principal combination of soils, types of farming, and size of farms, and they should include both tenant-operated and owner-operated farms. There should

be many demonstrations, enough so that every farmer can see one on a farm that resembles his own.

The benefits derived from fertilizer will usually be enhanced by the simultaneous adoption of improved varieties and good cultural practices. Therefore, from an extension point of view, an integrated approach aimed at simultaneous introduction of a number of improved methods of cultivation for a specific major crop may give much better results, also in terms of response to fertilizer use, than a campaign designed only to increase the use of fertilizer (FAO, 1960). The Intensive Agricultural District Program, sometimes referred to as the package program, eventually expected to cover about 3 million hectares in India and organized by the government with the support of the Ford Foundation, is an example of this integrated approach.

No matter how important may be the information gained from basic and applied research, field experimentation, soil surveys, pilot farms, and analysis of soils and crops, it remains sterile unless the farmers make use of it. And if farmers are to benefit from modern scientific knowledge, it must be brought to them along with information on how best to apply it to their own problems, and some assurance that it pay on their farms. There has always been a time lag between developments of science and their application on ordinary farms. This is due in part to the conservatism of farmers, who generally are wary of new methods and practices, but it is also due to the failure of those responsible to realize that the farmer does not have easy access to the results of research. To apply scientific knowledge successfully, he generally needs advice and assistance. In the past few decades there has been a better understanding of these facts in many countries, and extension and advisory services have accordingly been established.

Scientific knowledge can be spread among rural people in various ways. One of these is through state or farmer-sponsored extension services which supply agricultural advisers, agents, and counselors to work with local farm organizations, committees, or groups of farmers. The advisers can arrange lectures, field days, and courses of instruction for farm groups, and demonstration on farms can play an important role.

To widen the influence of the technically trained advisers, local leaders can be chosen from the more progressive and more socially minded farmers. These leaders can be instructed in some particular phase of soil fertility and they can assist their neigh-

bors. In countries where the rural population is literate, leaflets, bulletins, circulars, and the agricultural press are media through which farmers can be informed of better soil-management methods. The radio and films also offer great possibilities for this purpose and have the advantage that their effectiveness does not depend on the literacy of the audiences.

By all these extension methods the farmer can become acquainted with improved practices, but he may still need advice on soils, crops, manures, and fertilizers on his own farm. Individual farmers should have the advice of trained agriculturists with a knowledge of soils and fertilizers, and they in turn should be able to consult soil specialists on the more difficult questions. Laboratory facilities for analyzing farmers' soil samples should be available, for even the specialist often cannot foretell the fertilizer needs of crops on a particular soil by mere inspection of soil and crops.

Of special significance in some countries is individual technical assistance in helping the farmer to plan the specific land-use system adapted to his individual holding. In this way a farmer can be taught to appreciate the proper use of technical materials; it would help him in making those decisions for his own farm which would result in a higher level of economic production on a sustained basis. The farmer does not need to be introduced to the whole body of agricultural science, but only to those phases that apply specifically to his holding.

The activities and services discussed in this chapter can be of value not only in countries with well-developed agricultural systems using large quantities of fertilizer, but also in less advanced areas far removed from industrial centers. It may be entirely impracticable at present to create indigenous fertilizer industries in such areas or to import expensive fertilizers for farmers operating at a subsistence level, but much can be done to increase crop yields by the better use of local materials, such as animal manures, plant residues, wood ashes, and lime. The suggested activities could well be directed to this end.

The methods adopted in different countries for advising the individual farmer on soil fertility and fertilizer problems also differ widely. In many countries a soil-testing program is considered an essential part of a soil fertility advisory service. On the basis of the results of soil chemical analysis, extension

workers who have been specially trained in soil fertility advise the farmers with respect to the fertilizer requirements of different crops on different fields.

With regard to qualifications of an extension worker it is fairly well agreed that he should be a graduate of an agricultural college with a good knowledge of agricultural practices and of the theories behind those practices. In the United States, for example, the close association of research worker, college professor, and agricultural extension specialist, by having them together at a state university, is considered a most desirable thing.

In Japan, prospective agricultural agents, in addition to an education in an agricultural school or college, must pass an examination and receive training in an agricultural experiment station.

In Australia, most extension officers are graduates of agricultural colleges which provide practical training of a high standard.

In Iran, extension agents are mostly high-school or elementary graduates, but an attempt is being made to recruit most of them from agricultural high schools.

In India, the extension work is carried out through the Community Development Projects and National Extension Service Blocks, with one "village-level worker" in charge of all aspects of extension work, including agriculture, engineering, veterinary education, health, road construction, village welfare, etc.

These examples indicate in general the educational requirements for the extension worker. In addition to this training, however, it is very important that he should have the ability to relate his education to the problem facing the farmer (Government of India, 1959).

The ideal number of farmers to be served per extension worker varies with the complexity of agriculture and the amount of attention required by the individual farmer. It also varies with the extent to which government pamphlets, radio, television programs, and other media can be used. In addition to these approaches, however, personal contact of the workers with individual farmers is considered essential to the success of any extension program, and for this reason the ratio of extension workers to farmers should not fall below a certain optimum. It is presently felt in many of the developed countries that to do effective advisory work one extension worker should be available for every 200-400 farms.

## Fertilizer manufacture

Commercial fertilizers usually furnish one or more of the basic nutrient elements, nitrogen, phosphorus, and potassium. Also they often furnish other plant nutrients, frequently as incidental constituents. Such fertilizers are used primarily for their content of nutrient elements that are immediately available to plants. Farm manures, composts, night soil, and other locally produced materials, chiefly organic in nature, which contain relatively small percentages of nutrient elements and which do not involve commercial processing or manipulation, are not usually described as fertilizers.

### SOURCES OF NUTRIENTS

#### *Nitrogen*

The air over each hectare of the world's surface contains approximately 78,000 metric tons of nitrogen — the only fertilizer raw material commonly occurring in the atmosphere. Atmospheric nitrogen is the basis of the great chemical nitrogen-fixation industry and is by far the most important source of nitrogen. Furthermore, atmospheric nitrogen is the only fertilizer raw material of which every country has an adequate supply. However, this elemental nitrogen cannot be utilized by crop plants until it has been combined with other elements by chemical or biological means. On the farm, good use can be made of atmospheric nitrogen through nodule bacteria by growing legumes. It has been calculated that white clover can fix 600 kilograms of nitrogen per hectare.

There are two commercial methods for converting atmospheric nitrogen to compounds utilizable by crops, the calcium cyanamide process and the synthetic ammonia process, the latter being by far the most important. In the cyanamide process nearly pure nitrogen is caused to react with calcium carbide to produce calcium cyanamide. Manufacture of the calcium carbide requires chiefly coke, lime, and electric power. The synthetic ammonia process involves the reaction of pure nitrogen and hydrogen under high temperature and pressure to produce pure anhydrous ammonia, which is subsequently converted into fertilizer compounds or which can be used directly as a fertilizer under certain conditions. As hydrogen, the more costly raw material, is produced readily with several carbonaceous sub-

stances — including coal, coke, lignite, petroleum, and natural gas — the process is adapted to use in any country having supplies of these materials. Also, gases resulting as by-products of certain industries, especially coke manufacture and petroleum processing, are important materials for hydrogen production. Where electrical power is very cheap, hydrogen can be produced by the electrolysis of water.

The next most important source of fertilizer nitrogen is coal, from which ammonia, chiefly in the form of ammonium sulfate, is obtained as a by-product principally in the manufacture of coke. In modern plants, the average yield is about 2.3 kilograms of nitrogen as ammonia per ton of coal.

Naturally occurring mineral nitrates provide the third most important source of commercial fertilizer nitrogen. Chile is the only country which has large commercial deposits. The Chilean deposits probably contain more than 1,000 million metric tons of nitrogen, occurring chiefly as sodium nitrate mixed with other salts and with sand, clay, etc., from which it is concentrated by leaching, evaporation, and crystallization. Animal by-products and some plant residues, such as tankage, fish scrap, bird and bat guano, and oilseed meals are fairly important sources of fertilizer nitrogen in many countries.

#### *Phosphorus*

In increasing order of importance, the principal sources of fertilizer phosphorus are bones, iron ores, and deposits of mineral phosphates; phosphate rock, or phosphorite and apatite. Bone is no longer a major source of fertilizer phosphorus in large areas of the world because of the discovery and development of large mineral phosphate deposits and because of its higher value as a phosphorus supplement in animal feeds. Phosphate slags obtained as by-products in the manufacture of steel are important sources of phosphorus for European agriculture.

Phosphate rock is now by far the most important source of phosphorus for commercial fertilizers. These materials are composed chiefly of one or more complex fluorine-containing calcium phosphates, insoluble in water, but readily soluble in dilute acids. Deposits of mineral phosphates are

widely distributed throughout the world. The total known reserve which is being augmented continually by the discovery of new deposits, exceeds 50,000 million metric tons, containing more than 10,000 million tons of phosphorus pentoxide ( $P_2O_5$ ). (The total possible reserve of phosphate rock has been estimated at a very much higher figure. For example, in North Africa and Egypt alone the possible reserve has been reported to be as high as 450,000 million tons of material containing 61,000 million tons of phosphorus pentoxide  $P_2O_5$ .) About 37 percent of the known mineral phosphate is in Morocco and 33 percent in the United States. The rest is principally in the U.S.S.R., Tunisia, and Algeria. Important supplies have been developed in Brazil, Egypt, certain of the Pacific islands, and northern Transvaal in South Africa.

With some sources of mineral phosphate, preparation of the material for the market requires elaborate screening, washing, and flotation treatment to separate the phosphate from clay, sand, and other impurities. With others the phosphate is of commercial grade as it comes from the deposits.

Although much finely ground rock phosphate is used directly as fertilizer – in some countries, notably Finland, France, Federal Republic of Germany, Ireland, the U.S.S.R., the United Kingdom, Yugoslavia, South Africa, and especially the United States – by far the greater portion of the mineral phosphate is converted by various chemical processes into forms that are more readily available to plants.

#### *Potassium*

Very large deposits of potassium-bearing rocks are widely distributed throughout the world, but economical processes for converting these materials into fertilizers have been developed only to a very limited extent in a few countries. For example, some potassium fertilizers have been produced in Australia, Italy, Japan, and Korea from alunite and in Italy from leucite. Plant ash, cement-kiln dust, distillery waste from fermentation of sugar-cane molasses, and waste from the beet-sugar industry are among the minor sources of potassium for fertilizer. Extraction of potassium salts from Pacific Ocean kelps has been attempted, but without commercial success. Processes not yet in commercial operation have been developed for extracting potassium compounds directly from sea water. In India, potassium occurs in some places as deposits of “crude

niter earth” but because of low potassium content and large amounts of impurities, these deposits have not been exploited commercially to any extent.

Potassium fertilizer in the form of water soluble salts is obtained chiefly from underground deposits and also salt lakes and other brines. Estimates of the reserves of potassium in this form show wide differences. According to a recent estimate by one authority the total proved reserves in worked deposits amount to approximately 36,000 million metric tons of potash ( $K_2O$ ), more than half of which is in Germany; the remainder is chiefly in the U.S.S.R., with much smaller quantities in the Dead Sea (Israel and Jordan), France, Spain, and the United States. Small tonnages of potassium salts have been produced from brines and water-soluble minerals in other countries, including Chile, Eritrea, India, and Japan, and exploitation of deposits in Poland is said to be in progress. Development work is being done on the extensive deposits of soluble potassium salts recently discovered in Canada. Efforts to utilize the large deposits in Yorkshire, England, which occur at great depths, have ceased, at least for the present. Evidence has been reported recently of considerable deposits of potassium salts in Sicily, and of some deposits in Gabon, Africa.

Relatively little search has been made for soluble potassium minerals in vast areas of the world. Even in the countries where deposits of these minerals have been discovered, there is a good foundation for the belief that careful investigation of the known and probable potassium-bearing areas will greatly enlarge the usable reserve.

#### *Other nutrient elements*

Nearly all countries have resources of calcium, chiefly in the form of limestone deposits. Additional sources in many areas include silicate slags and deposits of marl, shells, calcium sulfate, and calcium phosphate.

The most important source of magnesium for fertilizer use is dolomitic limestone which is widely distributed throughout the world. Other sources include lake and well brines, deposits in association with soluble potassium salts, silicate minerals, and slags and magnesite (magnesium carbonate). Sea water contains a high percentage of magnesium and economical processes for its extraction in the form of magnesium oxide for agricultural and industrial uses are in operation.

The principal primary sources of sulfur are native sulfur, pyrites and other metal sulfide ores, natural gas and calcium sulfate; with the exception of native sulfur, these materials are widely distributed in large deposits. Though many countries have supplies of native sulfur, the major developed deposits are in the United States, Italy, Japan, and recently, in Mexico.

Boron, principally in the form of borax, is produced chiefly in the western part of the United States. Other countries having deposits include Argentina, Bolivia, Chile, Peru, Germany, Italy, Iran, Tibet, Turkey, and the U.S.S.R.

Small but increasing quantities of copper, iron, manganese, molybdenum, and zinc are used as fertilizers. The primary source of these materials is ores from which they are recovered, principally by the metal-mining and processing industries.

In some countries and areas where the soils are deficient in some of the plant micronutrient elements, salts of these elements are frequently added to fertilizers in common use. For instance, in parts of the United States salts of boron, copper, zinc, and manganese are often added to mixed fertilizers and in the eastern states borax is mixed with some of the superphosphates. In some areas of Australia salts of copper, molybdenum, and zinc are used singly or together with superphosphate. Likewise, the practice of adding copper and molybdenum, singly or together, to superphosphate is becoming common in New Zealand. In parts of Australia, New Zealand, and other countries, cobalt is added to phosphate fertilizers for the purpose of remedying deficiencies of this element in livestock. Basic slag is a useful source of plant micronutrients.

#### *Mixed fertilizers*

A mixed fertilizer is one containing two or more fertilizer materials. A genuine compound fertilizer was produced in Czechoslovakia in 1831 and was sold until 1853. Also Liebig manufactured a fertilizer based on his ideas of plant nutrition. The formation of the mixture was perfectly sound but he made the mistake of fusing the phosphate and potash salts with lime and as a result the fertilizer was a complete failure. However, the use of mixed fertilizers increased gradually and at present some 70 percent of the fertilizer used in some countries is in this form. Mixed fertilizers consist of individual fertilizer materials blended together to permit

distribution in the field in one operation. Equally good or better agronomic results can be obtained by applying fertilizer materials separately, but the use of mixed fertilizers has these advantages (Ignatief and Page, 1958):

1. Fewer man-hours are required to apply a mixture than to apply its various materials separately – an important factor in areas where farm labor is scarce and expensive.
2. Mixtures may have better physical condition and are more easily applied than many separate fertilizer materials and these advantages are most marked when granular materials are prepared.
3. The residual acidity of fertilizers can be conveniently and effectively controlled by the use of a proper quantity of dolomitic liming material in the mixtures.
4. Plant nutrients required in small amounts can be applied more evenly by being incorporated in mixed fertilizers.
5. Granular mixtures require no conditioning agent and by careful control and choice of raw materials the need for filler may also be reduced.
6. If a proper mixture is used for the particular soil type and crop, less care is needed on the part of the farmer to assure the right proportion of plant nutrients in the soil than when individual nutrients are applied separately.

The disadvantages of mixed fertilizers are:

1. Their use does not permit application of individual nutrients at specific times which may best suit the needs of the crop.
2. Since fertilizer materials are not easily recognized in mixtures, the farmer usually has no way of prejudging the quality of the plant nutrients in relation to his specific conditions of crop and soil.
3. The total concentration of plant nutrients in a mixture may be much less than that in the materials from which it is made so that for a given weight of nutrients more fertilizer must be handled and transported in the form of a mixture than in the ingredient materials.
4. The unit cost of plant nutrients is usually higher than in the ingredient materials.
5. Farmers often use mixtures without careful study of their needs, thus applying too little of some nutrients and more than necessary of others.

In some countries the formula of a mixed fertilizer is the term given to the list of kinds and qualities of ingredients which it contains. This list of materials is disclosed by manufacturers in some countries, but not in others. Knowing the formula, one is able to judge the type and quality of the nutrients and their suitability for specific soils and crops, and to determine roughly the quantity of sand and other inert material contained in their mixture.

#### DEVELOPMENT OF NATIONAL FERTILIZER INDUSTRIES<sup>4</sup>

In the early stages of fertilizer use by a developing country, fertilizer will almost certainly have to be imported. Regardless of what is recommended, the kind and amount used will depend to a very great extent on what is available or on what the country can afford.

Eventually, however, the question of a domestic fertilizer industry will arise. The decision to start manufacture may be based on a desire to save foreign exchange; it may be due to political reasons; or it may be due to the availability of raw materials.

These factors operate in a variety of ways. The lower limit of plant size for economically producing fertilizer nitrogen, for example, is put at around 30,000 tons of nutrient per year. Only a few of the underdeveloped countries are now actually using that much. But this figure may be much lower if there are ample local supplies of cheap raw materials or energy. Anticipated development in other fields again may need to be considered. A rapidly expanding steel industry may make coke-oven gas or basic slag available; the discovery of petroleum or natural gas or the establishment of a large refinery may make raw materials available. These may also be decisive factors in indicating which type of plant can be most economically built and what it shall produce. Here again a long-term view has to be taken. For example, it is now apparent that for many years there has been undue emphasis on fertilizer nitrogen in a number of countries. If a balanced program is to be evolved, either plants for phosphorus and potash production must be set up, or the materials must be bought abroad.

#### *Cost of manufacture*

A key question in making the decision whether or not to manufacture fertilizers is the cost of production and in turn, the cost to the farmer who is going to use the fertilizer. If the cost of production is such that the farmer cannot afford to buy it, or if the local demand is so limited that the home-manufactured fertilizer cannot be absorbed by the home market, excess production will have to be sold on a highly competitive world market. A developing country might therefore under certain conditions be well advised to import its fertilizer until a substantial demand has developed, unless the foreign exchange situation is such that importing is out of the question.

Also in considering the economic development of the country as a whole it must be appreciated that, once a factory is built, it provides very little in the way of employment, because fertilizer manufacture is labor-intensive.

Cost as well as other factors must be considered at a very early stage in the planning. The factors affecting cost have been summarized by Collins (1963):

##### *(a) General factors affecting any type of plant*

Climatic conditions, particularly maximum temperature and humidity (chiefly a matter of storage of fertilizer material).

Water supply.

Power supply.

Local (or national) facilities for fabrication or structural steel work and simple plant items such as tanks, low and medium pressure vessels, pipelines, etc.

Availability of skilled and semiskilled labor for erection.

Availability of managerial staff and skilled and semiskilled labor for operation and maintenance.

If local skills and experience are not available, will overseas training be necessary?

Will customs charges be levied on imported plant and materials, etc.?

##### *(b) Factors affecting any given type of plant*

End product to be manufactured.

Availability of raw materials.

Water and power supply (for manufacturing, as distinct from constructional requirements).

<sup>4</sup> Based on a review of the question of import or manufacture by Collins, 1963.

(c) *Factors affecting choice of site*

- Foundation conditions at site; whether piling for heavy plant loads will be necessary or not.
- Drainage conditions. Will treatment of effluents before disposal be necessary?
- State of development of immediate area of site. Will housing have to be provided for construction workers? Must provision be made for amenities, such as hospitals, schools, markets, etc.?
- State of communications for (i) materials to and from site; (ii) personnel.
- Location of site in relation to markets.
- Transportation facilities for raw materials to and from site.
- Location of source of supply of main plant items in relation to site for the purpose of estimating sea freight and insurance, etc.

*Importance of size and site*

With fertilizer factories in general and with factories based on ammonia synthesis in particular, the size of the factory affects very profoundly both capital cost per ton of installed capacity and also production costs. Comparing a factory for the production of, say, 100,000 tons of nitrogen per year with one of 20,000 tons, the capital cost per ton of installed capacity of the smaller factory could well be double that of the larger. It is indeed doubtful whether the smaller factory could produce at prices competitive with world prices for imported fertilizers from large factories, notwithstanding the sea freight and possibly customs charges on imported fertilizers. The problem is intensified if the plant is not operated at full capacity.

In fact the effect of idle capacity on production costs is more serious than almost any other factor. The relative cost index based on a urea project in East Pakistan is shown in Table IV-8.

TABLE IV-8. - EFFECT OF IDLE CAPACITY ON PRODUCTION COST OF UREA

Percent utilization or rated capacity	Relative production cost index for urea
100	100
90	107
80	115
70	127
60	142
50	168
40	196

SOURCE: FAO, *Preliminary report of the survey of the fertilizer economy of the Asia and Far East region*. Rome, 1960.

*Capital costs*

The total investment for a nitrogen plant with an annual capacity of 50,000 to 70,000 tons of nitrogen per year of the order of 30 to 50 million U.S. dollars, of which the foreign currency element may be U.S. \$20 to \$30 million (FAO, 1960). When this expenditure is under consideration, among the factors which should be taken into account is whether the factory is to be built and financed by the state or is to be constructed by private enterprise. The state may be able to consider much longer term financing, especially in view of the fact that a large fertilizer plant will almost inevitably be only a unit in the industrialization of a district and the facilities created for it will be an addition to the national capital usable for other purposes.

In any case it is of the utmost importance to ensure maximum utilization of installed capacity to provide good management and effective organization and a high degree of technical skill. Even with the best of management, the chances for the success of the undertaking are poor unless it is favored by one or more factors such as a ready home market, and cheap raw material and power.

**General conclusions**

**HOW MUCH CAN BE EXPECTED FROM FERTILIZERS?**

The rapid increase in the world's population raises serious problems of food supply especially in the

developing countries. The use of fertilizer will undoubtedly be one of the most important factors in supplying food for an increasing population. What it can do toward increasing yields can be

estimated from the results of experiments that have been conducted in many parts of the world.

The averages from 300 rice experiments conducted in Mainland China before and during the second world war showed an increase from 2,300 to 3,200 kg/ha - a direct response to fertilizer of 39 percent. Although Chinese farming is relatively efficient, it has been estimated that yields could be increased by a further 40 percent through the use of improved crop varieties, cultural methods including water control, and pest and disease control. On this basis the rice yield could be increased from the last-known average of 2,600 to at least 4,600 kg/ha. The validity of this estimate is confirmed by the fact that in Japan average yields of paddy have already passed this level and are still increasing.

Also in China, it is estimated that yields of wheat, although limited by the dryness and coldness of the climate, could be increased from its present average of 900 kg/ha to 1,600 kg/ha. Other crops such as potatoes, fruit, vegetables, cassava, millet, and forages, would be likely to show responses at least as large as those reported for rice and cereals (Richardson, 1960).

As further proof of the validity of the estimated response to fertilizer, Tables IV-9 and IV-10 show what fertilizers, along with other scientific improvements, have already done to raise yields in several countries that have modern intensive types of agriculture.

The medieval rice yield in Japan was about doubled by the second half of the 19th century, as a result of improving the early cultural methods and using local manures. With the introduction of chemical fertilizers into Japan, along with scientific improvements in cultural methods and in varieties, the increase in average yields continued, and by the present time rice yields have nearly doubled again. With wheat in England as well as with rice in Japan, it seems reasonable to assume that at least half of this doubling of yields since the late 19th century can be attributed to direct response to fertilizers. In Japan still higher yields can be expected as a result of research work now in progress, combined with still heavier applications of fertilizer. Crop competitions and officially observed measurements in many countries, even the less developed ones, have recorded yields of over 13,000 kg/ha where the national averages are not over 6,000. If all the reasons for these high yields were known it would eventually be possible to produce such yields on most of our cultivated land.

TABLE IV-9. - AVERAGE YIELDS OF WHEAT IN ENGLAND SINCE EARLY MEDIEVAL TIMES

Period	Yield (kg/ha)
1250	425
1350	560
1550	1 055
1750	1 410
1850	1 840
1900	2 120
1950	2 630
1959	3 585

SOURCE: H. L. RICHARDSON, Increasing world food supplies through greater crop production. *Outlook on agriculture*, 3 (1), 1960.

TABLE IV-10. - AVERAGE YIELDS OF PADDY IN JAPAN

Period	Yield (kg/ha)
8th century	1 265
16th century	1 895
1883	2 455
1898	2 845
1918	3 685
1938	3 786
1948	4 000
1959	4 750

SOURCE: H. L. RICHARDSON, Increasing world food supplies through greater crop production. *Outlook on agriculture*, 3 (1), 1960.

How much further the improvement in yields can go depends on such factors as the present fertility of the country's soils and whether or not irrigation is available in dry climates. On the more fertile soils, such as in Mainland China, where crop yields are already moderately high, doubling the original yields may be about the limit that could reasonably be expected from techniques now available. On the less fertile soils, such as those in India, tropical Africa, and America, the full application of modern intensive methods, including heavier fertilizer dressings and suitable new varieties, could not only double the original yields but double them again in many places. Thus, in the long run the production of food from present areas could be multiplied three or four times. Extension of the crop areas, or of the irrigated areas, would still further enlarge the capabilities of using fertilizers. Irrigation in particular, along with other agricultural improvements, makes possible remarkable responses to heavy fertilizer dressings.

When more is known about how to secure top

yields it should be possible to look forward with confidence to producing very many times the present quantities of food in the world and in this endeavor chemical fertilizers will continue to play a major part (Richardson, 1960).

#### THE ROLE OF INTERNATIONAL ORGANIZATIONS, GOVERNMENTS, FARMERS' ASSOCIATIONS, AND THE FERTILIZER INDUSTRY IN THE PROMOTION OF FERTILIZER USE

In the industrialized countries fertilizer use is regarded as an indispensable farming practice. Its use is promoted by governments, universities, and other educational sources, co-operatives, credit agencies, farm organizations, and by the fertilizer industry. A similar development is taking place more slowly in the less developed countries. A good beginning has been made in many countries with the technical assistance of different agencies, international, bilateral, and private, including foundations. The International Rice Commission, an arm of FAO, established a fertilizer working party in 1951. Participating governments have received assistance from FAO, the United States International Co-operation Administration, the Colombo Plan, and the fertilizer industry. In other countries, outstanding among the assistance programs are the work of the Rockefeller Foundation in Latin America and the Pilot Package Project of the Ford Foundation in India. Effectively functioning farmers' organizations, whether co-operative organizations or statutory boards, can be of great value in encouraging agricultural development programs. Reference has been made to Japanese farmers' co-operatives

which act as official agencies for buying cereals and for the distribution of fertilizers. In addition to material gains, co-operatives provide the farmers with confidence in their ability to manage their own affairs and give them a greater measure of control over their destiny.

However, the problems in the developing countries of raising the agricultural production are urgent and immense because agriculture has to provide not only the needs of an increasing population at more adequate levels of nutrition but also the means for general economic development. It has taken about a century for the industrialized countries to bring their agriculture to the present level of production through evolving and making use of modern technology. The developing countries do not have to follow the long tortuous path, they can short-cut the process by making use of techniques which have already been tested and proved. This will require enlightened and determined leadership of a kind that can be supplied only by governments which have the over-all national interest in view.

Governments will need to ensure that fertilizers and other agricultural requisites are available to farmers at the right time and at attractive prices, that farmers have access to credit with which to purchase them, that the advisory and extension services are able to teach farmers to use these materials efficiently, and that farmers can dispose, at lucrative prices, of the increased production.

In the war against hunger and malnutrition, fertilizers are powerful weapons in the armory of agricultural production, but there must be adequate supplies and the basic economic and social conditions to enable farmers to make full use of them.

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## **ANNEX TABLES**

ANNEX TABLE 1A. - INDICES OF TOTAL FOOD PRODUCTION, BY COUNTRIES AND REGIONS

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62 (Preliminary)
<i>Indices, average 1952/53-1956/57 = 100</i>										
WESTERN EUROPE .....	94	101	101	102	103	107	109	113	119	119
Northwestern Europe .....	95	100	102	101	102	106	107	109	120	119
Austria .....	91	102	96	103	108	112	116	109	123	127
Belgium-Luxembourg .....	94	96	104	107	100	107	112	105	118	120
Denmark .....	100	101	101	97	101	111	110	110	116	125
Finland .....	98	105	100	97	100	109	109	111	127	127
France .....	91	99	104	104	101	105	105	111	125	123
Germany, Federal Republic .....	95	101	101	100	103	105	111	107	121	112
Ireland .....	95	97	105	99	105	115	104	97	111	114
Netherlands .....	99	99	101	103	98	106	117	119	123	125
Norway .....	97	99	99	96	108	101	101	97	101	102
Sweden .....	104	103	101	91	101	99	95	97	99	101
Switzerland .....	101	100	103	99	97	99	108	106	110	111
United Kingdom .....	97	98	100	100	106	105	101	110	116	120
Southern Europe .....	90	103	98	105	104	111	115	121	116	120
Greece .....	81	105	100	104	110	125	120	125	116	127
Italy .....	92	104	96	105	104	102	117	115	109	118
Portugal .....	87	106	104	102	102	105	99	101	103	100
Spain .....	101	96	102	98	103	108	110	117	118	120
Yugoslavia .....	70	115	90	119	105	147	120	161	147	136
EASTERN EUROPE AND U.S.S.R. ....	90	95	96	104	116	119	131	133	134	137
NORTH AMERICA .....	99	98	97	101	104	101	109	110	111	110
Canada .....	112	104	78	99	107	92	96	100	104	92
United States .....	98	97	99	102	104	102	111	111	112	112
OCEANIA .....	99	99	98	103	100	99	116	115	121	123
Australia .....	98	100	99	104	99	95	119	115	123	125
New Zealand .....	98	96	100	103	103	109	113	115	118	121
LATIN AMERICA .....	94	96	100	101	100	111	117	117	119	120
Central America .....	91	94	100	102	113	122	132	136	139	136
Cuba .....	100	98	94	98	111	114	115	115	127	102
Guatemala .....	98	97	99	99	107	107	112	115	119	120
Honduras .....	102	105	93	95	105	103	108	118	119	124
Mexico .....	86	91	104	105	114	130	145	151	150	159
Panama .....	90	98	97	108	107	115	120	123	116	125
South America .....	94	96	101	101	108	109	114	113	114	117
Argentina .....	99	95	100	98	107	107	112	104	99	105
Brazil .....	89	96	101	103	111	115	122	127	132	133
Chile .....	101	95	102	104	99	109	105	105	112	105
Colombia .....	97	99	97	104	103	103	107	109	111	110
Peru .....	100	99	102	102	96	99	105	112	112	118
Uruguay .....	95	109	101	99	96	89	83	78	91	90
Venezuela .....	92	99	101	103	105	110	111	119	129	129

ANNEX TABLE 1A. - INDICES OF TOTAL FOOD PRODUCTION, BY COUNTRIES AND REGIONS (*concluded*)

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62 (Preliminary)
<i>Indices, average 1952/53-1956/57 = 100</i>										
FAR EAST <sup>1</sup> .....	91	99	100	103	107	106	111	116	120	122
Burma .....	102	98	96	97	107	93	109	114	113	111
Ceylon .....	97	90	101	113	99	102	106	113	113	120
China: Taiwan .....	88	95	101	104	112	118	125	123	129	133
Federation of Malaya .....	90	89	101	104	116	114	112	125	136	133
India .....	90	100	100	102	107	106	111	115	120	121
Indonesia .....	89	102	105	101	103	104	108	110	110	112
Japan .....	97	85	94	114	110	115	117	121	125	125
Korea, Republic of .....	86	107	104	106	98	111	114	116	119	122
Pakistan .....	97	101	103	96	104	102	102	109	114	114
Philippines .....	94	98	99	101	107	112	113	115	121	126
Thailand .....	89	108	84	105	114	90	106	110	124	128
NEAR EAST .....	93	101	97	100	109	113	117	120	121	120
Iran .....	91	98	98	104	109	123	122	124	113	121
Iraq .....	86	106	119	86	104	126	105	99	101	108
Israel .....	81	92	100	104	123	127	148	164	155	179
Syria .....	93	106	117	68	117	133	84	89	90	102
Turkey .....	100	110	85	99	107	105	122	122	129	127
United Arab Republic .....	86	93	103	106	113	116	114	119	124	117
AFRICA .....	94	99	101	100	106	102	106	108	113	109
Northwest Africa .....	91	101	107	94	107	92	108	102	108	84
Algeria .....	91	99	106	96	109	98	95	101	104	86
Morocco .....	<sup>2</sup> 91	<sup>2</sup> 101	<sup>2</sup> 110	<sup>2</sup> 97	<sup>2</sup> 102	<sup>2</sup> 81	116	101	105	82
Tunisia .....	95	110	103	80	113	99	135	112	127	84
South of Sahara <sup>3</sup> .....	95	98	100	102	105	104	106	109	114	114
Ethiopia <sup>4</sup> .....	99	100	100	100	102	98	98	102	102	103
South Africa .....	88	99	101	103	109	105	109	114	124	131
WORLD <sup>1</sup> .....	94	98	98	102	107	108	114	117	120	120

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 1962/63.

<sup>1</sup> Excluding Mainland China. - <sup>2</sup> Former French zone only. - <sup>3</sup> Derived by subtraction of subtotal for northwest Africa from regional total. - <sup>4</sup> Excluding Eritrea.

ANNEX TABLE 1B. - INDICES OF PER CAPUT FOOD PRODUCTION, BY COUNTRIES AND REGIONS

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62 (Preliminary)
<i>Indices, average 1952/53-1956/57 = 100</i>										
WESTERN EUROPE .....	95	102	101	101	101	105	106	108	113	113
Northwestern Europe .....	96	101	102	100	101	103	104	104	114	112
Austria .....	91	103	96	103	108	112	115	108	121	124
Belgium-Luxembourg .....	95	97	104	106	99	105	109	102	114	115
Denmark .....	101	102	101	96	100	109	108	106	111	119
Finland .....	100	106	100	96	98	106	105	105	120	119
France .....	92	100	104	103	100	102	101	106	118	114
Germany, Federal Republic .....	97	102	101	99	100	101	106	101	113	104
Ireland .....	94	96	104	99	106	117	107	100	115	119
Netherlands .....	102	101	101	102	95	102	111	111	114	114
Norway .....	99	100	99	96	106	98	98	93	96	96
Sweden .....	105	104	101	90	100	97	93	94	96	97
Switzerland .....	103	102	103	98	95	95	102	99	101	99
United Kingdom .....	97	99	100	99	105	104	99	107	112	116
Southern Europe .....	92	104	98	104	103	109	112	117	111	114
Greece .....	83	106	100	103	108	122	116	119	110	120
Italy .....	93	104	96	104	103	100	115	112	105	113
Portugal .....	88	106	104	101	101	103	97	98	99	96
Spain .....	102	97	102	97	102	106	106	113	112	113
Yugoslavia .....	72	117	91	118	102	143	115	153	138	126
EASTERN EUROPE AND U.S.S.R. ....	92	96	96	103	113	114	123	124	123	124
NORTH AMERICA .....	103	100	97	99	101	96	101	100	100	98
Canada .....	118	107	77	96	102	84	86	87	89	77
United States .....	101	99	100	100	100	97	103	102	101	100
OCEANIA .....	104	102	98	101	96	92	106	102	106	105
Australia .....	102	103	99	102	94	89	109	103	108	107
New Zealand .....	103	98	100	101	98	102	104	103	104	104
LATIN AMERICA .....	99	98	101	99	103	103	105	102	101	99
Central America .....	97	97	100	99	107	113	118	118	117	112
Cuba .....	104	100	94	96	107	107	106	104	113	88
Guatemala .....	104	100	99	96	101	98	100	100	100	98
Honduras .....	107	103	93	93	100	96	97	103	101	102
Mexico .....	91	94	104	102	108	119	129	130	125	129
Panama .....	96	101	98	105	101	107	108	108	99	104
South America .....	99	99	101	99	102	101	103	99	97	97
Argentina .....	103	97	100	97	103	101	104	95	89	93
Brazil .....	94	99	102	100	105	105	109	109	109	106
Chile .....	105	97	102	101	95	103	96	95	100	92
Colombia .....	101	101	97	102	99	97	98	98	98	94
Peru .....	104	102	102	100	92	92	95	98	95	97
Uruguay .....	98	111	101	97	93	84	77	72	83	81
Venezuela .....	100	103	101	99	97	98	96	99	103	100

ANNEX TABLE 1B. - INDICES OF PER CAPUT FOOD PRODUCTION, BY COUNTRIES AND REGIONS (*concluded*)

	1952/53	1953/54	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62 (Preliminary)
<i>Indices, average 1952/53-1956/57 = 100</i>										
FAR EAST <sup>1</sup> .....	95	101	100	101	103	100	103	105	106	105
Burma .....	104	99	96	96	105	90	105	108	107	104
Ceylon .....	102	92	101	110	95	94	96	100	97	100
China: Taiwan .....	95	99	101	100	105	107	109	103	105	104
Federation of Malaya .....	96	92	101	101	110	105	99	108	113	107
India .....	93	103	101	100	103	100	102	104	105	103
Indonesia .....	92	104	106	100	99	97	99	98	96	94
Japan .....	99	86	94	113	108	111	112	116	118	117
Korea, Republic of .....	88	107	104	105	95	104	105	104	104	104
Pakistan .....	100	102	103	94	100	97	95	99	102	100
Philippines .....	100	101	100	98	101	102	100	98	100	101
Thailand .....	94	111	84	102	108	83	95	96	105	106
NEAR EAST .....	98	103	97	98	104	105	107	107	105	103
Iran .....	96	100	98	101	104	115	112	113	100	105
Iraq .....	91	109	119	84	98	116	94	86	85	89
Israel .....	87	96	102	101	114	113	127	137	125	140
Syria .....	99	110	116	65	110	123	75	75	73	82
Turkey .....	106	113	85	96	101	97	109	107	109	104
United Arab Republic .....	90	95	103	104	108	108	104	106	108	99
AFRICA .....	98	101	102	98	101	96	98	97	98	93
Northwest Africa .....	96	104	107	92	102	86	93	86	88	67
Algeria .....	95	101	107	94	104	92	86	89	90	73
Tunisia .....	98	111	103	78	110	94	127	104	116	76
Morocco .....	<sup>1</sup> 96	<sup>2</sup> 104	<sup>1</sup> 110	<sup>2</sup> 94	<sup>2</sup> 96	<sup>2</sup> 71	91	77	78	59
South of Sahara <sup>3</sup> .....	99	100	100	100	101	98	98	99	100	98
South Africa .....	92	102	101	101	104	93	100	101	108	111
WORLD <sup>1</sup> .....	98	100	99	101	103	102	106	106	107	105

NOTE: See explanatory note to Annex Table 1A.

<sup>1</sup> Excluding Mainland China. - <sup>2</sup> Former French zone only. - <sup>3</sup> Derived by subtraction of subtotal for northwest Africa from regional total.

ANNEX TABLE 2A. - WORLD<sup>1</sup> PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat.....	144.7	155.5	171.4	183.5	201.3	197.5	228.2	229.0	219.9	210.3	234.0
Barley.....	44.1	46.7	57.1	62.0	70.1	63.8	69.4	67.5	76.5	68.9	79.4
Oats.....	64.0	60.6	57.8	62.8	62.0	58.7	60.9	54.8	57.2	49.1	48.7
Maize.....	106.4	124.0	127.4	147.0	148.2	149.4	165.9	180.6	193.1	190.0	188.5
Rice (milled equivalent) <sup>2</sup> .....	65.7	70.6	77.8	83.0	87.5	81.4	90.3	95.6	100.6	100.3	101.9
Sugar (centrifugal).....	24.9	31.9	37.5	38.8	40.9	44.3	48.8	48.6	53.7	50.3	49.8
Citrus fruit.....	11.1	15.1	17.7	18.2	17.9	18.1	19.7	20.0	20.3	21.8	18.9
Apples <sup>3</sup> .....	11.5	13.3	14.8	13.6	16.1	9.9	20.9	13.7	21.0	14.6	19.4
Bananas.....	8.1	13.7	14.2	14.6	15.0	16.0	16.8	19.1	18.7	19.1	19.3
Vegetable oils and oilseeds (oil equivalent).....	10.4	15.6	17.9	18.7	20.3	19.9	21.2	20.5	21.5	22.7	22.2
Coffee.....	2.41	2.23	2.44	2.86	2.52	3.18	3.51	4.65	3.96	4.28	3.90
Cocoa.....	0.74	0.76	0.82	0.83	0.90	0.76	0.92	1.01	1.20	1.16	1.14
Tea.....	0.47	0.56	0.69	0.72	0.73	0.72	0.79	0.80	0.81	0.87	0.87
Wine.....	20.3	18.9	22.4	23.0	22.0	18.4	23.9	24.6	24.4	22.2	25.7
Tobacco.....	2.29	2.73	3.09	3.27	3.28	3.21	3.12	3.23	3.23	3.20	3.44
Cotton (lint).....	5.99	6.78	8.00	8.20	8.04	7.67	7.89	8.52	8.89	8.93	9.41
Jute.....	2.15	2.08	1.73	2.38	2.36	2.22	2.50	2.21	2.09	3.21	2.92
Wool (greasy).....	1.61	1.79	2.04	2.13	2.23	2.21	2.35	2.48	2.46	2.49	2.50
Rubber (natural).....	1.00	1.74	1.85	1.95	1.92	1.98	1.97	2.07	2.03	2.12	2.15
Milk (total).....	221.0	259.6	288.2	297.2	310.0	321.2	329.8	335.8	342.8	348.0	352.4
Meat <sup>4</sup> .....	29.4	36.2	42.6	44.6	46.9	47.8	49.6	50.0	50.5	52.2	54.1
Eggs.....	6.32	8.77	10.3	10.6	11.0	11.4	11.7	12.2	12.5	13.0	13.5
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	77	88	98	103	107	107	113	116	119	120	123
	1953	1954	1955	1956	1957	1958	1959	1960	1961		1962 (Preliminary)
<b>FOREST PRODUCTS</b>											
Roundwood <sup>5</sup> .....	1 471	1 553	1 698	1 721	1 725	1 713	1 787	1 794	1 769	1 810	
Sawnwood <sup>5</sup> .....	271.5	279.6	299.4	302.6	294.0	306.1	326.2	327.6	328.5	339.0	
Plywood <sup>5</sup> .....	8.3	9.0	10.9	11.3	11.8	13.0	14.9	15.4	16.5	17.6	
<i>Million metric tons</i>											
Wood pulp.....	39.1	42.5	46.5	49.6	50.1	50.0	55.0	59.2	62.4	65.2	
Newsprint <sup>5</sup> .....	9.8	10.4	11.2	12.0	12.3	12.1	13.1	14.0	14.4	14.7	
Other paper and board <sup>5</sup> .....	38.6	41.1	45.7	48.6	49.3	50.7	56.0	60.0	63.7	68.3	

<sup>1</sup> Excluding Mainland China, except for forest products. - <sup>2</sup> Paddy converted at 65 percent. - <sup>3</sup> Including cider. - <sup>4</sup> Beef and veal, mutton and lamb, pork. - <sup>5</sup> Pre-1955 data are not strictly comparable with those for 1955 and after.

ANNEX TABLE 2B. - WORLD EXPORTS<sup>1</sup> OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat and wheat flour (wheat equivalent) ....	15.29	25.02	22.62	24.70	31.63	29.44	27.53	29.27	33.12	40.71	36.55
Barley .....	1.76	3.23	5.47	5.16	7.04	6.35	6.50	6.18	4.93	6.16	5.64
Oats .....	0.72	1.23	1.48	0.91	1.32	1.58	1.46	1.40	1.29	1.22	1.37
Maize .....	9.33	4.35	5.41	4.68	5.86	7.10	8.80	10.00	11.13	12.55	17.50
Rice (milled equivalent) ..	9.67	4.40	4.28	4.85	5.46	5.54	4.95	4.80	5.52	5.77	5.49
Sugar (raw equivalent) <sup>2</sup> ..	9.63	10.75	11.91	13.31	13.52	14.68	14.35	13.33	15.99	17.21	15.81
Citrus fruit <sup>3</sup> .....	1.86	1.88	2.60	2.84	2.39	2.69	2.78	3.10	3.38	3.26	3.24
Apples .....	0.69	0.57	0.71	0.98	0.87	1.14	0.85	1.29	1.22	1.36	1.44
Bananas .....	2.48	2.35	2.95	3.10	3.09	3.40	3.56	3.72	3.95	3.98	3.89
Vegetable oils and oilseeds (oil equivalent) <sup>4</sup> .....	4.20	3.63	4.55	4.67	5.09	5.25	4.95	5.26	5.58	5.43	5.93
Coffee .....	1.64	1.93	1.78	2.07	2.34	2.23	2.19	2.55	2.61	2.67	2.79
Cocoa beans .....	0.68	0.67	0.69	0.70	0.75	0.78	0.64	0.75	0.88	1.00	1.03
Tea .....	0.36	0.41	0.50	0.43	0.50	0.48	0.52	0.50	0.49	0.52	0.54
Wine .....	1.93	1.61	2.25	2.58	2.46	2.74	2.75	2.38	2.60	2.59	2.54
Tobacco .....	0.49	0.54	0.59	0.64	0.64	0.68	0.66	0.64	0.68	0.76	0.72
Cotton (lint) .....	2.88	2.37	2.63	2.38	2.84	3.07	2.65	2.79	3.50	3.28	2.74
Jute .....	0.79	0.85	0.90	0.99	0.88	0.81	0.95	0.89	0.83	0.75	0.90
Wool (actual weight) ...	0.96	1.05	1.01	1.14	1.18	1.20	1.15	1.38	1.32	1.42	1.44
Rubber (natural) <sup>5</sup> .....	0.98	1.67	1.86	2.02	1.94	1.96	1.97	2.27	2.01	2.21	2.24
Meat (fresh, chilled, and frozen) <sup>6</sup> .....	1.15	0.95	1.11	1.18	1.32	1.43	1.48	1.57	1.56	1.60	1.94
Eggs (in the shell) .....	0.26	0.24	0.34	0.35	0.36	0.38	0.39	0.43	0.42	0.39	0.35
<b>FOREST PRODUCTS</b>											
Roundwood <sup>7</sup> .....	...	<sup>8</sup> 18.4	21.3	26.1	26.3	27.0	26.0	28.8	33.7	38.4	37.0
Sawnwood .....	...	<sup>8</sup> 28.7	32.1	35.7	31.7	33.8	33.3	36.2	40.9	40.7	42.6
Plywood .....	...	<sup>8</sup> 0.5	0.8	1.0	0.9	1.1	1.2	1.6	1.5	1.6	1.8
<i>Million metric tons</i>											
Wood pulp .....	...	<sup>8</sup> 6.0	6.9	7.6	7.8	7.8	7.7	8.5	9.7	9.8	10.2
Newsprint .....	...	<sup>8</sup> 6.0	6.2	6.6	7.0	6.9	6.8	7.0	7.5	7.7	7.6
Other paper and board ..	...	<sup>8</sup> 2.3	2.8	3.1	3.2	3.5	3.4	3.9	4.5	5.1	5.3

<sup>1</sup> Including exports from the rest of the world to the U.S.S.R., eastern Europe, and Mainland China, but excluding exports from these countries, except for forest products. - <sup>2</sup> Excluding United States trade with its territories. - <sup>3</sup> Oranges and lemons only. - <sup>4</sup> Excluding re-exports of copra from the Federation of Malaya and Singapore, but including unrecorded shipments of copra from Indonesia and the Philippines to the Federation of Malaya, Singapore and North Borneo. - <sup>5</sup> Excluding imports into the Federation of Malaya and Singapore for re-export and exports from Hong Kong, but including unrecorded shipments from Indonesia to the Federation of Malaya and Singapore. - <sup>6</sup> Beef and veal, mutton and lamb, pork. - <sup>7</sup> Logs, pulpwood, pitprops, fuelwood, poles, pilings and posts. - <sup>8</sup> 1953.

ANNEX TABLE 3A. - WESTERN EUROPE: PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat .....	31.07	30.32	35.70	37.80	32.01	40.49	39.09	42.66	39.62	37.65	47.40
Rye .....	7.49	6.65	7.64	6.69	7.14	7.21	7.01	7.17	7.04	5.43	6.01
Barley .....	9.08	10.93	13.72	14.74	19.04	17.50	17.73	20.35	22.14	22.60	25.82
Oats .....	16.44	14.84	14.58	14.78	15.98	13.23	12.91	12.58	13.30	12.93	12.49
Maize .....	9.73	7.17	8.59	9.76	10.16	12.20	11.08	14.32	14.83	13.13	12.25
Sugar (centrifugal) .....	4.02	5.13	6.56	6.89	6.49	7.07	8.19	7.32	9.93	7.80	7.46
Potatoes .....	69.87	76.34	80.99	73.11	84.33	79.02	72.55	72.49	79.71	72.87	73.54
Citrus fruit.....	1.99	2.10	2.63	2.54	1.84	2.76	2.91	3.28	3.26	3.87	2.96
Apples <sup>1</sup> .....	7.42	8.55	9.32	8.51	10.12	4.22	13.44	7.18	13.75	7.85	12.07
Olive oil .....	0.81	0.86	0.84	0.69	0.90	1.06	0.83	1.06	1.10	1.20	0.72
Wine .....	14.13	13.09	15.33	16.08	15.58	11.53	16.02	16.66	16.63	14.24	17.39
Tobacco .....	0.19	0.24	0.29	0.34	0.30	0.36	0.30	0.32	0.26	0.20	0.25
Milk (total) .....	77.02	76.64	90.17	89.24	92.24	96.62	97.79	98.09	103.06	105.47	106.94
Meat <sup>2</sup> .....	8.56	7.39	10.20	10.47	10.64	11.06	11.20	11.56	12.13	12.82	13.40
Eggs .....	1.95	2.13	2.66	2.74	2.82	2.96	3.11	3.27	3.33	3.48	3.80
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	82	86	101	102	103	107	109	112	118	119	124
	1938	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>FOREST PRODUCTS<sup>3</sup></b>											
Sawn softwood .....											
	10.24	10.20	11.16	11.65	11.25	11.18	11.16	10.90	11.82	11.84	11.74
<i>Million cubic meters</i>											
Sawn hardwood .....	9.07	9.35	10.13	10.90	11.15	11.76	11.97	12.12	12.87	13.77	13.75
	1.09	1.27	1.88	2.00	1.94	2.14	2.18	2.35	2.67	2.72	2.82
<i>Million metric tons</i>											
Fibreboard (hard and insulating) .....											
	0.17	0.67	1.05	1.19	1.27	1.38	1.46	1.53	1.76	1.86	1.97
Particle board .....	—	...	0.15	0.25	0.43	0.52	0.61	0.88	1.24	1.59	1.90
Wood pulp (chemical) ..	6.67	5.96	7.66	8.41	8.72	9.26	9.18	9.90	11.04	11.86	11.95
Wood pulp (mechanical) <sup>4</sup>	3.95	3.46	4.43	4.70	4.98	5.12	5.12	5.46	6.02	6.27	6.25
Newsprint .....	2.80	2.33	2.86	3.11	3.43	3.52	3.52	3.81	4.22	4.34	4.37
Other paper and board ..	8.29	8.85	12.11	13.24	13.68	14.72	15.19	16.26	18.25	19.23	20.30

<sup>1</sup> Including cider. - <sup>2</sup> Beef and veal, mutton and lamb, pork. - <sup>3</sup> Including eastern Europe. - <sup>4</sup> Only partial coverage of production of exploded and defibrated pulp.

ANNEX TABLE 3B. - WESTERN EUROPE: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>GROSS EXPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	1.44	0.75	2.30	3.39	2.31	3.10	3.88	3.76	3.33	3.06	3.53
Sugar (raw equivalent) ..	0.86	1.37	1.68	1.83	1.56	1.84	1.37	1.34	1.57	1.50	1.27
Citrus fruit <sup>1</sup> .....	0.97	0.91	1.26	1.40	0.86	0.97	1.20	1.35	1.48	1.48	1.43
Apples .....	0.19	0.31	0.41	0.66	0.53	0.74	0.38	0.79	0.71	0.82	0.85
Wine .....	0.50	0.48	0.77	0.76	0.93	0.86	1.15	0.73	0.88	1.01	1.04
Bacon, ham, and salted pork .....	0.26	0.14	0.27	0.29	0.28	0.30	0.30	0.31	0.37	0.36	0.37
Eggs (in the shell) .....	0.20	0.17	0.26	0.27	0.28	0.31	0.31	0.34	0.32	0.30	0.28
Wool (actual weight) ...	0.12	0.05	0.06	0.08	0.08	0.09	0.08	0.11	0.11	0.11	0.11
<i>Million metric tons</i>											
Coniferous logs <sup>2</sup> .....	2.39	1.71	0.88	0.84	0.61	0.69	0.92	0.97	1.29	1.33	1.15
Broadleaved logs <sup>2</sup> .....	0.50	0.42	0.56	0.77	0.68	0.68	0.59	0.80	1.04	0.99	0.94
Pulpwood <sup>2</sup> .....	3.03	3.53	4.11	5.74	5.21	5.13	4.13	4.70	5.99	7.38	5.51
Pitprops <sup>2</sup> .....	3.16	3.00	2.44	3.01	3.03	3.13	2.62	2.10	1.85	2.06	1.59
Sawn softwood <sup>2</sup> .....	13.86	12.64	14.88	15.26	13.93	14.65	13.52	15.10	17.24	16.34	16.37
Plywood <sup>2</sup> .....	0.36	0.30	0.46	0.51	0.40	0.46	0.42	0.54	0.64	0.61	0.64
<i>Million cubic meters</i>											
Wood pulp <sup>2</sup> .....	4.55	3.51	4.39	4.70	4.97	4.90	4.83	5.34	5.90	5.62	5.79
Newsprint <sup>2</sup> .....	0.92	0.87	1.02	1.12	1.30	1.29	1.34	1.36	1.56	1.68	1.67
Other paper and board <sup>2</sup>	1.20	1.49	2.21	2.41	2.44	2.67	2.59	2.94	3.36	3.71	3.92
<b>GROSS IMPORTS</b>											
Wheat and wheat flour (wheat equivalent) ...	11.91	14.35	12.89	13.19	15.78	14.04	12.21	12.79	11.06	15.06	13.22
Barley .....	2.41	2.53	3.95	3.58	5.06	4.62	4.69	4.75	4.27	4.19	4.75
Maize .....	8.46	4.03	4.27	4.51	5.02	4.78	6.32	7.65	8.93	9.43	12.70
Rice (milled equivalent) ..	1.17	0.33	0.41	0.57	0.58	0.43	0.51	0.61	0.64	0.53	0.56
Sugar (raw equivalent) ..	3.47	4.26	3.79	4.07	4.41	5.38	4.87	4.61	4.62	4.05	4.16
Vegetable oils and oilseeds (oil equivalent) .....	3.00	2.50	3.02	3.12	3.46	3.57	3.30	3.43	3.76	3.53	3.42
Oranges .....	1.28	1.32	1.92	2.06	1.73	1.95	2.10	2.24	2.47	2.30	2.25
Coffee .....	0.69	0.48	0.61	0.68	0.75	0.76	0.80	0.88	0.94	0.99	1.03
Cocoa beans .....	0.36	0.33	0.40	0.40	0.39	0.45	0.39	0.43	0.47	0.52	0.56
Tea .....	0.26	0.23	0.28	0.26	0.27	0.31	0.30	0.27	0.28	0.29	0.29
Wine .....	1.68	1.39	2.00	2.40	2.13	2.53	2.67	2.23	2.51	2.34	2.48
Tobacco .....	0.37	0.34	0.39	0.41	0.40	0.41	0.41	0.40	0.47	0.48	0.51
Cotton (lint) .....	1.76	1.40	1.58	1.42	1.51	1.72	1.43	1.44	1.70	1.59	1.47
Rubber (natural) .....	0.36	0.59	0.69	0.78	0.73	0.76	0.74	0.65	0.68	0.73	0.70
Meat (fresh, chilled, frozen) <sup>3</sup> .....	1.12	0.82	0.77	0.93	1.14	1.18	1.12	1.08	1.18	1.03	1.15
Canned meat .....	0.08	0.18	0.20	0.20	0.19	0.23	0.24	0.24	0.23	0.24	0.23
Bacon, ham, and salted pork .....	0.39	0.21	0.31	0.31	0.32	0.34	0.35	0.36	0.41	0.40	0.42
Butter .....	0.57	0.39	0.32	0.40	0.44	0.45	0.46	0.47	0.48	0.47	0.49
Cheese .....	0.23	0.27	0.28	0.28	0.30	0.31	0.33	0.34	0.34	0.36	0.39
Eggs (in the shell) .....	0.31	0.21	0.29	0.31	0.32	0.34	0.36	0.41	0.43	0.42	0.38

<sup>1</sup> Oranges and lemons only. - <sup>2</sup> Including eastern Europe. Prewar figures refer to 1938. - <sup>3</sup> Beef and veal, mutton and lamb, pork.

ANNEX TABLE 4A. - EASTERN EUROPE AND U.S.S.R.: PRODUCTION OF MAJOR COMMODITIES

	Average 1949-53	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
..... Million metric tons .....										
EASTERN EUROPE <sup>1</sup>										
Wheat.....	11.9	9.7	12.0	10.8	13.3	11.9	13.9	12.9	13.6	13.5
Rye .....	10.9	9.8	11.2	10.7	11.4	11.2	11.9	11.4	11.3	9.7
Barley.....	4.4	4.3	5.2	4.6	5.3	4.8	5.6	6.3	5.9	6.2
Oats .....	5.2	4.7	5.3	5.1	5.3	5.3	5.2	5.5	5.4	...
Maize.....	5.9	9.0	10.9	7.6	11.7	8.0	11.4	11.3	10.5	10.4
Potatoes.....	56.0	64.2	51.6	66.2	64.5	58.5	60.2	63.9	63.9	59.1
Tomatoes.....	0.9	0.9	1.0	1.0	1.2	1.2	1.3	1.5	1.6	...
Onions .....	0.6	0.7	0.6	0.5	0.6	0.6	0.8	0.8	0.7	...
Apples.....	0.9	1.2	1.0	1.6	0.8	2.2	1.1	2.2	1.1	...
Plums .....	0.6	0.6	0.8	0.6	0.6	1.1	1.4	1.1	1.1	...
Grapes .....	1.7	1.5	2.3	1.4	2.1	3.0	2.3	2.0	2.0	...
Sugar beet .....	20.9	23.5	24.1	19.6	26.1	27.1	23.3	34.0	29.9	28.5
Sunflowerseed .....	0.6	0.7	0.7	0.6	0.6	0.6	0.9	0.9	0.9	0.9
Tobacco .....	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	...
Milk .....	20.6	22.5	23.6	24.0	25.6	27.2	27.7	28.2	28.7	...
Eggs <sup>2</sup> .....	9.6	10.6	11.5	12.7	13.6	14.3	15.4	16.8	18.0	...
U. S. S. R.										
Total grain.....	80.9	85.6	106.8	127.6	105.0	141.2	125.9	134.4	138.0	147.5
Wheat .....	34.5	42.4	47.3	67.4	58.1	76.6	69.1	64.3	66.5	70.6
Rye .....	<sup>3</sup> 15.5	15.6	16.5	14.1	14.5	15.7	16.9	16.3	16.7	16.9
Barley .....	<sup>3</sup> 7.8	7.8	10.3	12.9	8.5	13.0	10.2	16.0	13.3	19.5
Oats .....	<sup>3</sup> 10.1	10.8	11.8	13.2	12.7	13.4	13.5	12.0	8.9	5.6
Maize .....	5.3	3.4	14.7	12.5	7.0	16.7	12.0	18.7	24.3	23.3
Millet .....	<sup>3</sup> 2.7	3.0	3.0	4.6	1.6	2.9	1.3	3.2	2.9	2.8
Rice .....	<sup>3</sup> 0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Potatoes.....	75.7	75.0	71.8	96.0	87.8	86.5	86.6	84.4	84.3	68.8
Pulses (for food and feed) .....	1.6	...	...	...	...	1.8	2.1	2.7	4.0	7.6
Other vegetables.....	10.0	11.9	14.1	14.3	14.8	14.9	14.8	16.6	16.2	15.4
Fruit .....	<sup>3</sup> 2.2	...	...	...	...	3.1	3.2	3.1	2.8	...
Grapes .....	<sup>3</sup> 1.0	...	...	1.2	1.4	1.7	1.7	1.9	2.2	...
Sugar beet .....	21.1	19.8	31.0	32.5	39.7	54.4	43.9	57.7	50.9	47.2
Oilseeds .....	2.5	...	...	4.4	3.2	5.1	3.4	4.3	5.3	5.5
Sunflowerseed .....	2.0	1.9	3.8	3.9	2.8	4.6	3.0	4.0	4.7	4.8
Tobacco .....	<sup>3</sup> 0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	...
Milk .....	35.7	38.2	43.0	49.1	54.7	58.7	61.7	61.7	62.6	64.0
Butter .....	<sup>3</sup> 0.5	0.5	0.6	0.7	0.8	0.8	0.8	0.8	0.9	...
Meat .....	4.9	6.3	6.3	6.6	7.4	7.7	8.9	8.7	8.7	9.4
Eggs <sup>2</sup> .....	12.9	17.2	18.5	19.5	22.3	23.0	25.6	27.5	29.3	30.2
Flax.....	0.2	0.2	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Cotton (lint) .....	3.5	4.2	3.9	4.3	4.2	4.3	4.6	4.3	4.5	4.3
Wool.....	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4

<sup>1</sup> Albania (excluding livestock products), Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Romania. - <sup>2</sup> Thousand million units. - <sup>3</sup> 1953. -

ANNEX TABLE 4B. - EASTERN EUROPE AND U.S.S.R.: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	U.S.S.R.						Eastern Europe <sup>1</sup>					
	1956	1957	1958	1959	1960	1961	1956	1957	1958	1959	1960	1961
<i>..... Thousand metric tons .....</i>												
<b>GROSS EXPORTS</b>												
Wheat .....	1 452.4	5 450.8	3 878.7	6 052.0	5 624.4	4 800.6	209.6	68.2	125.1	159.8	138.9	131.0
Rye .....	519.4	440.6	461.0	548.9	682.5	1 088.0	151.8	8.6	5.3	3.1	24.0	42.7
Barley .....	785.4	1 214.0	278.3	121.6	324.0	1 006.8	110.1	111.7	99.7	64.8	107.7	163.0
Oats .....	164.3	223.5	261.1	131.4	41.5	179.9	0.1	—	0.1	1.5	—	—
Maize .....	293.7	84.6	220.5	154.9	122.2	405.6	541.4	174.4	508.7	112.8	465.3	783.9
Fresh meat .....	30.9	74.4	33.4	173.6	68.0	60.2	70.2	65.4	94.0	86.5	110.6	160.8
Butter .....	26.3	49.1	24.7	80.3	37.2	55.6	5.3	5.1	32.5	31.4	37.9	33.8
Cheese .....	0.8	7.9	0.4	1.0	2.6	3.9	5.1	6.8	8.6	17.4	20.5	22.5
Eggs <sup>2</sup> .....	—	—	—	—	—	869	789	1 055	1 290	1 742	2 373	—
Cattle <sup>3</sup> .....	—	—	—	—	—	91.1	86.5	94.5	104.8	186.3	121.0	—
Pigs <sup>3</sup> .....	—	25.0	58.0	54.7	54.5	91.4	408.3	195.8	641.5	660.0	562.1	891.6
Tobacco .....	7.5	6.0	6.2	7.1	1.6	2.9	53.6	61.2	51.2	73.6	89.8	82.8
Cotton (lint) .....	309.5	318.7	310.9	344.5	390.9	382.6	8.3	4.3	5.3	1.6	3.2	4.2
Wool (clean basis) .....	12.7	13.8	17.0	16.9	18.0	28.1	1.0	0.2	0.5	1.9	2.9	3.1
Flax .....	37.5	44.7	43.3	77.5	65.2	42.6	3.1	6.3	7.8	11.1	8.7	24.5
Oilseeds .....	59.9	49.8	47.1	83.3	110.4	120.7	60.4	49.5	5.1	7.9	19.9	9.9
Vegetable oils .....	55.6	47.8	52.2	82.5	91.8	121.8	35.0	34.6	27.4	39.8	48.8	57.4
Sugar (raw equivalent) .....	189.6	207.1	217.8	214.4	264.0	950.7	336.8	409.1	879.5	1 138.9	1 064.7	2 180.4
<b>GROSS IMPORTS</b>												
Wheat .....	443.3	122.1	323.3	246.9	98.0	655.9	2 227.0	5 216.7	3 296.8	4 793.3	5 381.7	4 711.3
Rye .....	—	—	—	—	—	—	872.2	403.2	485.2	405.0	536.2	758.7
Barley .....	—	—	176.4	1.0	21.8	—	671.5	1 087.6	436.3	488.1	411.5	688.3
Oats .....	—	—	31.0	8.5	3.2	—	110.7	178.4	143.2	64.5	60.0	125.9
Maize .....	50.2	30.3	261.5	—	117.2	22.6	476.4	449.6	425.6	386.9	508.7	546.1
Rice .....	637.6	370.5	500.5	689.1	501.1	19.9	171.7	206.3	248.1	392.8	430.7	289.1
Meat (fresh) .....	189.0	94.3	116.9	83.0	47.4	46.9	137.8	179.8	149.2	349.9	265.6	224.9
Butter .....	5.8	8.2	25.2	—	4.0	7.8	41.5	60.1	30.8	84.3	61.2	73.0
Cheese .....	0.3	0.3	—	3.1	—	—	10.7	17.8	12.4	15.4	23.5	22.9
Eggs <sup>2</sup> .....	225	224	373	110	113	161	264	335	158	198	144	122
Cattle <sup>3</sup> .....	187.0	136.2	121.1	142.3	158.0	138.1	7.4	9.1	18.4	16.7	9.5	9.4
Pigs <sup>3</sup> .....	62.4	—	58.0	54.7	54.5	300.4	90.6	64.8	172.5	120.1	85.0	138.6
Citrus fruit .....	87.8	108.5	132.6	103.9	120.4	100.5	61.7	94.1	114.6	160.0	113.1	132.1
Coffee .....	3.3	5.1	4.1	13.3	19.1	29.7	18.1	21.1	24.3	43.9	39.2	41.9
Tea .....	16.0	21.0	25.7	29.8	22.6	14.9	4.5	7.4	6.7	9.4	6.6	4.1
Cocoa beans .....	16.4	44.1	10.4	39.8	58.1	20.6	22.3	23.9	30.9	40.1	41.5	43.0
Cotton (lint) .....	51.4	108.8	142.1	190.3	193.1	141.6	352.0	392.1	401.9	426.7	475.5	503.1
Wool (clean basis) .....	48.5	57.3	55.2	57.8	61.5	55.3	43.2	52.3	54.4	60.8	63.4	68.7
Flax .....	—	—	—	—	—	—	17.1	19.8	21.6	26.3	29.1	17.0
Jute .....	20.0	16.4	23.0	22.0	16.9	14.5	42.1	45.9	53.1	48.4	50.5	50.4
Oilseeds .....	801.5	716.0	551.7	715.2	418.5	90.2	209.7	387.4	296.0	306.5	289.9	231.1
Vegetable oils .....	96.5	45.6	73.3	71.6	59.3	58.0	55.1	93.8	102.1	143.0	105.5	102.3
Rubber (natural) .....	140.7	145.5	258.7	242.1	190.9	360.3	84.0	107.6	120.5	117.2	141.2	129.8
Sugar (raw equivalent) .....	347.0	671.0	394.6	334.8	1 717.3	3 596.9	79.1	89.0	94.9	122.6	313.1	524.4
Tobacco .....	73.3	91.1	84.3	96.6	74.2	57.8	36.2	48.9	59.2	58.5	58.7	61.7

<sup>1</sup> Albania, Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Romania. - <sup>2</sup> Million units. - <sup>3</sup> Thousand units.

ANNEX TABLE 4C. - U.S.S.R.: PRODUCTION AND EXPORTS OF FOREST PRODUCTS

	Average 1948-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>PRODUCTION</b>											
..... <i>Million standards</i> .....											
Sawn softwood .....	8.80	12.08	12.55	13.75	13.93	14.95	17.03	18.92	19.21	18.97	19.25
..... <i>Million cubic meters</i> .....											
Sawn hardwood .....	7.24	9.96	10.35	11.34	11.49	12.20	14.10	15.60	15.84	15.64	15.75
Plywood .....	0.66	0.95	1.02	1.05	1.12	1.15	1.23	1.30	1.35	1.46	1.55
..... <i>Million metric tons</i> .....											
Fibreboard .....	0.02	0.04	0.05	0.05	0.07	0.09	0.11	0.16	0.21	0.25	0.30
Wood pulp (chemical)...	1.08	1.56	1.68	1.74	1.85	1.96	2.09	2.19	2.28	2.37	2.60
Wood pulp (mechanical)..	0.43	0.61	0.66	0.72	0.77	0.79	0.81	0.83	0.93	1.02	1.10
Newspaper .....	0.24	0.29	0.32	0.36	0.36	0.38	0.39	0.40	0.43	0.49	0.55
Other paper and board..	1.20	1.76	1.95	2.04	2.22	2.41	2.57	2.69	2.79	2.95	3.10
<b>EXPORTS</b>											
..... <i>Million cubic meters</i> .....											
Pulpwood .....	0.06	—	—	0.55	0.53	0.59	0.82	1.18	1.59	2.33	2.80
Pitprops .....	0.29	0.44	0.78	0.84	0.64	0.82	0.99	0.88	1.11	1.00	1.20
Sawn softwood .....	0.82	1.30	1.74	2.33	2.21	3.46	3.63	4.38	4.98	5.20	5.65
Plywood .....	0.05	0.05	0.06	0.09	0.05	0.10	0.11	0.12	0.13	0.12	0.13

ANNEX TABLE 5A. - NORTH AMERICA: PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat .....	26.65	44.54	35.81	39.63	42.96	36.50	50.50	42.63	51.05	41.32	44.89
Oats .....	18.99	25.29	25.19	28.00	24.80	24.59	25.67	20.58	22.92	19.06	22.59
Maize .....	53.20	74.69	69.35	73.78	78.82	78.11	86.01	97.94	99.93	92.83	93.36
Rice (milled equivalent) <sup>1</sup>	0.62	1.25	1.89	1.65	1.46	1.27	1.32	1.58	1.61	1.60	1.90
Potatoes .....	11.94	12.47	11.42	12.12	12.98	12.85	13.90	12.76	13.61	15.31	14.20
Citrus fruit .....	3.62	6.41	7.32	7.47	7.51	6.40	7.36	7.20	6.85	7.80	5.78
Vegetable oils and oilseeds (oil equivalent) .....	1.19	2.66	2.86	3.20	3.66	3.37	4.00	3.71	4.00	4.39	4.46
Tobacco .....	0.62	1.02	1.10	1.06	1.06	0.83	0.88	0.89	0.98	1.03	1.14
Cotton (lint) .....	2.81	3.11	2.98	3.21	2.90	2.39	2.51	3.17	3.11	3.12	3.24
Milk (total) .....	54.44	59.55	63.20	63.72	64.40	64.45	64.15	63.65	64.16	65.71	66.50
Meat <sup>2</sup> .....	8.09	10.91	12.40	13.21	13.76	13.25	12.74	13.56	13.90	14.12	14.32
Eggs .....	2.42	3.93	4.09	4.09	4.16	4.13	4.16	4.24	4.08	4.06	4.08
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	68	93	97	101	103	98	105	108	109	109	111
Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)	
<b>FOREST PRODUCTS</b>											
Sawn softwood .....	11.86	18.15	18.43	19.33	19.34	17.20	17.28	19.14	17.31	16.82	17.56
<i>Million cubic meters</i>											
Sawn hardwood .....	12.08	18.10	17.80	18.81	19.92	14.79	15.07	15.99	15.80	15.05	16.23
Plywood .....	0.82	3.49	4.99	6.52	6.71	6.74	7.62	8.82	8.91	9.68	10.35
<i>Million metric tons</i>											
Fibreboard (hard and insulating) .....	0.64	1.21	1.50	1.67	1.72	1.63	1.71	1.97	1.81	1.87	1.92
Wood pulp (chemical) ..	5.20	13.68	17.02	19.16	20.62	20.25	20.27	21.54	23.78	25.17	27.00
Wood pulp (mechanical) <sup>3</sup>	3.44	7.23	8.32	8.87	9.20	8.98	8.70	9.36	9.58	9.58	9.65
Newsprint .....	3.38	5.74	6.51	6.92	7.32	7.40	7.04	7.51	7.89	7.99	8.00
Other paper and board ..	10.05	20.50	23.31	26.04	27.20	26.35	26.53	29.17	29.69	30.83	32.84

<sup>1</sup> Paddy converted at 65 percent. - <sup>2</sup> Beef and veal, mutton and lamb, pork. - <sup>3</sup> Includes exploded and defibrated pulp.

ANNEX TABLE 5B. - NORTH AMERICA: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>GROSS EXPORTS</b>											
											<i>Million metric tons</i>
Wheat and wheat flour (wheat equivalent) ...	6.08	18.39	13.25	13.64	21.98	20.27	19.18	19.64	23.29	29.92	25.19
Barley .....	0.50	1.44	2.15	2.96	3.56	2.55	4.25	3.83	3.01	2.40	2.59
Maize .....	0.80	2.31	1.96	2.78	3.02	4.52	4.57	5.59	5.61	7.44	10.81
Rice (milled equivalent) ..	0.07	0.54	0.56	0.52	0.82	0.74	0.57	0.68	0.87	0.80	1.05
Oranges .....	0.15	0.23	0.33	0.30	0.41	0.33	0.16	0.26	0.21	0.20	0.20
Vegetable oils and oilseeds (oil equivalent) .....	0.02	0.41	0.85	0.83	1.17	1.32	1.09	1.44	1.58	1.26	1.63
Tobacco .....	0.20	0.22	0.22	0.27	0.25	0.24	0.23	0.23	0.24	0.24	0.23
Cotton (lint) .....	1.29	1.04	0.94	0.56	1.03	1.57	1.04	0.83	1.73	1.45	0.87
											<i>Million cubic meters</i>
Coniferous logs .....	...	0.33	0.60	0.71	0.72	0.54	0.60	0.79	1.00	2.28	2.24
Broadleaved logs .....	...	0.23	0.25	0.22	0.26	0.24	0.27	0.24	0.34	0.31	0.40
Pulpwood .....	...	5.68	4.64	4.58	4.89	4.51	3.29	2.91	3.12	3.17	3.20
Sawn softwood .....	...	8.41	11.14	12.60	10.80	10.22	10.76	11.38	12.55	13.28	14.50
											<i>Million metric tons</i>
Wood pulp .....	0.80	1.83	2.38	2.72	2.63	2.64	2.48	2.81	3.40	3.67	3.84
Newsprint .....	2.80	4.50	5.14	5.42	5.55	5.51	5.27	5.47	5.74	5.84	5.68
<b>GROSS IMPORTS</b>											
Sugar (raw equivalent) <sup>1</sup> ..	3.22	3.88	4.05	4.22	4.46	4.43	5.01	4.86	4.93	4.55	4.96
Citrus fruit <sup>2</sup> .....	0.11	0.19	0.22	0.21	0.21	0.21	0.20	0.24	0.22	0.20	0.20
Bananas .....	1.35	1.48	1.61	1.58	1.67	1.70	1.76	1.91	2.02	1.94	1.72
Vegetable oils and oilseeds (oil equivalent) .....	0.90	0.55	0.52	0.56	0.54	0.52	0.54	0.58	0.59	0.60	0.62
Coffee .....	0.81	1.27	1.07	1.23	1.33	1.30	1.26	1.45	1.38	1.41	1.54
Cocoa .....	0.26	0.29	0.25	0.24	0.27	0.25	0.21	0.23	0.27	0.36	0.31
Tea .....	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08
Jute .....	0.07	0.08	0.06	0.05	0.08	0.06	0.04	0.07	0.06	0.02	0.08
Sisal .....	0.14	0.18	0.17	0.18	0.16	0.16	0.15	0.16	0.12	0.13	0.15
Wool (actual weight) ...	0.10	0.29	0.15	0.17	0.17	0.13	0.12	0.19	0.15	0.16	0.17
Rubber (natural) .....	0.52	0.81	0.65	0.70	0.64	0.61	0.52	0.63	0.45	0.43	0.47

<sup>1</sup> Excluding United States trade with its territories. - <sup>2</sup> Oranges and lemons only.

ANNEX TABLE 6A. - OCEANIA: PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
<i>Million metric tons</i>											
Wheat .....	4.38	5.30	4.70	5.39	3.74	2.76	6.02	5.64	7.70	6.94	8.61
Sugar (centrifugal) .....	0.94	1.04	1.48	1.36	1.36	1.51	1.64	1.60	1.55	1.56	2.13
Wool (greasy) .....	0.59	0.69	0.79	0.85	0.93	0.88	0.97	1.02	1.00	1.04	1.03
Milk (total) .....	10.18	10.24	10.53	11.30	11.81	11.54	11.39	11.85	11.96	11.68	12.24
Meat <sup>1</sup> .....	1.42	1.60	1.81	1.87	1.96	1.99	2.21	2.17	2.08	2.27	2.48
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	78	90	98	103	105	102	117	119	122	125	131
	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961		1962 (Preliminary)
<b>FOREST PRODUCTS</b>											
<i>Million cubic meters</i>											
Sawnwood .....	...	4.17	4.73	4.83	4.60	4.50	4.71	4.97	5.06	4.77	4.80

<sup>1</sup> Beef and veal, mutton and lamb, pork.

ANNEX TABLE 6B. - OCEANIA: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>GROSS EXPORTS</b>											
<i>Million metric tons</i>											
Wheat and wheat flour (wheat equivalent) ....	2.80	3.09	1.99	2.55	3.57	2.56	1.42	2.68	3.60	6.41	4.79
Barley .....	0.07	0.26	0.63	0.36	0.63	0.64	0.32	0.88	0.38	0.95	0.40
Oats .....	0.01	0.19	0.03	0.11	0.20	0.22	0.07	0.38	0.22	0.47	0.27
Sugar (raw equivalent) ...	0.56	0.47	0.81	0.80	0.82	0.98	0.89	0.84	1.04	0.99	1.39
Copra and coconut oil (oil equivalent) .....	0.13	0.13	0.16	0.17	0.17	0.17	0.16	0.16	0.16	0.18	0.17
Beef .....	0.15	0.13	0.17	0.25	0.24	0.28	0.28	0.32	0.25	0.26	0.37
Mutton and lamb .....	0.27	0.30	0.34	0.33	0.31	0.30	0.34	0.39	0.42	0.41	0.41
Butter .....	0.24	0.21	0.18	0.24	0.25	0.21	0.24	0.28	0.22	0.25	0.24
Cheese .....	0.10	0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.11	0.12
Wool (actual weight) ....	0.49	0.66	0.62	0.71	0.72	0.80	0.73	0.87	0.85	0.89	0.91
<b>GROSS IMPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	0.06	0.21	0.26	0.28	0.32	0.34	0.32	0.27	0.22	0.21	0.23
Sugar (raw equivalent) ...	0.09	0.11	0.12	0.12	0.11	0.12	0.13	0.11	0.13	0.16	0.16
Rubber (natural) .....	0.01	0.04	0.05	0.06	0.05	0.04	0.05	0.04	0.04	0.04	0.04

ANNEX TABLE 7A. - LATIN AMERICA: PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b> ..... <i>Million metric tons</i> .....											
Wheat .....	8.62	7.98	11.69	9.53	11.06	10.18	10.61	9.43	7.83	8.91	8.87
Maize .....	18.00	14.95	17.26	18.81	18.44	20.34	21.85	22.17	23.36	23.84	23.85
Rice (milled equivalent) <sup>1</sup> .....	1.33	3.07	3.83	3.64	4.17	3.97	4.21	4.86	5.29	5.35	5.25
Sugar (centrifugal) .....	6.89	12.52	13.11	13.11	14.59	15.10	16.81	17.17	18.08	16.13	15.48
Citrus fruit .....	3.28	3.71	4.01	4.19	4.39	4.51	4.68	4.77	5.17	5.07	5.10
Bananas .....	4.20	8.08	9.28	9.53	9.95	10.73	11.29	12.28	12.55	12.61	12.70
Coffee .....	2.11	1.88	1.94	2.23	1.88	2.50	2.75	3.79	2.94	3.29	2.81
Cocoa .....	0.24	0.25	0.32	0.29	0.31	0.29	0.34	0.33	0.32	0.31	0.29
Tobacco .....	0.21	0.31	0.35	0.38	0.39	0.39	0.40	0.41	0.44	0.44	0.45
Cotton (lint) .....	0.59	0.86	1.13	1.27	1.16	1.28	1.27	1.21	1.42	1.54	1.64
Milk (total) .....	12.22	14.48	17.42	18.46	19.63	19.79	20.63	21.68	22.49	22.61	22.93
Meat <sup>2</sup> .....	5.03	6.03	6.16	6.48	7.14	7.34	7.68	7.02	6.92	7.16	7.34
Eggs .....	0.48	0.58	0.73	0.77	0.80	0.88	0.92	0.88	0.92	0.96	0.98
..... <i>Indices, average 1952/53-1956/57 = 100</i> .....											
Index of all farm products	73	88	100	102	107	112	118	122	121	125	124
	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)	
<b>FOREST PRODUCTS</b> ..... <i>Million cubic meters</i> .....											
Sawnwood <sup>3</sup> .....	10.48	12.10	12.53	12.32	11.06	11.42	11.34	11.06	10.83	10.73	
..... <i>Million metric tons</i> .....											
Wood pulp .....	0.22	0.31	0.29	0.34	0.38	0.44	0.49	0.59	0.76	0.85	
All paper and board <sup>3</sup> .....	0.75	0.93	1.18	1.29	1.34	1.49	1.62	1.68	2.03	2.15	

<sup>1</sup> Paddy converted at 65 percent. - <sup>2</sup> Beef and veal, mutton and lamb, pork. - <sup>3</sup> Pre-1955 data are not strictly comparable with those for 1955 and after.

ANNEX TABLE 7B. - LATIN AMERICA: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>GROSS EXPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	3.44	2.00	3.38	4.23	3.03	2.83	2.45	2.48	2.49	1.10	2.75
Maize .....	6.61	1.20	2.27	0.53	1.11	0.84	1.74	2.74	3.11	1.79	2.60
Rice (milled equivalent) ..	0.10	0.25	0.16	0.13	0.25	0.13	0.17	0.13	0.13	0.33	0.28
Sugar (raw equivalent) <sup>1</sup> ..	4.05	7.06	6.56	7.70	7.90	8.64	8.84	8.16	9.92	10.92	9.29
Bananas .....	2.04	1.92	2.32	2.37	2.37	2.63	2.79	2.94	3.13	3.11	3.00
Linseed and linseed oil (oil equivalent) .....	0.55	0.19	0.29	0.18	0.08	0.17	0.18	0.23	0.21	0.27	0.29
Coffee .....	1.40	1.61	1.35	1.57	1.70	1.57	1.56	1.87	1.85	1.83	1.89
Cocoa beans .....	0.21	0.18	0.22	0.22	0.21	0.20	0.19	0.17	0.23	0.18	0.15
Cotton (lint) .....	0.34	0.39	0.73	0.69	0.76	0.52	0.59	0.73	0.62	0.76	0.85
Wool (actual weight) ....	0.19	0.18	0.16	0.17	0.19	0.13	0.18	0.20	0.19	0.23	0.24
Meat (fresh, chilled and frozen) <sup>2</sup> .....	0.59	0.34	0.25	0.28	0.49	0.50	0.52	0.47	0.42	0.40	0.52
Canned meat .....	0.12	0.12	0.10	0.10	0.10	0.14	0.13	0.11	0.08	0.11	0.12
<i>Million cubic meters</i>											
Broadleaved logs .....	...	0.40	0.34	0.40	0.46	0.35	0.38	0.26	0.32	0.33	0.33
Sawn softwood .....	...	1.25	1.19	1.60	1.03	1.74	1.49	1.19	1.26	1.40	1.15
<b>GROSS IMPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	1.67	2.80	3.39	3.79	3.31	3.25	3.37	3.86	4.18	4.19	4.23
Rice (milled equivalent) ..	0.39	0.36	0.30	0.22	0.22	0.32	0.40	0.34	0.25	0.30	0.27
Sugar (raw equivalent) ....	0.25	0.36	0.43	0.47	0.28	0.49	0.37	0.39	0.25	0.52	0.30
Potatoes .....	0.18	0.24	0.21	0.19	0.20	0.21	0.16	0.15	0.20	0.15	0.15

<sup>1</sup> Excluding trade between the United States and its territories. - <sup>2</sup> Beef and veal, mutton and lamb, pork.

ANNEX TABLE 8A. - FAR EAST (EXCLUDING MAINLAND CHINA): PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat .....	12.13	11.47	13.45	13.95	13.79	14.66	13.13	15.60	16.02	16.93	17.87
Millet and sorghum .....	14.94	13.83	18.15	15.54	15.35	16.98	18.35	17.03	17.52	16.40	16.50
Rice (milled equivalent) <sup>1</sup> .....	60.61	62.39	67.53	73.19	77.23	71.25	80.31	84.23	88.81	88.55	90.22
Sugar (centrifugal) .....	4.18	3.14	4.69	5.07	5.22	5.59	5.71	6.29	6.80	6.49	6.47
Sugar (noncentrifugal) .....	3.67	4.03	4.36	4.32	4.92	5.33	5.81	5.38	5.11	6.02	6.25
Starchy roots .....	21.62	29.37	33.97	35.93	35.85	37.23	39.92	42.66	41.89	43.45	43.19
Pulses <sup>2</sup> .....	6.78	7.17	8.31	9.42	9.25	9.88	8.77	11.47	10.11	10.71	10.41
Vegetable oils and oilseeds (oil equivalent) .....	3.96	4.03	5.06	4.83	5.26	5.20	5.14	4.67	5.38	5.64	5.56
Tea .....	0.46	0.52	0.63	0.66	0.66	0.65	0.70	0.71	0.71	0.76	0.75
Tobacco .....	0.79	0.60	0.75	0.79	0.84	0.86	0.77	0.81	0.81	0.84	0.89
Cotton (lint) .....	1.22	0.90	1.30	1.21	1.27	1.31	1.23	1.07	1.36	1.27	1.37
Jute .....	1.94	2.00	1.64	2.28	2.26	2.11	2.40	2.10	1.98	3.09	2.80
Rubber (natural) .....	0.97	1.65	1.74	1.82	1.77	1.83	1.82	1.90	1.86	1.95	1.97
Meat <sup>3</sup> .....	1.65	1.83	2.02	2.24	2.39	2.47	2.53	2.60	2.55	2.62	2.80
Milk (total) .....	23.23	25.23	27.38	27.77	28.27	28.02	28.49	28.73	28.94	29.18	29.48
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	84	87	100	104	107	106	111	115	119	121	123
	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)	
<b>FOREST PRODUCTS</b>											
Sawnwood .....	17.26	21.42	25.24	29.50	31.70	30.28	31.17	34.68	39.45	41.40	
Plywood .....	0.25	0.67	0.84	1.05	1.24	1.40	1.78	1.80	1.97	2.20	
<i>Million metric tons</i>											
Wood pulp .....	0.78	1.65	1.93	2.21	2.47	2.38	3.02	3.58	4.18	4.80	
Newsprint .....	0.16	0.45	0.48	0.55	0.59	0.61	0.75	0.82	0.90	1.00	
Other paper and board ..	0.90	1.77	2.11	2.53	2.84	2.90	3.70	4.46	5.37	6.30	

<sup>1</sup> Paddy converted at 65 percent. - <sup>2</sup> Dry beans, dry peas, broad beans, chick-peas, lentils. - <sup>3</sup> Beef and veal, mutton and lamb, pork.

ANNEX TABLE 8B. - FAR EAST (EXCLUDING MAINLAND CHINA): EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<i>Million metric tons</i>											
<b>GROSS EXPORTS</b>											
Rice (milled equivalent) ..	8.96	3.05	3.08	3.55	3.51	4.00	3.32	3.56	3.84	3.90	3.65
Sugar (raw equivalent) ..	3.31	1.01	1.83	1.86	2.00	1.97	1.98	1.81	2.18	2.21	2.25
Vegetable oils and oilseeds (oil equivalent) <sup>1</sup> .....	1.72	1.30	1.29	1.56	1.59	1.48	1.25	1.19	1.37	1.47	1.35
Tea .....	0.36	0.39	0.47	0.40	0.47	0.44	0.49	0.45	0.45	0.47	0.48
Cotton (lint) .....	0.65	0.27	0.19	0.28	0.24	0.18	0.18	0.13	0.14	0.11	0.14
Jute .....	0.79	0.84	0.89	0.99	0.87	0.81	0.94	0.89	0.83	0.75	0.90
Rubber (natural) <sup>2</sup> .....	0.95	1.61	1.76	1.92	1.82	1.83	1.83	2.12	1.85	2.06	2.09
<i>Million cubic meters</i>											
Broadleaved logs .....	...	0.76	2.20	2.50	2.92	3.27	3.82	5.35	6.10	6.71	7.15
Sawn hardwood .....	...	0.56	0.89	1.09	1.08	1.06	1.10	1.18	1.44	1.26	1.30
Plywood .....	...	0.02	0.17	0.25	0.30	0.36	0.49	0.71	0.49	0.57	0.70
<i>Million metric tons</i>											
<b>GROSS IMPORTS</b>											
Wheat and wheat flour (wheat equivalent) .....	1.01	4.89	3.99	4.49	5.68	7.90	7.87	8.37	10.24	9.19	8.36
Rice (milled equivalent) ..	6.16	3.11	3.38	3.11	4.03	4.05	3.85	3.17	3.88	3.50	3.14
Barley .....	0.05	0.69	0.82	0.61	1.20	1.12	1.07	0.50	0.02	0.16	0.04
Maize .....	0.21	0.20	0.24	0.44	0.49	0.68	0.82	1.15	1.65	2.20	2.59
Sugar (raw equivalent) ..	1.72	1.17	2.56	2.30	2.07	1.82	2.08	1.91	2.03	2.28	2.45
Vegetable oils and oilseeds (oil equivalent) <sup>3</sup> .....	0.37	0.27	0.42	0.55	0.54	0.59	0.55	0.62	0.68	0.68	0.73
Cotton (lint) .....	0.89	0.52	0.74	0.66	0.86	0.89	0.75	0.90	1.15	1.24	0.99
Jute .....	0.04	0.27	0.25	0.29	0.23	0.18	0.14	0.12	0.21	0.16	0.18

<sup>1</sup> Excluding re-exports of copra from the Federation of Malaya and Singapore, but including unrecorded shipments of copra from Indonesia and the Philippines to the Federation of Malaya, Singapore, and North Borneo. - <sup>2</sup> Excluding imports into the Federation of Malaya and Singapore for re-export and exports from Hong Kong, but including unrecorded shipments from Indonesia to the Federation of Malaya and Singapore. - <sup>3</sup> Excluding copra imported into the Federation of Malaya and Singapore for re-export.

ANNEX TABLE 9A. - NEAR EAST: PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat .....	9.50	10.95	13.56	14.08	15.21	17.82	16.54	16.34	16.36	15.80	17.87
Barley .....	4.24	4.67	5.87	5.40	6.18	7.45	6.39	6.00	6.12	5.98	7.18
Rice (milled equivalent) <sup>1</sup> .....	1.09	1.33	1.50	1.35	1.65	1.82	1.41	1.72	1.76	1.52	1.70
Total grains <sup>2</sup> .....	19.07	22.16	26.57	27.39	29.88	33.87	31.88	31.40	31.57	30.24	33.65
Sugar (centrifugal) .....	0.22	0.42	0.59	0.69	0.71	0.78	0.86	1.02	1.19	0.94	1.03
Pulses <sup>3</sup> .....	0.70	0.78	0.84	0.84	0.83	0.91	0.81	0.84	0.90	0.77	0.87
Citrus fruit .....	0.79	0.85	1.11	1.25	1.18	1.32	1.50	1.46	1.45	1.46	1.44
Dates .....	0.87	0.85	1.06	1.01	1.11	1.11	1.10	1.11	1.20	1.15	1.15
Bananas .....	0.05	0.07	0.09	0.10	0.11	0.11	0.14	0.14	0.14	0.14	0.15
Vegetable oils and oilseeds (oil equivalent) .....	0.32	0.41	0.52	0.50	0.61	0.53	0.63	0.63	0.65	0.68	0.64
Tobacco .....	0.09	0.12	0.13	0.15	0.15	0.16	0.14	0.17	0.17	0.14	0.13
Cotton (lint) .....	0.56	0.66	0.74	0.76	0.81	0.80	0.95	1.00	1.02	1.02	1.18
Milk (total) .....	9.70	10.45	9.99	11.02	11.46	11.29	12.31	12.73	12.58	12.38	12.33
Meat <sup>4</sup> .....	0.65	0.74	0.87	0.96	1.04	1.07	1.04	1.06	1.16	1.18	1.18
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	73	85	97	100	109	112	118	121	123	122	127

<sup>1</sup> Paddy converted at 65 percent. - <sup>2</sup> Wheat, barley, oats, maize, millet, sorghum, rice (milled equivalent), rye, mixed grain. - <sup>3</sup> Dry beans, dry peas, broad beans, chick-peas, lentils. - <sup>4</sup> Beef and veal, mutton and lamb, pork.

ANNEX TABLE 9B. - NEAR EAST: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>GROSS EXPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	0.24	0.27	1.28	0.33	0.42	0.44	0.27	0.45	0.08	0.06	0.06
Barley .....	0.38	0.46	1.03	0.46	0.78	0.53	0.58	0.26	0.02	0.13	0.72
Rice (milled equivalent) .....	0.15	0.27	0.13	0.25	0.25	0.32	0.40	0.08	0.33	0.27	0.17
Total grains <sup>1</sup> .....	0.93	1.09	2.60	1.11	1.54	1.40	1.34	0.91	0.65	0.58	1.04
Citrus fruit <sup>2</sup> .....	0.30	0.20	0.36	0.30	0.35	0.37	0.39	0.46	0.51	0.40	0.47
Tobacco .....	0.04	0.07	0.07	0.06	0.07	0.09	0.06	0.07	0.06	0.09	0.09
Cotton (lint) .....	0.47	0.47	0.52	0.57	0.51	0.55	0.54	0.76	0.72	0.66	0.62
<b>GROSS IMPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	0.28	1.42	0.86	1.32	2.21	2.45	2.30	2.90	3.90	4.29	4.36
Total grains <sup>1</sup> .....	0.47	1.77	1.10	1.84	2.78	3.19	3.00	3.90	4.97	5.35	5.79
Sugar (raw equivalent) ...	0.35	0.55	0.74	0.86	0.94	0.93	1.05	1.13	1.16	1.42	1.50
<i>Million cubic meters</i>											
Sawn softwood .....	...	0.38	0.71	0.63	0.55	0.59	0.54	0.71	0.75	0.63	0.65

<sup>1</sup> Wheat and wheat flour, barley, maize, oats, sorghums, millet, rice (milled). - <sup>2</sup> Oranges and lemons only.

ANNEX TABLE 10A. - AFRICA: PRODUCTION OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63 (Preliminary)
<b>FARM PRODUCTS</b>											
Wheat .....	2.66	3.15	4.33	3.82	4.31	3.65	3.88	3.68	4.03	2.68	4.30
Barley .....	2.60	3.19	4.04	2.94	3.69	2.17	3.23	2.59	2.94	1.37	2.73
Maize .....	4.62	7.17	8.66	8.84	9.34	8.74	9.35	9.40	10.98	11.45	11.32
Millet and sorghum .....	9.31	10.66	11.47	11.51	11.87	12.26	12.17	12.72	13.10	13.27	13.36
Rice (milled equivalent) <sup>1</sup> .....	1.11	1.55	1.71	1.78	1.74	1.89	1.89	1.86	1.98	1.94	2.02
Sugar (centrifugal) .....	0.95	1.36	1.64	1.83	1.98	2.15	2.23	2.34	2.04	2.52	2.63
Starchy roots .....	35.40	46.02	51.57	52.35	53.79	52.42	53.14	55.91	55.43	54.86	55.29
Pulses <sup>2</sup> .....	1.02	1.47	1.64	1.55	1.53	1.37	1.45	1.51	1.49	1.36	1.42
Citrus fruit .....	0.38	0.78	1.00	1.08	1.19	1.26	1.29	1.32	1.46	1.44	1.45
Bananas .....	0.30	0.65	0.79	0.91	0.84	0.93	0.89	0.94	0.94	1.01	1.02
Groundnuts (oil equivalent) .....	0.56	0.72	0.82	0.96	0.99	1.15	1.04	1.00	1.15	1.17	1.17
Vegetable oils and oilseeds (oil equivalent) .....	1.73	2.20	2.50	2.52	2.76	2.77	2.84	2.68	2.90	2.69	2.72
Coffee .....	0.14	0.28	0.39	0.51	0.51	0.54	0.61	0.68	0.81	0.75	0.85
Cocoa .....	0.49	0.50	0.49	0.53	0.58	0.46	0.57	0.66	0.87	0.83	0.82
Wine .....	2.14	1.72	2.51	2.07	2.50	2.15	2.04	2.61	2.25	2.22	2.22
Cotton (lint) .....	0.14	0.23	0.26	0.27	0.28	0.31	0.31	0.32	0.33	0.23	0.30
Sisal .....	0.16	0.23	0.29	0.30	0.31	0.33	0.35	0.36	0.38	0.36	0.38
Milk (total) .....	6.82	8.24	8.96	9.05	9.13	9.23	9.29	9.39	9.57	9.65	9.67
Meat <sup>3</sup> .....	1.52	1.87	2.03	1.99	2.07	2.07	2.12	2.16	2.18	2.20	2.21
<i>Indices, average 1952/53-1956/57 = 100</i>											
Index of all farm products	69	88	101	101	106	104	108	111	116	111	116
	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961		1962 (Preliminary)
<i>FOREST PRODUCTS</i>											
Sawnwood .....	1.31	1.77	1.93	1.95	1.95	2.07	2.16	2.27	2.38		2.50

<sup>1</sup> Paddy converted at 65 percent. - <sup>2</sup> Dry beans, dry peas, broad beans, chick-peas, lentils. - <sup>3</sup> Beef and veal, mutton and lamb, pork.

ANNEX TABLE 10B. - AFRICA: EXPORTS AND IMPORTS OF MAJOR COMMODITIES

	Average 1934-38	Average 1948-52	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<b>GROSS EXPORTS</b>											
Wheat and wheat flour (wheat equivalent) <sup>1</sup> ...	0.57	0.31	0.48	0.61	0.34	0.28	0.36	0.26	0.34	0.12	0.12
Barley .....	0.21	0.55	0.64	0.46	0.48	0.10	0.25	0.25	0.16	0.04	0.02
Maize .....	0.66	0.36	0.79	1.02	1.31	1.39	1.56	0.83	0.87	1.54	2.68
Sugar (raw equivalent) ...	0.68	0.71	1.00	1.05	1.08	1.15	1.18	1.12	0.98	1.19	1.38
Oranges.....	0.15	0.39	0.53	0.66	0.56	0.76	0.69	0.73	0.98	0.84	0.83
Bananas .....	0.14	0.22	0.34	0.37	0.35	0.40	0.39	0.37	0.38	0.37	0.38
Groundnuts and groundnut oil (oil equivalent) ....	0.34	0.32	0.50	0.46	0.59	0.55	0.67	0.63	0.55	0.67	0.71
Palm kernels and palm kernel oil (oil equivalent)	0.30	0.34	0.38	0.36	0.38	0.35	0.39	0.38	0.36	0.36	0.33
Palm oil.....	0.24	0.33	0.39	0.37	0.38	0.35	0.37	0.39	0.39	0.35	0.40
Coffee .....	0.13	0.28	0.34	0.44	0.52	0.53	0.54	0.59	0.65	0.67	0.72
Cocoa beans .....	0.46	0.48	0.47	0.48	0.52	0.57	0.44	0.56	0.64	0.80	0.86
Wine .....	1.40	1.13	1.59	1.90	1.53	1.90	1.52	1.63	1.74	1.61	1.57
Tobacco .....	0.03	0.06	0.09	0.08	0.09	0.08	0.08	0.09	0.11	0.11	0.12
Cotton (lint) .....	0.13	0.19	0.24	0.24	0.26	0.24	0.27	0.29	0.27	0.27	0.20
Sisal .....	0.16	0.22	0.27	0.29	0.30	0.32	0.34	0.36	0.37	0.36	0.39
<i>..... Million cubic meters .....</i>											
Broadleaved logs .....	...	1.19	1.88	2.28	2.38	2.75	2.86	3.74	4.39	4.22	3.95
<b>GROSS IMPORTS</b>											
Wheat and wheat flour (wheat equivalent) ....	0.28	0.75	0.77	0.79	0.99	0.93	0.79	1.65	1.75	1.98	1.85
Rice (milled equivalent) ..	0.39	0.18	0.24	0.36	0.35	0.46	0.38	0.53	0.51	0.51	0.53
Sugar (raw equivalent) ...	0.48	0.73	1.18	0.94	0.95	1.03	1.01	1.08	1.12	1.13	1.16

<sup>1</sup> Including coarse ground flour.

ANNEX TABLE 11. - TOTAL CATCH (LIVE WEIGHT) OF FISH, CRUSTACEANS, AND MOLLUSKS IN SELECTED COUNTRIES<sup>1</sup>

	1938	1948	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)	Average 1955-59
<i>..... Thousand metric tons .....</i>											
WORLD TOTAL .....	20 500.0	19 090.0	28 330.0	29 910.0	30 910.0	32 240.0	35 740.0	38 02.0	41 160.0	44 500.0	100.0 31 426.0
<i>A. 1959 catch: 1 000 000 tons and more .....</i>											56.7 17 791.5
Japan .....	3 562.0	2 431.4	4 912.8	4 762.6	5 407.3	5 504.7	5 884.1	6 192.7	6 710.5	6 863.7	16.8 5 294.3
China (Mainland) .....	...	...	2 518.0	2 648.0	3 120.0	4 060.0	5 020.0	...	...	...	11.1 3 473.2
United States .....	2 260.1	2 416.6	2 790.4	2 989.4	2 759.8	2 708.6	2 890.8	2 814.7	2 931.9	2 904.9	9.0 2 827.8
U.S.S.R. .....	1 523.0	1 485.0	2 495.0	2 616.0	2 531.0	2 621.0	2 756.0	3 051.0	3 250.0	...	8.3 2 603.8
Peru .....	...	47.7	213.3	297.3	483.1	930.2	2 152.4	3 531.4	5 243.1	6 830.0	2.6 815.3
Norway .....	1 152.5	1 504.0	1 813.4	2 187.3	1 745.8	1 434.5	1 575.2	1 540.7	1 509.4	1 338.0	5.6 1 751.2
Canada .....	836.8	1 052.9	965.0	1 105.5	997.1	1 007.6	1 054.4	934.5	1 020.8	...	3.3 1 025.9
<i>B. 1959 catch: 500 000 tons and more but less than 1 000 000 .....</i>											21.1 6 634.1
United Kingdom .....	1 198.1	1 206.1	1 100.4	1 050.4	1 014.7	999.0	988.9	923.8	902.7	944.4	3.3 1 030.7
Spain (incl. Ceuta and Melilla) .....	423.5	547.2	770.3	761.6	777.2	844.9	855.8	898.0	1 014.5	1 023.8	2.6 802.0
India .....	...	...	839.0	1 012.3	1 233.0	1 064.6	823.2	1 161.4	961.0	...	3.2 994.3
Germany, Fed. Rep. .....	776.5	408.7	814.8	800.6	791.7	743.1	768.0	674.0	618.9	632.7	2.5 783.6
Denmark and Faeroe Islands .....	160.1	318.2	530.9	579.3	638.9	704.8	760.9	690.6	757.5	928.4	2.0 643.0
South Africa and South West Africa .....	66.7	185.9	607.1	536.4	583.6	655.7	741.6	867.6	1 010.3	1 062.3	2.0 624.8
Indonesia .....	472.0	...	669.8	713.9	728.0	687.0	754.1	756.7	906.8	943.0	2.2 699.2
Iceland .....	327.2	478.1	480.3	517.3	502.7	580.4	640.8	592.8	710.0	832.6	1.7 544.3
France .....	530.3	437.5	496.5	515.5	492.3	500.9	555.8	570.7	567.7	672.3	1.6 512.2
<i>C. 1959 catch: 100 000 tons and more but less than 500 000 .....</i>											(16.9) 5 276.7
Philippines .....	80.9	195.1	385.2	416.0	407.5	447.3	457.5	465.5	475.7	504.7	1.3 422.7
Portugal .....	247.2	292.1	424.7	472.2	470.3	455.5	427.8	475.1	570.2	...	1.4 450.1
Korea, Rep. of .....	844.2	293.8	265.9	346.6	409.3	403.3	392.1	357.2	424.5	450.4	1.2 363.4
Burma .....	...	...	...	360.0	360.0	360.0	360.0	360.0	360.0	...	1.1 360.0
Netherlands .....	256.2	294.1	319.5	298.1	300.8	313.8	319.6	314.7	346.0	321.9	1.0 310.4
Korea, North .....	925.2	...	312.0	...	291.5	...	...	...	...	...	1.0 300.7
Pakistan .....	...	...	270.9	277.0	282.8	283.7	290.1	304.5	319.1	330.6	0.9 280.9
Chile .....	32.2	64.6	214.3	188.3	213.1	225.8	272.6	339.6	429.8	638.6	0.7 222.9
Sweden .....	129.2	193.9	219.5	197.4	222.1	238.0	268.0	254.3	267.3	290.9	0.7 229.0
Angola .....	26.2	113.2	290.4	420.5	395.5	278.2	267.4	252.0	241.5	...	1.1 330.4
China (Taiwan) .....	89.5	83.5	180.3	193.2	208.0	229.7	246.3	259.1	312.4	327.0	0.7 211.5
Brazil .....	103.3	144.8	190.3	208.0	216.2	212.2	244.3	257.1	...	...	0.7 216.5
Italy .....	181.2	156.6	218.0	219.6	212.3	211.0	214.9	213.3	239.6	248.6	0.7 214.1
Thailand .....	161.0	161.0	213.0	217.9	234.5	196.3	204.7	220.9	305.6	...	0.7 213.3
Mexico .....	17.1	68.4	105.8	144.8	117.5	164.0	190.6	...	...	...	0.5 144.5
Poland .....	12.5	47.1	126.9	139.3	138.8	145.1	162.2	183.9	185.5	179.6	0.5 142.5
Viet-Nam, Rep. of .....	180.0	...	120.0	130.0	135.0	143.0	153.5	240.0	250.0	255.0	0.4 136.6
Congo (Léopoldville) .....	0.9	17.5	86.1	96.2	122.4	136.6	153.4	...	...	...	0.4 118.9
Cambodia .....	...	...	150.0	150.0	...	...	...	...	...	145.8	0.5 150.0
Federation of Malaya .....	...	139.0	136.8	138.5	138.3	139.5	145.9	167.1	178.4	198.4	0.4 139.8
Morocco .....	43.7	68.6	94.3	108.2	145.1	161.7	144.4	154.1	164.9	...	0.4 130.7
Germany, Eastern .....	...	...	68.6	74.9	96.5	93.2	105.6	114.4	...	...	0.3 87.8
Muscat and Oman .....	...	...	...	...	...	...	...	...	...	...	0.3 100.0

ANNEX TABLE 11. - TOTAL CATCH (LIVE WEIGHT) OF FISH, CRUSTACEANS, AND MOLLUSKS IN SELECTED COUNTRIES<sup>1</sup> (*concluded*)

	1938	1948	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)	Average 1955-59
<i>..... Thousand metric tons .....</i>											
<i>D. 1959 catch: 50 000 tons and more, but less than 100 000 tons .....</i>											2.8
Senegal .....	...	...	...	...	75.6	85.9	99.8	122.1	126.9	133.4	0.3
Turkey .....	76.0	...	111.5	139.5	116.7	101.3	96.7	89.4	82.3	...	0.4
Argentina .....	55.3	71.2	79.0	75.4	81.6	80.6	88.6	100.9	93.7	94.4	0.3
United Arab Republic .....	38.1	42.8	63.4	70.3	75.2	80.0	85.6	88.5	92.0	...	0.2
Venezuela .....	21.7	92.3	69.6	61.3	83.7	78.3	83.3	84.7	...	...	0.2
Greece .....	25.0	33.6	60.0	65.0	75.0	80.0	82.0	...	...	...	0.2
Finland .....	44.4	46.1	63.3	60.2	64.5	61.5	67.4	66.0	67.1	64.7	0.2
Hong Kong .....	...	34.3	57.5	57.2	67.2	69.5	67.0	62.3	63.1	...	0.2
Tanganyika .....	16.0	22.0	52.4	55.0	55.0	55.0	60.0	60.0	60.7	60.2	0.2
Australia .....	33.5	38.9	52.5	49.9	55.3	54.3	58.8	61.0	61.1	66.0	0.2
Belgium .....	42.8	71.1	80.0	69.1	62.9	64.3	57.5	63.7	61.7	59.9	0.2
Uganda .....	...	11.0	34.9	45.7	57.4	59.1	62.2	68.8	68.5	71.1	0.2
<i>E. 1959 catch: less than 50 000 tons .....</i>											1.4
Ceylon .....	...	24.0	31.3	40.3	38.5	40.7	48.3	57.8	74.0	83.9	0.1
New Zealand .....	27.0	35.7	39.2	38.4	39.0	39.3	41.5	44.3	43.1	41.3	0.1
Ireland .....	12.8	25.8	23.6	30.5	36.6	37.5	38.6	42.8	32.2	29.0	0.1
Ghana .....	...	20.0	25.3	26.3	28.4	30.9	36.0	31.8	34.5	42.4	0.1
Ecuador .....	1.8	3.4	15.0	21.8	26.4	31.1	35.9	44.3	60.2	52.4	0.1
Ethiopia .....	...	...	6.2	11.0	13.5	27.9	34.7	19.1	17.2	...	0.1
Greenland .....	4.7	21.0	25.8	25.8	30.8	32.0	33.2	34.6	41.8	...	0.1
Yugoslavia .....	16.8	21.2	22.6	28.4	30.7	31.4	29.4	30.9	37.3	30.3	0.1
Cuba .....	10.0	8.3	12.8	15.6	22.0	21.9	28.2	31.2	31.1	35.9	0.1
Aden .....	...	20.0	34.8	21.8	22.6	21.5	24.4	22.3	47.4	53.8	0.1
Algeria .....	...	30.0	26.2	22.3	22.2	18.8	22.5	25.6	...	...	0.1
Colombia .....	10.0	15.0	18.0	21.2	30.1	25.0	21.1	29.7	47.5	...	0.1
Ryukyu Islands .....	12.0	7.7	13.6	13.7	13.1	16.6	21.4	14.4	16.0	17.8	0.1
Sudan .....	8.8	11.4	13.6	13.5	9.9	19.2	16.2	16.5	17.3	...	—
Tunisia .....	9.6	12.2	10.8	11.9	14.0	15.2	...	...	...	...	—
Hungary .....	...	...	...	...	12.3	13.0	14.4	14.9	19.3	21.0	—
Israel .....	1.7	2.5	10.7	10.3	11.6	12.6	13.2	13.8	14.9	16.4	—
Kenya .....	...	...	...	...	...	...	...	12.6	...	...	—
Singapore .....	1.5	2.3	6.2	9.6	13.8	12.3	11.5	9.2	9.7	11.5	—
Rwanda and Burundi .....	...	2.3	5.6	5.4	9.7	11.5	11.0	9.2	...	...	—
St. Pierre and Miquelon .....	1.9	2.2	6.8	9.3	7.9	8.3	9.4	10.3	13.6	8.0	—
Bulgaria .....	...	...	4.5	5.7	5.1	5.3	5.2	7.9	...	...	—
Uruguay .....	3.6	3.5	4.9	5.4	6.9	5.4	5.9	8.0	8.8	...	—
Mauritius .....	2.0	1.6	1.7	1.7	1.7	1.6	1.3	1.4	1.5	1.2	—
Malta and Gozo .....	1.1	1.5	0.8	0.8	1.0	1.1	1.1	1.2	1.3	1.3	—
<i>F. 1959 catch: less than 50 000 tons .....</i>											1.1
120 countries not specified <sup>2</sup> .....	...	...	...	...	...	...	...	...	...	...	1.1
											407.7

<sup>1</sup> Countries arranged in order of 1959 catch. - <sup>2</sup> These countries do not publish regularly annual fish catch statistics.

ANNEX TABLE 12. - UNITED STATES COMMODITY CREDIT CORPORATION: QUANTITY AND VALUE OF INVESTMENT<sup>1</sup>

	Quantity (30 April)										Value (30 April)							Percentage			
	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1954	1955	1956	1957	1958	1959	1960	1961 <sup>2</sup>	1962	1963	
Wheat .....	24 208	23 156	29 073	24 453	24 174	33 937	35 512	37 888	34 209	34 057	2 155	2 633	2 795	2 411	2 402	3 105	3 253	3 389	(2 772)	2 459	2 499
Rice .....	58	763	1 322	804	535	455	240	34	73	6	98	232	107	104	81	65	27	(26)	5	9	
Barley .....	622	2 044	1 937	1 774	2 698	3 242	3 333	2 184	1 344	1 463	34	107	92	87	114	155	113	100	(85)	52	56
Oats .....	589	1 052	1 222	650	732	1 376	646	598	557	688	32	58	60	32	32	57	27	24	(21)	21	26
Maize .....	20 568	22 255	29 192	34 801	37 211	39 206	45 291	45 012	43 587	40 036	1 296	1 437	1 926	2 289	2 414	2 486	2 783	3 091	(2 688)	1 952	1 818
Grain sorghum .....	1 029	2 927	2 887	2 040	8 295	13 498	14 964	18 784	19 070	18 618	60	167	128	105	393	706	833	1 048	(797)	810	800
Butter .....	165	149	34	16	45	20	27	40	144	176	245	212	44	21	60	26	35	54	(53)	191	227
Cheese .....	164	176	139	87	74	5	4	—	38	30	146	156	111	73	62	4	3	—	—	32	25
Dried milk .....	298	101	81	65	70	59	108	117	217	311	109	38	30	24	26	20	34	37	(35)	80	102
Soybeans .....	101	876	270	1 223	1 746	3 255	1 598	89	2 565	1 567	10	70	20	95	131	247	114	6	(6)	214	129
Linseed .....	382	201	41	351	59	279	18	6	5	141	56	25	5	42	7	31	2	1	(1)	1	16
Linseed oil .....	31	27	26	—	—	—	14	—	—	—	13	14	9	—	—	—	4	—	—	—	—
Cottonseed oil .....	469	170	5	—	—	27	—	—	—	—	185	64	2	—	—	—	7	—	—	—	—
Cotton linters .....	279	318	141	20	—	—	—	—	—	—	58	67	31	5	—	—	—	—	—	—	—
Cotton, upland .....	1 674	1 817	2 839	2 056	973	1 623	1 179	565	1 203	2 214	1 268	1 439	2 268	1 580	642	1 260	947	431	(410)	894	1 600
Wool .....	55	70	54	24	—	—	—	—	—	—	81	103	82	35	—	—	—	—	—	—	—
Tobacco .....	281	366	402	451	427	414	317	280	211	285	270	406	535	609	590	594	441	393	(393)	321	461
Other commodities .....											165	167	263	301	274	154	176	147	(141)	152	191
TOTAL .....											6 189	7 261	8 633	7 816	7 251	8 933	8 833	8 748	(7 428)	7 184	7 959
Change from previous year .....											+ 97	+ 17	+ 19	— 9	— 7	+ 23	— 1	— 1	— 3	+ 11	

SOURCE: United States Department of Agriculture, Commodity Credit Corporation, *Report of financial conditions and operations*, 30 April 1955 - 30 April 1963.  
<sup>1</sup> Stocks pledged for outstanding loans and stocks in price support inventory. - <sup>2</sup> Figures in brackets, revised in accordance with the change in accounting policy adopted by the CCC as of 30 June 1961, are for comparison with 1962 and 1963.

ANNEX TABLE 13A. - FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES

	Period	Cereals <sup>1</sup>	Starchy roots <sup>2</sup>	Sugar <sup>3</sup>	Pulses and nuts <sup>4</sup>	Vegetables <sup>5</sup>	Meat <sup>6</sup>	Eggs <sup>7</sup>	Fish <sup>8</sup>	Milk <sup>9</sup>		Fats (fat content)
										Fat	Protein	
<i>Kilograms per caput per year</i>												
WESTERN EUROPE												
Austria.....	1954/55-1956/57	118	96	31	2	63	47	8	3	7	8	18
	1957/58-1959/60	114	92	34	3	65	52	10	3	7	8	18
	1962/63	101	80	37	3	53	62	12	3	7	7	18
Belgium-Luxembourg .....	1954/55-1956/57	100	150	28	4	65	53	14	7	4	6	22
	1957/58-1959/60	92	144	30	4	69	58	15	7	5	7	21
	1960/61	95	126	33	4	75	56	16	7	5	6	21
Denmark .....	1954/55-1956/57	90	131	48	5	62	63	8	14	8	8	26
	1957/58-1959/60	82	128	46	4	66	68	9	15	9	8	28
	1961/62	77	123	48	6	66	68	11	17	9	9	28
Finland .....	1954/55-1956/57	118	109	38	2	19	32	8	11	13	13	18
	1957/58-1959/60	114	98	40	2	21	32	6	11	12	12	18
	1960/61	110	113	39	2	17	32	8	11	12	12	19
France .....	1954/55-1956/57	111	130	26	6	132	69	10	6	5	6	17
	1957/58-1959/60	106	107	30	6	127	74	11	6	6	7	17
	1959/60	101	109	31	6	132	83	11	6	6	7	18
Germany, Federal Republic .....	1954/55-1956/57	96	157	28	4	45	48	10	7	6	7	25
	1957/58-1959/60	88	143	28	3	46	54	12	7	6	7	25
	1962/63	78	129	30	2	47	61	13	7	6	7	26
Greece .....	1954-56	158	39	10	14	99	17	4	7	4	4	17
	1957-59	167	43	12	14	116	22	6	8	5	5	18
	1960	163	36	13	14	118	23	6	8	5	5	18
Ireland .....	1954-56	128	155	42	2	61	55	16	4	8	10	20
	1957-59	117	142	44	3	63	58	16	4	8	10	20
	1961	107	140	49	3	64	65	16	4	8	9	19
Italy .....	1954/55-1956/57	145	48	16	9	96	20	8	5	4	4	14
	1957/58-1959/60	138	49	19	10	128	25	8	5	4	4	15
	1962/63	134	51	24	8	140	31	9	5	4	4	17
Netherlands .....	1954/55-1956/57	90	96	39	4	66	43	10	5	7	9	24
	1957/58-1959/60	85	91	40	4	66	44	12	4	8	9	25
	1962/63	83	96	42	3	69	50	12	5	8	9	30
Norway .....	1954/55-1956/57	95	105	39	4	34	37	8	20	12	9	26
	1957/58-1959/60	84	104	38	3	36	38	8	18	12	9	25
	1962/63	77	95	39	3	28	39	9	20	11	8	25
Portugal.....	1954-56	125	113	15	8	110	17	3	18	1	1	16
	1957-59	122	103	17	8	105	17	3	20	1	1	16
	1961	118	104	18	8	107	20	4	20	1	1	16
Spain .....	1954/55-1956/57	117	113	13	16	102	14	5	10	2	3	16
	1957/58-1959/60	112	115	15	16	114	16	5	11	2	3	18
	1961/62	111	125	18	17	134	21	8	11	2	3	20
Sweden .....	1954/55-1956/57	76	102	42	3	25	50	11	18	10	9	21
	1957/58-1959/60	74	92	41	3	25	50	12	18	10	9	21
	1961/62	72	86	39	3	30	51	12	19	10	9	22
Switzerland .....	1954/55-1956/57	101	74	40	7	75	51	10	3	10	10	17
	1957/58-1958/59	97	73	39	8	76	56	10	3	10	10	19
	1961/62	95	67	42	9	77	61	10	4	10	9	19
United Kingdom .....	1954/55-1956/57	88	98	47	6	58	68	13	10	7	7	22
	1957/58-1959/60	84	95	49	6	60	71	15	10	7	7	22
	1961/62	81	97	48	5	59	76	15	9	8	7	23
Yugoslavia .....	1954-56	186	60	10	10	39	23	2	1	3	4	9
	1957-59	187	67	14	10	50	24	3	2	4	5	10
	1960	186	70	15	10	56	30	3	1	4	5	13

ANNEX TABLE 13A. - FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (*continued*)

	Period	Cereals <sup>1</sup>	Starchy roots <sup>2</sup>	Sugar <sup>3</sup>	Pulses and nuts <sup>4</sup>	Vegetables <sup>5</sup>	Meat <sup>6</sup>	Eggs <sup>7</sup>	Fish <sup>8</sup>	Milk <sup>9</sup>		Fats (fat content)
										Fat	Protein	
<i>Kilograms per caput per year</i>												
<b>NORTH AMERICA</b>												
Canada .....	1954/55-1956/57	74	68	44	5	72	81	16	6	8	9	20
	1957/58-1959/60	70	66	44	5	77	78	17	7	8	9	19
	1961/62	70	69	45	5	73	78	16	8	8	9	19
United States .....	1954-56	69	49	41	7	98	92	21	5	9	9	21
	1957-59	67	48	42	7	96	92	20	5	9	9	21
	1961	66	47	42	7	97	96	19	5	8	9	21
<b>LATIN AMERICA</b>												
Argentina .....	1954-56	105	83	34	3	49	108	7	2	5	5	18
	1957-59	116	70	34	2	44	109	7	2	4	4	16
	1960	109	76	32	3	46	96	8	2	4	3	16
Brazil .....	1954-56	103	117	32	26	19	26	3	2	2	2	8
	1957-59	97	120	34	26	8	30	3	2	2	2	7
	1960	106	123	36	29	8	27	3	3	2	2	7
Chile .....	1954-56	137	76	31	8	67	31	4	9	3	3	7
	1957-59	127	79	23	8	72	33	3	11	3	4	10
	1960	129	67	26	9	70	32	3	11	3	3	10
Colombia.....	1956-58	61	84	51	9	13	41	3	1	2	2	6
Ecuador .....	1954-56	78	78	25	12	23	11	4	3	3	3	4
	1957-59	74	90	24	13	30	15	5	4	3	3	4
	1960	69	96	26	12	30	14	4	4	3	3	5
Mexico .....	1954-56	128	10	33	19	24	20	4	2	2	2	10
	1957-59	122	8	32	21	24	23	6	2	3	3	9
	1960	123	9	29	21	25	22	5	2	4	4	10
Paraguay .....	1957-59	84	229	15	15	36	48	1	—	3	2	4
Peru .....	1952	103	169	20	9	50	20	3	2	1	1	6
	1957-59	83	136	24	9	80	7	1	5	1	1	8
	1960	91	136	22	9	77	17	1	5	1	1	7
Surinam .....	1959	98	15	23	7	12	10	3	11	1	1	9
Uruguay .....	1954-56	99	61	33	2	37	109	7	1	6	6	17
	1957-59	92	65	32	2	48	111	7	1	6	6	21
	1960	99	49	27	1	47	96	7	1	8	7	18
Venezuela .....	1954-56	81	78	32	13	10	20	5	6	3	3	7
	1957-59	83	88	33	16	13	24	4	8	3	3	8
	1960	102	111	37	15	14	25	4	8	3	3	9
<b>FAR EAST</b>												
Ceylon .....	1954-56	125	34	17	34	42	3	1	5	1	1	4
	1957-59	126	22	18	30	43	3	1	6	1	1	4
	1961	126	37	18	30	42	2	1	5	1	1	4
China: Taiwan .....	1954-56	148	68	9	58	17	2	10	—	—	—	3
	1957-59	156	69	9	60	18	2	11	—	—	—	4
	1961	165	58	9	57	16	2	13	—	—	—	5
India .....	1954/55-1956/57	126	11	14	24	16	1	—	1	<sup>11</sup> 2	<sup>12</sup> 3	
	1957/58-1959/60	132	10	14	23	16	2	—	1	<sup>11</sup> 2	<sup>12</sup> 4	
	1960/61	140	11	18	24	16	2	—	1	<sup>11</sup> 2	<sup>12</sup> 4	
Japan .....	1954-56	151	63	12	68	3	3	23	—	—	—	3
	1957-59	153	66	13	75	5	4	25	1	1	1	3
	1961	149	56	16	85	6	7	29	1	1	1	5
Pakistan .....	1954/55-1956/57	150	...	14	8	18	4	—	2	<sup>11</sup> 2	<sup>12</sup> 4	
	1957/58-1959/60	153	4	15	7	18	4	—	2	<sup>11</sup> 2	<sup>12</sup> 3	
	1960/61	158	4	13	5	16	4	—	2	<sup>11</sup> 2	<sup>12</sup> 3	
Philippines .....	1954-56	118	47	13	3	...	9	2	8	—	—	3
	1957-59	120	46	12	4	...	11	3	10	—	—	3
	1961	119	42	14	6	14	15	3	10	—	—	3

ANNEX TABLE 13A. - FOOD SUPPLIES AVAILABLE FOR HUMAN CONSUMPTION IN SELECTED COUNTRIES (concluded)

	Period	Cereals <sup>1</sup>	Starchy roots	Sugar <sup>2</sup>	Pulses and nuts <sup>4</sup>	Vegetables <sup>5</sup>	Meat <sup>6</sup>	Eggs <sup>7</sup>	Fish <sup>8</sup>	Milk <sup>9</sup>		Fats (fat content)
										Fat	Protein	
<i>Kilograms per caput per year</i>												
NEAR EAST												
Israel	1954/55-1956/57	140	47	25	8	116	21	15	8	5	5	16
	1957/58-1959/60	123	41	29	7	117	30	19	7	4	5	16
	1960/61	120	37	32	7	114	35	19	7	4	5	17
Jordan	1957-59	124	12	21	12	87	7	1	1	1	1	7
	1960	109	15	20	8	154	7	1	1	1	1	6
Syria	1957	162	10	11	11	59	12	1	1	1	4	6
Turkey	1954/55-1956/57	201	29	10	13	76	14	2	2	2	3	8
	1957/58-1959/60	200	40	9	14	78	13	2	2	3	3	8
	1960/61	223	39	17	13	105	14	2	3	4	4	8
United Arab Republic	1954/55-1956/57	188	9	13	10	66	13	1	5	<sup>11</sup> 3	<sup>12</sup> 2	<sup>12</sup> 4
	1957/58-1959/60	184	9	12	10	80	13	1	5	<sup>11</sup> 3	<sup>12</sup> 2	<sup>12</sup> 5
	1960/61	182	13	10	12	87	12	1	5	<sup>11</sup> 3	<sup>12</sup> 2	<sup>12</sup> 5
AFRICA												
Libya	1959	115	17	28	7	80	10	2	1	2	2	8
Cyrenaica	1957	115	6	33	4	20	8	2	1	5	4	5
	1958	109	8	33	4	17	8	2	1	6	5	5
Mauritius	1955-56	131	17	39	11	28	6	—	6	1	1	9
	1957-59	131	16	37	11	29	5	1	6	1	2	10
	1961	126	12	38	12	28	6	2	5	2	2	12
Rhodesia and Nyasaland, Fed. of:												
Southern Rhodesia	1951-53	184	12	13	14	26	30	1	2	1	1	2
	1953	201	10	12	16	26	29	1	2	1	1	2
South Africa	1954-56	149	14	39	4	38	43	3	8	3	3	6
	1957-59	145	17	45	4	37	44	3	7	3	3	6
	1959-60	138	21	39	5	35	43	3	11	3	3	11
OCEANIA												
Australia	1954/55-1956/57	93	46	52	4	61	112	10	4	7	6	16
	1957/58-1959/60	86	53	51	4	63	115	11	5	7	7	16
	1960/61	86	40	49	4	62	106	12	5	7	7	15
New Zealand	1954-56	86	52	43	3	73	105	14	7	11	10	19
	1957-59	86	57	42	3	69	106	15	7	11	10	20
	1961	87	61	43	4	74	108	18	7	11	11	20

<sup>1</sup> In terms of flour and milled rice. - <sup>2</sup> Including sweet potatoes, cassava, and other starchy roots. - <sup>3</sup> In terms of refined sugar; raw sugar included on the basis of its caloric content; excluding syrup and honey. - <sup>4</sup> Shelled equivalent of nuts; including cocoa beans. - <sup>5</sup> In terms of fresh equivalent but including also minor quantities of processed vegetables in terms of product weight. - <sup>6</sup> Including poultry, offal, and game; expressed in terms of carcass weight, excluding slaughter fats. - <sup>7</sup> Fresh egg equivalent. - <sup>8</sup> Estimated edible weight. - <sup>9</sup> Milk and milk products, excluding butter, expressed in terms of fat and proteins. - <sup>10</sup> Including soybean curd in terms of soybeans. - <sup>11</sup> Including milk for butter-making. - <sup>12</sup> Excluding butter. - <sup>13</sup> Including "miso" and "shoyu" (soybean preparations) in terms of soybeans.

ANNEX TABLE 13B. - CALORIE AND PROTEIN CONTENT OF NATIONAL AVERAGE FOOD SUPPLIES IN SELECTED COUNTRIES

	Period	Calories	<i>Per caput per day</i>	
			Total protein (grams)	Animal protein (grams)
<b>WESTERN EUROPE</b>				
Austria .....	1954/55-1956/57	2 900	85	42
	1957/58-1959/60	2 980	87	45
	1962/63	2 920	86	48
Belgium-Luxembourg .....	1954/55-1956/57	2 970	88	44
	1957/58-1959/60	2 910	88	47
	1960/61	2 870	86	44
Denmark .....	1954/55-1956/57	3 360	91	52
	1957/58-1959/60	3 390	93	57
	1961/62	3 370	93	58
Finland .....	1954/55-1956/57	3 160	98	55
	1957/58-1959/60	3 110	94	53
	1960/61	3 110	93	53
France .....	1954/55-1956/57	2 890	95	47
	1957/58-1959/60	2 940	98	52
	1959/60	2 990	99	53
Germany, Fed. Rep. .....	1954/55-1956/57	2 990	79	43
	1957/58-1959/60	2 940	79	46
	1962/63	2 950	80	49
Greece .....	1954-56	2 720	87	23
	1957-59	2 950	94	27
	1960	2 930	95	28
Ireland .....	1954-56	3 540	99	54
	1957-59	3 480	95	55
	1961	3 440	91	55
Italy .....	1954/55-1956/57	2 550	74	23
	1957/58-1959/60	2 630	77	26
	1962/63	2 750	79	30
Netherlands .....	1954/55-1956/57	2 940	80	43
	1957/58-1959/60	2 950	79	44
	1962/63	3 020	81	46
Norway .....	1954/55-1956/57	3 160	89	50
	1957/58-1959/60	3 010	84	49
	1962/63	2 930	80	48
Portugal .....	1954-56	2 450	70	23
	1957-59	2 440	71	26
	1961	2 500	73	21
Spain .....	1954/55-1956/57	2 520	71	20
	1957/58-1959/60	2 590	71	20
	1961/62	2 790	76	22
Sweden .....	1954/55-1956/57	2 980	84	53
	1957/58-1959/60	2 930	81	52
	1961/62	2 940	83	54
Switzerland .....	1954/55-1956/57	3 130	93	52
	1957/58-1958/59	3 120	90	51
	1961/62	3 210	91	52
United Kingdom .....	1954/55-1956/57	3 260	86	50
	1957/58-1959/60	3 280	86	51
	1961/62	3 250	89	54
Yugoslavia .....	1954-56	2 780	89	22
	1957-59	2 920	96	26
	1960	3 070	96	26

ANNEX TABLE 13B. - CALORIE AND PROTEIN CONTENT OF NATIONAL AVERAGE FOOD SUPPLIES IN SELECTED COUNTRIES (continued)

	Period	Calories	Total protein (grams)	Animal protein (grams)
<i>..... Per caput per day .....</i>				
<b>NORTH AMERICA</b>				
Canada .....	1954/55-1956/57	3 150	97	63
	1957/58-1959/60	3 110	95	63
	1961/62	3 100	94	63
United States .....	1954-56	3 150	94	66
	1957-59	3 100	94	63
	1961	3 100	92	66
<b>LATIN AMERICA</b>				
Argentina .....	1954-56	3 070	97	58
	1957-59	3 090	98	57
	1960	2 930	83	50
Brazil .....	1954-56	2 580	65	18
	1957-59	2 540	61	19
	1960	2 690	65	18
Chile .....	1954-56	2 540	77	26
	1957-59	2 440	80	29
	1960	2 480	79	28
Colombia .....	1956-58	2 200	48	23
Ecuador .....	1954-56	2 170	52	13
	1957-59	2 230	56	18
	1960	2 110	53	23
Mexico .....	1954-56	2 380	64	17
	1957-59	2 400	67	20
	1960	2 490	68	22
Paraguay .....	1957-59	2 500	68	26
Peru .....	1952	2 070	58	10
	1957-59	1 970	49	12
	1960	2 040	50	12
Surinam .....	1959	1 810	41	14
Uruguay .....	1954-56	2 960	96	62
	1957-59	3 020	95	62
	1960	2 900	93	60
Venezuela .....	1954-56	2 010	54	21
	1957-59	2 170	61	24
	1960	2 490	66	24
<b>FAR EAST</b>				
Ceylon .....	1954-56	2 070	44	8
	1957-59	2 030	45	9
	1961	2 060	44	8
China: Taiwan .....	1954-56	2 210	53	13
	1957-59	2 330	57	14
	1961	2 400	60	16
India .....	1954/55-1956/57	1 840	49	6
	1957/58-1959/60	1 910	51	6
	1960/61	2 040	53	6
Japan .....	1954-56	2 100	64	15
	1957-59	2 230	68	18
	1961	2 290	70	22

ANNEX TABLE 13B. - CALORIE AND PROTEIN CONTENT OF NATIONAL AVERAGE FOOD SUPPLIES IN SELECTED COUNTRIES (concluded)

	Period	Calories	Total protein (grams)	Animal protein (grams)
<i>Per caput per day</i>				
Pakistan .....	1954/55-1956/57	1 990	46	8
	1957/58-1959/60	1 980	46	7
	1960/61	1 970	45	7
Philippines .....	1954-56	1 720	38	9
	1957-59	1 790	42	11
	1961	1 830	43	14
 <b>NEAR EAST</b>				
Israel .....	1954/55-1956/57	2 870	88	31
	1957/58-1959/60	2 780	84	33
	1960/61	2 800	84	35
Jordan .....	1957-59	2 050	55	6
	1960	1 830	50	7
Syria .....	1957	2 330	78	17
Turkey .....	1954/55-1956/57	2 780	88	14
	1957/58-1959/60	2 820	90	15
	1960/61	3 100	98	16
United Arab Republic .....	1954/55-1956/57	2 570	75	13
	1957/58-1959/60	2 530	73	12
	1960/61	2 530	75	12
 <b>AFRICA</b>				
Libya .....	1959	2 180	53	10
Cyrennica .....	1957	2 110	55	16
	1958	2 090	55	18
Mauritius .....	1955-56	2 290	47	10
	1957-59	2 270	46	11
	1961	2 330	48	13
Rhodesia-Nyasaland, Fed. of:				
Southern Rhodesia .....	1951-53	2 450	75	16
	1953	2 630	81	16
South Africa .....	1954-56	2 620	75	31
	1957-59	2 550	74	32
	1959-60	2 660	74	30
 <b>OCEANIA</b>				
Australia .....	1954/55-1956/57	3 230	91	59
	1957/58-1959/60	3 210	91	61
	1960/61	3 150	90	59
New Zealand .....	1954-56	3 400	103	70
	1957-59	3 430	105	72
	1961	3 510	109	74

ANNEX TABLE 14. - EXPORTS OF MAIN AGRICULTURAL COMMODITIES IN 1960-62 IN COMPARISON WITH 1952-53

	Total earnings <sup>1</sup>	Volume	Unit value (price) <sup>1</sup>	Estimated average export earnings 1960-62 <sup>1</sup>
<i>Indices, average 1952-53 = 100</i>				
Beef and veal .....	293	243	121	589
Apples .....	244	193	126	183
Live cattle .....	242	212	114	431
Pork.....	233	228	102	119
Oilcake and meal .....	202	223	91	333
Edible vegetable oils and oilseeds .....	152	178	85	1,507
Citrus fruit .....	151	138	109	383
Wine .....	150	133	113	489
Linseed and oil.....	146	172	85	145
Cheese .....	145	133	109	343
Tea .....	144	117	123	620
Mutton and lamb .....	141	118	119	175
Animal fats.....	137	168	82	258
Tobacco.....	135	128	105	916
Potatoes .....	134	124	108	145
Dried raisins.....	134	106	126	99
Natural rubber .....	131	126	104	1,302
Condensed and dried milk .....	130	160	81	317
Coarse grains .....	128	191	67	1,157
Bacon and ham .....	128	133	96	259
Sugar .....	126	135	93	1,632
Bananas .....	123	146	84	327
Canned meats .....	121	118	103	362
Wheat and flour .....	113	144	78	2,308
Cocoa .....	107	143	75	492
Sisal .....	106	152	70	114
Jute .....	106	89	119	207
Eggs in shell .....	103	131	79	209
Cotton .....	97	133	73	2,051
Wool.....	97	126	77	1,684
Silk.....	97	96	101	56
Butter .....	97	121	80	398
Coffee.....	80	134	60	1,808
Rice .....	77	125	62	601

<sup>1</sup> At current prices, converted from national currencies to U.S. dollars at official conversion rates.

ANNEX TABLE 15A. - REGIONAL AND WORLD<sup>1</sup> INDICES OF VOLUME AND VALUE OF AGRICULTURAL IMPORTS, BY COMMODITY GROUPS

	Average 1934-38	Average 1948-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Preliminary)
<i>Indices, average 1952-53 = 100</i>												
<b>Import volume</b>												
WESTERN EUROPE												
Food and feed .....	112	96	103	103	112	127	127	129	138	141	143	151
Beverages and tobacco .....	110	90	104	112	120	122	131	132	132	145	150	157
Raw materials <sup>1</sup> .....	112	96	108	109	109	113	124	106	114	119	116	115
All agricultural products .....	112	95	105	107	113	122	127	123	130	135	136	141
NORTH AMERICA												
Food and feed .....	89	92	99	94	96	99	109	125	124	122	127	139
Beverages and tobacco .....	67	99	102	86	95	103	101	98	111	108	114	121
Raw materials .....	95	110	92	76	86	82	73	64	83	66	68	71
All agricultural products .....	81	100	99	86	93	96	96	97	107	101	106	113
LATIN AMERICA												
Food and feed .....	58	88	102	102	104	99	117	123	118	119	120	118
Beverages and tobacco .....	82	111	105	110	103	102	116	120	83	100	114	113
Raw materials .....	32	94	95	130	120	114	124	119	112	123	132	136
All agricultural products .....	57	91	102	106	106	101	118	122	114	118	121	119
FAR EAST <sup>2</sup>												
Food and feed .....	99	82	98	95	98	114	126	124	119	139	136	135
Beverages and tobacco .....	91	91	97	103	119	137	132	121	127	141	190	187
Raw materials .....	121	75	102	103	101	129	133	117	144	177	197	166
All agricultural products .....	106	80	99	98	99	120	128	122	127	151	158	147
NEAR EAST												
Food and feed .....	44	89	98	90	118	150	165	169	204	234	249	271
Beverages and tobacco .....	69	100	104	102	117	108	118	119	129	124	132	138
Raw materials .....	34	80	104	143	106	107	127	144	166	162	179	183
All agricultural products .....	50	91	100	96	117	137	151	155	183	202	215	232
AFRICA												
Food and feed .....	68	83	104	108	111	122	132	123	153	166	182	182
Beverages and tobacco .....	61	87	103	108	113	132	119	115	114	125	133	134
Raw materials .....	33	88	110	136	136	133	151	148	138	175	190	179
All agricultural products .....	64	86	104	109	113	125	129	123	141	156	169	169
OCEANIA												
Food and feed .....	58	89	96	106	114	123	131	138	127	126	123	132
Beverages and tobacco .....	72	96	107	115	120	115	125	125	125	131	131	128
Raw materials .....	68	116	111	153	157	136	133	154	138	137	111	119
All agricultural products .....	66	99	104	122	128	123	129	138	129	131	123	127
WORLD <sup>1</sup>												
Food and feed .....	99	92	102	100	107	120	125	128	134	141	143	150
Beverages and tobacco .....	87	94	103	100	109	113	117	116	121	127	134	139
Raw materials .....	107	95	103	103	104	110	116	101	113	119	121	116
All agricultural products .....	99	93	102	101	107	116	121	118	126	132	135	138

ANNEX TABLE 15A. - REGIONAL AND WORLD<sup>1</sup> INDICES OF VOLUME AND VALUE OF AGRICULTURAL IMPORTS,  
BY COMMODITY GROUPS (*concluded*)

	Average 1934-38	Average 1948-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)
<i>Indices, average 1952-53 = 100</i>												
<b>Import value</b>												
WESTERN EUROPE												
Food and feed .....	44	98	99	95	104	121	122	114	121	124	123	133
Beverages and tobacco .....	40	82	105	134	130	125	138	144	128	135	134	130
Raw materials .....	36	99	99	98	101	99	111	82	82	94	89	86
All agricultural products .....	41	96	100	103	108	115	121	109	111	117	115	119
NORTH AMERICA												
Food and feed .....	34	92	101	95	92	96	107	126	129	121	126	136
Beverages and tobacco .....	13	79	103	110	99	101	97	86	84	78	76	76
Raw materials .....	35	111	79	62	86	78	69	51	72	63	54	56
All agricultural products .....	25	91	96	93	94	94	93	89	94	87	85	88
LATIN AMERICA												
Food and feed .....	18	87	100	94	92	83	98	99	95	94	95	96
Beverages and tobacco .....	20	83	108	140	105	95	112	118	85	80	81	86
Raw materials .....	17	98	84	111	122	106	112	98	97	119	111	123
All agricultural products .....	18	88	99	100	97	87	101	100	94	96	96	98
FAR EAST <sup>2</sup>												
Food and feed .....	23	79	96	83	80	91	107	98	92	105	101	102
Beverages and tobacco .....	37	78	97	104	115	111	105	107	111	106	131	154
Raw materials .....	38	84	91	95	96	115	117	92	102	136	150	126
All agricultural products .....	28	81	95	87	86	99	110	96	96	114	117	111
NEAR EAST												
Food and feed .....	15	89	91	71	88	110	130	116	133	148	161	172
Beverages and tobacco .....	23	99	103	129	149	117	133	124	127	122	115	107
Raw materials .....	10	83	98	139	106	102	125	122	136	156	166	151
All agricultural products .....	16	91	94	87	102	111	131	118	132	143	151	157
AFRICA												
Food and feed .....	21	81	101	97	95	106	112	104	118	126	137	134
Beverages and tobacco .....	22	81	105	115	112	118	114	120	101	104	105	109
Raw materials .....	13	96	94	110	137	120	132	105	105	149	148	145
All agricultural products .....	21	82	101	102	101	110	114	107	113	123	131	129
OCEANIA												
Food and feed .....	20	90	95	98	102	111	121	120	109	106	103	111
Beverages and tobacco .....	31	97	105	139	148	118	131	135	128	120	109	109
Raw materials .....	24	130	94	118	149	128	116	117	112	129	90	92
All agricultural products .....	26	103	99	120	133	118	124	125	117	117	102	106
WORLD <sup>1</sup>												
Food and feed .....	35	92	99	92	97	109	115	111	115	119	119	126
Beverages and tobacco .....	26	81	104	122	115	112	117	115	106	105	105	103
Raw materials .....	35	99	93	91	98	98	104	78	84	96	93	88
All agricultural products .....	33	92	98	98	101	107	113	103	105	110	109	111

<sup>1</sup> Excluding U.S.S.R., eastern Europe, and Mainland China. - <sup>2</sup> Excluding Mainland China.

ANNEX TABLE 15B. - REGIONAL AND WORLD<sup>1</sup> INDICES OF VOLUME AND VALUE OF AGRICULTURAL EXPORTS, BY COMMODITY GROUPS

	Average 1934-38	Average 1948-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)
<i>Indices, average 1952-53 = 100</i>												
<b>Export volume</b>												
WESTERN EUROPE												
Food and feed .....	90	79	104	119	130	124	142	142	146	161	173	166
Beverages and tobacco .....	79	71	107	107	113	129	132	159	114	130	144	137
Raw materials .....	183	86	109	103	128	149	138	134	175	159	173	191
All agricultural products .....	95	79	105	117	128	126	141	143	145	158	170	165
NORTH AMERICA												
Food and feed .....	33	94	93	77	90	125	119	121	135	146	161	170
Beverages and tobacco .....	93	100	111	100	120	111	110	105	104	110	111	106
Raw materials .....	158	131	83	130	79	139	211	138	113	222	187	115
All agricultural products .....	61	102	92	89	90	126	136	123	128	158	163	155
LATIN AMERICA												
Food and feed .....	128	108	112	116	118	127	136	146	140	154	150	159
Beverages and tobacco .....	87	98	104	85	97	105	98	97	113	114	113	114
Raw materials .....	108	90	120	124	118	126	94	111	134	116	143	155
All agricultural products .....	105	100	109	103	108	117	111	117	126	129	132	137
FAR EAST <sup>2</sup>												
Food and feed .....	249	96	98	105	123	123	128	113	119	135	139	136
Beverages and tobacco .....	109	92	105	116	99	123	122	128	118	119	142	148
Raw materials .....	113	95	100	96	111	102	98	98	107	96	100	105
All agricultural products .....	159	95	100	102	113	113	112	108	113	113	120	123
NEAR EAST												
Food and feed .....	85	81	111	140	101	124	127	127	106	131	125	129
Beverages and tobacco .....	53	95	108	103	96	99	140	95	102	91	125	122
Raw materials .....	87	87	116	95	107	96	102	99	142	132	118	111
All agricultural products .....	83	86	114	108	104	104	113	106	128	127	121	117
AFRICA												
Food and feed .....	84	90	105	122	122	129	127	143	134	125	141	157
Beverages and tobacco .....	74	92	103	109	126	133	141	128	146	163	174	184
Raw materials .....	69	87	101	106	111	116	112	116	131	125	129	117
All agricultural products .....	76	90	103	113	121	128	130	130	138	141	153	160
OCEANIA												
Food and feed .....	86	95	106	95	106	115	108	98	121	116	145	138
Beverages and tobacco .....	127	87	113	104	115	130	148	141	183	214	287	343
Raw materials .....	72	99	100	92	105	106	118	108	128	125	132	135
All agricultural products .....	79	97	103	94	105	110	113	103	125	121	139	137
WORLD <sup>1</sup>												
Food and feed .....	97	93	102	102	111	124	127	128	134	143	155	158
Beverages and tobacco .....	86	95	104	97	107	116	115	112	121	127	133	136
Raw materials .....	106	98	103	105	106	114	120	110	124	130	132	124
All agricultural products .....	97	95	103	102	109	119	122	119	128	136	144	144

ANNEX TABLE 15B. - REGIONAL AND WORLD<sup>1</sup> INDICES OF VOLUME AND VALUE OF AGRICULTURAL EXPORTS,  
BY COMMODITY GROUPS (*concluded*)

	Average 1934-38	Average 1948-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)
..... Indices, average 1952-53 = 100 .....												
<b>Export value</b>												
WESTERN EUROPE												
Food and feed .....	38	82	101	111	118	118	135	128	131	147	151	147
Beverages and tobacco .....	51	83	104	102	117	123	140	162	122	137	153	172
Raw materials .....	59	92	110	100	119	137	141	105	130	128	135	145
All agricultural products .....	41	83	102	109	118	120	136	130	130	144	150	149
NORTH AMERICA												
Food and feed .....	15	98	91	72	80	109	105	103	110	117	134	140
Beverages and tobacco .....	45	87	114	104	123	113	122	120	120	130	134	130
Raw materials .....	47	128	76	118	74	113	161	100	72	145	130	81
All agricultural products .....	24	102	90	84	82	110	117	104	103	124	133	128
LATIN AMERICA												
Food and feed .....	37	112	108	105	106	109	130	124	119	127	131	149
Beverages and tobacco .....	14	75	105	110	97	102	93	84	80	81	76	71
Raw materials .....	34	98	112	119	109	109	84	84	89	88	110	122
All agricultural products .....	26	92	108	110	102	105	105	98	95	98	101	106
FAR EAST <sup>2</sup>												
Food and feed .....	59	93	102	96	95	96	103	93	97	100	107	106
Beverages and tobacco .....	46	98	108	149	129	139	136	141	128	127	131	134
Raw materials .....	40	109	84	79	121	104	99	85	114	115	100	97
All agricultural products .....	47	102	94	96	114	107	106	97	111	112	108	106
NEAR EAST												
Food and feed .....	33	80	103	123	89	118	118	111	98	114	109	113
Beverages and tobacco .....	30	93	113	121	120	130	191	129	120	93	111	109
Raw materials .....	29	104	99	95	100	96	106	90	105	113	104	97
All agricultural products .....	30	97	101	105	100	105	118	99	105	111	106	102
AFRICA												
Food and feed .....	28	85	103	115	110	120	119	123	117	111	120	128
Beverages and tobacco .....	20	84	102	133	124	118	126	141	146	132	130	130
Raw materials .....	21	90	92	89	93	97	95	83	89	99	99	90
All agricultural products .....	23	86	100	116	112	114	116	121	122	117	120	120
OCEANIA												
Food and feed .....	38	91	108	94	102	107	102	96	125	116	135	134
Beverages and tobacco .....	40	81	112	140	124	116	131	164	188	176	202	231
Raw materials .....	22	97	107	92	94	96	122	79	91	94	96	100
All agricultural products .....	29	95	107	93	97	101	113	87	107	104	114	116
WORLD <sup>1</sup>												
Food and feed .....	32	94	100	96	99	110	117	112	116	123	132	137
Beverages and tobacco .....	24	81	106	119	111	113	113	112	107	105	104	103
Raw materials .....	34	105	95	96	102	103	112	87	97	110	106	99
All agricultural products .....	31	94	100	101	103	109	114	105	109	115	119	119

<sup>1</sup> Excluding the U.S.S.R., eastern Europe and Mainland China. - <sup>2</sup> Excluding Mainland China.

ANNEX TABLE 16. - WORLD AVERAGE EXPORT UNIT VALUES OF AGRICULTURAL PRODUCTS

	Average 1934-38	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)
Indices, average 1952-53 = 100																	
U.S. \$ per metric ton																	
All agricultural products .....	34.0	88.0	98.8	89.4	92.7	116.7	102.7	97.3	99.4	94.2	91.7	93.8	87.5	85.2	82.8	82.6	
Food and feed .....	37.0	105.2	116.5	100.8	89.8	101.7	101.5	98.5	93.0	89.0	89.4	91.3	87.4	87.4	85.6	85.2	
Cereals .....	33.0	106.9	124.2	100.2	84.7	92.0	101.0	99.0	84.4	79.4	76.3	75.2	74.0	72.8	71.6	86.7	
Edible oils and oilsseeds .....	29.2	101.4	127.1	106.2	95.1	123.2	98.2	101.8	96.8	86.8	90.8	90.1	90.1	97.8	72.1	74.3	
Meat .....	41.5	70.2	82.6	86.6	81.1	93.9	99.6	100.4	102.5	101.9	101.2	100.6	104.3	105.7	92.4	85.7	
Dairy products .....	43.5	95.9	115.1	108.5	83.7	92.9	101.4	98.6	95.5	95.4	96.7	90.8	80.6	109.1	107.2	82.9	
Beverages and tobacco .....	28.0	72.5	75.4	72.3	88.8	98.6	101.2	123.3	104.6	97.7	98.2	98.8	90.4	90.4	84.5	84.8	
Agricultural raw materials .....	33.5	69.6	86.0	82.5	100.8	157.3	107.9	92.1	92.2	95.5	91.0	94.7	78.7	77.9	83.5	76.5	
Wheat .....	31.1	87.6	106.1	88.5	71.5	74.1	78.6	79.7	68.2	65.8	62.8	63.5	62.6	62.2	61.9	65.2	
Wheat flour .....	44.4	130.2	139.8	116.1	96.8	105.5	112.4	111.8	103.0	92.6	86.8	85.8	81.6	77.6	75.3	81.9	
Barley .....	25.8	93.2	105.4	64.9	59.1	71.9	77.4	62.9	53.1	55.7	50.9	51.3	52.6	52.7	47.1	46.6	
Maize .....	18.8	78.6	93.2	64.2	60.4	77.7	85.3	69.7	60.8	61.5	59.9	55.1	50.6	50.1	48.4	51.1	
Rice (milled) .....	29.2	141.7	164.1	152.2	126.9	135.1	167.1	183.5	146.9	117.7	115.5	120.1	110.3	101.5	107.8	113.0	
Sugar (raw) .....	38.3	107.4	99.0	98.5	104.0	116.1	110.0	97.4	99.0	95.1	95.4	116.5	99.8	94.4	89.0	108.7	
Apples .....	66.3	139.8	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	140.5	
Bananas .....	30.6	95.0	100.0	105.0	103.7	100.6	97.2	99.9	99.9	100.1	102.8	102.4	93.1	86.8	83.1	86.6	
Oranges and tangerines .....	56.5	120.6	115.8	126.1	107.7	102.9	102.7	95.9	105.1	102.1	124.5	134.8	127.9	104.9	110.4	113.9	
Raisins .....	123.3	285.7	260.7	242.1	226.8	270.6	229.4	201.6	207.2	240.6	274.5	280.2	280.2	327.2	316.8	271.1	
Copra .....	45.4	176.6	252.1	170.0	195.4	219.1	144.3	191.4	172.6	149.6	142.5	139.4	167.7	203.3	173.8	143.0	
Palm kernels .....	37.0	108.9	132.1	148.1	120.2	173.1	155.7	152.0	136.3	121.6	123.5	120.5	125.1	159.4	125.5	120.1	
Soybeans .....	37.7	130.0	134.0	100.6	95.1	122.1	114.4	108.3	113.3	94.9	96.0	91.1	86.6	84.4	93.3	94.5	
Groundnuts (shelled) .....	50.6	158.5	214.2	209.5	149.3	210.0	225.4	210.2	210.2	185.7	195.0	203.8	171.7	164.4	182.5	167.9	
Olive oil .....	268.8	1 018.5	930.4	738.7	547.5	783.2	584.1	586.0	529.0	560.9	719.5	664.5	598.2	510.3	518.0	574.3	
Coconut oil .....	83.9	317.4	413.4	348.3	333.2	394.2	258.9	306.7	289.0	237.6	232.9	241.3	278.5	349.0	288.9	233.2	
Palm oil .....	61.2	182.8	279.5	254.1	206.0	309.6	243.9	188.5	184.6	200.0	217.4	220.9	204.2	191.4	203.6	226.5	
Palm kernel oil .....	108.4	287.1	300.8	373.8	293.9	366.0	250.1	295.7	265.9	240.3	242.4	253.3	216.2	236.7	230.7	219.4	
Soybean oil .....	120.3	525.2	539.1	340.0	320.4	461.5	307.7	309.9	317.1	321.7	343.3	338.4	303.3	253.3	233.6	248.4	
Groundnut oil .....	433.6	433.6	469.1	482.3	368.0	495.5	394.9	419.7	404.4	319.4	397.8	405.7	362.6	326.5	354.0	343.6	
Cattle (per head) .....	36.3	100.8	116.3	114.7	121.6	132.8	110.8	117.6	129.6	125.2	124.8	125.7	135.9	144.8	138.9	130.4	
Beef and veal .....	121.3	305.4	323.9	362.1	353.7	459.2	501.3	439.8	464.7	452.1	419.1	440.0	503.8	577.9	598.0	563.6	
Mutton and lamb .....	213.7	262.9	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	364.7	
Bacon, ham, salted pork .....	409.0	618.6	776.2	751.6	612.5	650.1	711.8	674.1	666.0	663.6	722.7	679.2	706.3	667.5	661.8	660.6	
Canned meat .....	270.0	481.9	533.4	639.5	733.3	846.1	858.9	954.9	906.0	873.9	869.2	826.7	854.3	889.2	905.3	930.1	
Cheese .....	323.5	644.9	766.0	749.7	583.2	630.2	686.1	658.6	648.6	674.9	742.3	709.3	637.0	741.1	724.0	721.2	
Butter .....	424.6	866.1	1 109.6	1 078.5	816.0	883.9	957.4	963.1	970.6	951.2	784.5	641.2	897.4	831.3	715.6	758.4	
Eggs (in the shell) .....	283.4	670.7	776.1	730.5	584.1	631.0	689.1	686.6	628.4	649.9	642.0	608.4	596.3	536.8	518.0	546.5	
Milk, condensed and evaporated .....	134.5	329.6	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	
Milk, powdered .....	191.7	554.4	604.4	486.2	334.5	445.2	514.8	458.9	410.9	377.2	375.0	437.4	356.7	401.9	361.3	317.1	

ANNEX TABLE 16. - WORLD AVERAGE EXPORT UNIT VALUES OF AGRICULTURAL PRODUCTS (concluded)

	Average 1944-38	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962 (Prelim- inary)
U.S. \$ per metric ton																	
Potatoes	31.8	63.3	59.1	47.9	46.2	53.9	59.6	57.6	51.7	46.9	59.7	52.2	59.7	57.6	61.2	54.4	73.8
Oilseed cake and meal	23.6	95.0	92.0	62.2	58.2	74.1	75.5	72.6	71.9	73.3	67.7	61.9	54.7	67.9	67.9	63.5	63.9
Coffee	152.3	494.5	510.3	580.5	959.2	1 075.0	1 104.4	1 141.3	1 401.0	1 075.7	1 048.4	1 024.7	918.4	767.2	720.4	679.7	620.1
Cocoa	117.4	469.1	707.3	461.4	555.0	711.2	683.2	660.5	1 070.2	818.0	580.8	563.0	844.6	816.3	593.5	474.3	461.3
Tea	515.8	1 135.8	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	1 214.4	1 183.6	1 186.2
Wine	85.9	286.0	241.1	206.1	164.8	180.8	171.4	165.1	147.3	143.0	155.4	169.8	216.1	180.5	178.7	181.6	196.7
Tobacco (unmanufactured)	567.6	1 151.1	1 114.8	1 118.5	1 096.7	1 126.3	1 163.8	1 228.1	1 224.7	1 267.4	1 227.6	1 342.3	1 292.3	1 320.5	1 296.2	1 246.7	1 260.4
Linseed	44.9	217.1	222.0	180.0	148.9	166.8	170.4	129.0	112.7	130.3	143.5	115.5	123.9	133.7	128.9	126.3	130.6
Linseed oil	105.3	618.7	561.2	370.6	318.3	390.3	397.5	231.1	166.9	205.4	245.8	250.7	212.1	246.8	254.0	259.4	
Cotton	261.2	650.5	856.4	797.6	837.7	1 169.9	1 002.5	771.5	828.2	805.0	739.8	741.7	680.5	588.0	630.3	656.2	656.4
Jute	63.9	306.9	327.6	301.1	243.6	327.6	250.2	175.9	185.1	189.4	184.0	209.5	195.2	177.1	223.1	310.4	225.0
Sisal	76.6	244.4	299.3	291.8	272.4	423.5	374.6	204.7	176.7	157.3	158.9	141.5	139.9	175.4	213.4	193.4	
Wool (greasy)	446.0	723.6	1 027.8	1 164.1	1 527.5	2 589.8	1 413.1	1 593.4	1 549.2	1 357.3	1 379.6	1 600.5	1 133.8	1 072.0	1 164.4	1 146.6	1 164.0
Rubber (natural)	262.7	389.0	414.4	342.2	662.8	1 090.1	670.9	484.0	450.1	701.8	634.0	603.5	519.3	662.4	745.2	549.9	532.0

ANNEX TABLE 17. - INSTITUTIONAL AGRICULTURAL CREDIT GRANTED AND OUTSTANDING IN SELECTED COUNTRIES

		Loans advanced during							Loans outstanding at the end of							
		1951	1952	1953	1955	1957	1959	1961	1951	1952	1953	1955	1957	1959	1961	
..... Million national currency units .....																
NORTH AMERICA																
United States	dollars	...	...	...	...	...	...	...	7 837	8 408	8 249	9 813	11 247	13 906	...	
Canada	dollars	...	...	...	...	...	...	...	...	540	586	612	804	1 085		
OCEANIA																
Australia	pounds	...	...	...	...	...	...	...	...	...	...	398	412	463	500	
New Zealand	pounds	...	...	...	...	...	...	...	...	...	...	132	158	180	226	
WESTERN EUROPE																
Austria	schillings	870	...	...	...	...	...	...	1 212	1 516	2 467	3 056	4 034	4 789		
Belgium	francs	...	1 051	1 376	1 773	2 516	2 493	3 538	...	4 485	5 166	6 342	8 169	9 582	11 415	
Denmark	kroner	...	...	...	...	...	...	...	...	...	...	...	7 554	8 705	10 660	
Finland <sup>1</sup>	markkas	...	...	...	...	...	...	...	42	45	51	93	97	118	153	
France <sup>1</sup>	new francs	...	433	570	688	949	...	...	...	336	413	528	768	...	...	
Germany, Fed. Rep.	DM	...	753	876	2 081	2 317	2 747	3 359	926	1 384	1 902	3 986	6 306	8 947	11 612	
Greece	drachmas	...	...	...	3 386	5 480	5 528	6 090	...	...	...	...	...	...	...	
Italy <sup>1</sup>	lire	97	123	144	243	269	304	...	83	104	138	253	354	455	...	
Norway	kroner	...	...	...	...	...	...	...	1 497	1 475	1 671	2 019	2 196	2 427	2 882	
Poland	zloty	...	...	...	...	...	...	9 373	...	...	...	...	...	...	...	
Portugal	escudos	...	...	3 273	3 772	4 466	4 759	...	...	...	...	...	...	...	...	
Romania	lei	...	...	...	...	...	...	940	...	...	...	...	...	...	...	
Sweden	kronor	...	...	...	...	...	...	...	...	2 988	3 245	3 678	3 999	4 454	4 932	
Spain	pesetas	...	...	...	1 434	1 388	1 919	2 812	...	...	...	2 410	3 995	4 184	5 837	
United Kingdom	pounds	...	...	...	...	...	...	...	...	226	228	265	...	323	422	
Yugoslavia <sup>1</sup>	dinars	17	24	11	39	115	309	...	...	38	40	79	140	...	...	
LATIN AMERICA																
Bolivia <sup>1</sup>	bolivianos	...	...	...	...	...	...	12	...	...	...	...	...	4	...	
Chile <sup>1</sup>	pesos	...	...	14	33	64	...	...	...	...	...	...	...	...	199	
Cuba	pesos	...	...	...	...	...	...	32	...	36	48	44	...	...	36	
Dominican Republic	dollars	9	...	38	18	11	16	...	...	...	...	...	...	...	...	
Ecuador <sup>2</sup>	sucres	331	246	250	350	406	323	450	...	...	...	...	...	...	...	
Guatemala	guetzales	...	...	15	16	21	19	...	...	...	13	16	21	...	...	
Honduras <sup>2</sup>	lempiras	...	3 699	5 350	7 995	...	...	...	...	4 334	5 094	3 948	...	...	...	
Mexico	pesos	...	...	...	6 303	9 000	...	...	514	...	...	1 072	1 218	...	...	
Panama	balboas	...	...	815	1 851	2 278	...	...	...	...	616	1 455	2 111	...	...	
Paraguay	guaraniés	...	...	57	...	80	...	...	...	...	40	...	56	...	...	
Puerto Rico	dollars	29	30	31	37	...	...	...	30	33	33	44	...	...	...	
Venezuela	bolivares	...	...	...	...	...	372	...	...	...	...	...	...	...	...	
FAR EAST																
Burma	kyats	...	...	53	...	55	70	87	...	...	...	...	...	...	...	
Cambodia	piastres	8	15	24	57	132	164	85	4	18	27	65	43	91	139	
Ceylon	rupees	29	25	...	...	...	...	...	...	...	...	...	...	...	...	
Hong Kong <sup>2</sup>	dollars	...	...	528	2 228	4 073	2 579	8 595	...	...	...	...	3 509	3 320	6 324	
India	rupees	519	670	771	863	1 659	2 086	...	...	...	...	...	...	...	...	
Indonesia	rupiah	...	...	...	...	...	...	...	...	...	...	...	693	...	...	
Japan	yen	...	...	...	...	...	...	...	101	184	252	364	512	557	1 025	
Laos <sup>2</sup>	kips	...	...	7 265	6 468	...	...	...	...	...	...	...	...	...	...	
Malaya <sup>2</sup>	dollars	...	...	3 179	...	...	...	10 375	...	...	1 059	...	...	...	...	
Philippines	pesos	...	204	230	245	346	610	763	...	294	345	413	548	664	844	
Sarawak <sup>2</sup>	Malayan dollars	...	...	...	...	...	1 431	3 959	...	...	...	...	...	...	...	
China: Taiwan	dollars	...	...	...	...	6 083	...	...	...	...	...	...	992	...	...	
Viet-Nam, Rep. of	piastres	...	...	18	154	201	868	320	...	...	...	...	...	...	...	

ANNEX TABLE 17. - INSTITUTIONAL AGRICULTURAL CREDIT GRANTED AND OUTSTANDING IN SELECTED COUNTRIES (concluded)

		Loans advanced during							Loans outstanding at the end of						
		1951	1952	1953	1955	1957	1959	1961	1951	1952	1953	1955	1957	1959	1961
<i>Million national currency units</i>															
NEAR EAST															
Cyprus <sup>2</sup>	pounds	...	...	...	...	...	...	7 935	...	...	...	...	...	...	17 852
Iran	rials	181	192	284	...	...	1 960	...	653	571	615	...	...	3 101	...
Iraq <sup>2</sup>	dinars	...	...	1 354	971	...	551	...	...	...	...	...	...	...	...
Israel	pounds	...	...	...	...	...	...	...	...	...	...	513	447	...	761
Jordan <sup>2</sup>	dinars	...	...	465	713	...	1 042	...	...	...	382	...	...	4 458	...
Lebanon	pounds	...	1	3	3	13	31	...	...	...	...	...	...	...	...
Turkey	pounds	656	1 208	1 025	1 179	1 475	...	1 939	467	933	1 021	1 357	2 204	...	2 693
United Arab Republic	pounds	12	19	20	13	20	29	39	2	7	7	...	...	...	...
AFRICA															
Algeria	francs	...	63	60	65	67	...	...	...	29	36	40	39	...	...
Cameroon	CFA francs	...	...	...	...	...	597	...	...	...	...	...	...	...	...
Ethiopia <sup>2</sup>	dollars	161	150	259	...	...	...	...	148	274	82	...	3 230	5 328	...
Ghana <sup>2</sup>	pounds	...	...	...	...	...	2 531	...	...	...	...	...	...	...	...
Kenya	pounds	...	...	...	...	9	8	8	...	...	...	...	12	12	13
Libya	pounds	...	24	40	...	...	348	...	...	...	...	...	...	239	...
Madagascar	CFA francs	...	514	162	280	...	504	342	...	631	537	561	...	...	...
Mauritius	rupees	...	...	...	70	72	...	...	...	...	...	...	...	96	113
Mozambique	escudos	...	...	...	...	...	...	...	17	17	17	...	...	...	...
Nigeria <sup>2</sup>	pounds	...	270	597	1 588	1 384	2 477	...	...	148	244	832	1 007	2 990	...
Reunion	francs	...	324	189	665	...	...	...	...	369	206	834	...	...	...
Seychelles <sup>2</sup>	rupees	...	...	...	2	—	38	38	...	...	...	131	...	45	...
Sierra Leone <sup>2</sup>	pounds	6	7	...	67	...	...	...	5	5	...	42	...	...	...
Tanganyika <sup>2</sup>	pounds	...	...	...	...	...	...	...	2 344	...	...	...	3 248	5 148	...
Togo	CFA francs	...	4	...	7	13	126	...	...	—	...	...	13	167	...
Tunisia	francs	...	...	4 387	6 912	...	...	...	36	...	...	...	...	...	117
Upper Volta	francs	...	...	...	...	...	...	...	...	...	...	...	...	...	...

<sup>1</sup> Thousand million national currency units. — <sup>2</sup> Thousand national currency units.

ANNEX TABLE 18. - CONSUMPTION OF NITROGENOUS FERTILIZERS

	1949/50	1952/53	1955/56	1959/60	1960/61	1961/62
WESTERN EUROPE	<i>Thousand metric tons N</i>					
Austria .....	17.6	23.7	31.8	45.0	46.7	52.3
Belgium .....	78.3	83.1	85.3	98.6	100.3	103.2
Denmark <sup>1</sup> .....	59.6	80.9	88.7	122.8	124.0	133.6
Finland .....	13.3	25.9	36.2	61.3	64.4	59.1
France <sup>2</sup> .....	*225.0	268.1	381.1	504.8	564.9	...
Germany, Fed. Rep. .....	327.6	419.0	471.6	624.6	618.4	621.4
Greece .....	*25.0	28.0	41.6	69.5	73.1	83.3
Iceland .....	*2.5	3.5	4.9	7.1	7.4	9.0
Ireland .....	6.2	9.3	13.6	21.7	24.6	29.0
Italy .....	119.9	181.3	253.9	350.8	332.6	346.7
Luxembourg .....	3.3	3.6	3.7	4.5	4.8	4.7
Netherlands .....	143.2	159.1	184.3	212.1	223.6	242.9
Norway .....	36.9	36.0	37.7	48.4	50.1	49.8
Portugal <sup>3</sup> .....	23.0	34.5	43.8	68.4	63.8	68.4
Spain .....	38.5	113.0	171.7	236.4	275.2	...
Sweden <sup>4</sup> .....	59.6	71.5	83.8	104.0	106.2	107.5
Switzerland .....	8.1	11.0	11.0	15.0	16.2	16.0
United Kingdom .....	209.2	233.8	295.9	421.2	459.5	...
Yugoslavia <sup>3</sup> .....	7.4	9.7	17.6	78.4	83.1	82.8
<b>TOTAL</b> .....	<b>1 410</b>	<b>1 800</b>	<b>2 260</b>	<b>3 100</b>	<b>3 240</b>	<b>*3 400</b>
EASTERN EUROPE AND U.S.S.R.						
Bulgaria .....	...	...	26.9	122.7	100.6	...
Czechoslovakia .....	42.3	50.0	99.4	133.9	146.2	...
Germany, Eastern .....	184.4	192.5	199.9	242.4	245.6	...
Hungary .....	...	...	...	87.1	*81.6	<sup>5</sup> 92.4
Poland .....	93.7	106.0	162.9	251.3	274.0	...
Romania <sup>3</sup> .....	...	...	...	*16.4	*27.5	*34.4
U.S.S.R. <sup>3</sup> .....	*307.0	*394.0	479.0	710.0	769.0	859.0
<b>TOTAL</b> .....	<b>660</b>	<b>780</b>	<b>1 020</b>	<b>1 570</b>	<b>1 650</b>	<b>*1 760</b>
NORTH AMERICA						
Canada .....	31.2	37.4	47.6	63.7	90.6	...
United States <sup>9</sup> .....	935.0	1 636.0	1 753.9	2 483.9	2 747.8	2 903.0
<b>TOTAL</b> .....	<b>970</b>	<b>1 670</b>	<b>1 800</b>	<b>2 550</b>	<b>2 840</b>	<b>3 000</b>
LATIN AMERICA						
Argentina .....	*6.0	10.3	6.5	...	...	...
Brazil <sup>3</sup> .....	*10.0	*13.0	* <sup>10</sup> 27.1	43.8	64.5	...
British Guiana <sup>3</sup> .....	2.5	2.4	3.9	4.4	3.8	4.6
Chile .....	7.0	13.9	18.9	*25.0	*28.0	...
Colombia .....	*1.5	3.6	5.3	* <sup>11</sup> 6.8	...	...
Costa Rica <sup>3</sup> .....	*0.9	6.0	...	* <sup>12</sup> 5.3	...	...
Cuba .....	15.9	* <sup>13</sup> 6.6	...	26.1	...	...
Dominican Republic .....	*1.2	1.8	1.7	4.5	...	10.1
Ecuador .....	*0.2	*0.2	2.7	3.7	5.2	...
El Salvador .....	*0.4	...	6.2	* <sup>14</sup> 10.0	11.8	...
Guadeloupe .....	...	1.2	...	* <sup>14</sup> 2.1	...	...
Guatemala .....	*0.6	...	4.3	6.1	7.5	9.0
Honduras <sup>3</sup> .....	0.2	0.7	*5.0	6.6	5.2	5.3
Jamaica <sup>3</sup> .....	2.4	3.8	...	4.5	4.8	6.6
Martinique <sup>3</sup> .....	...	2.3	* <sup>10</sup> 1.8	*3.0	...	...
Mexico .....	3.4	16.4	112.8	*125.0	*135.0	...
Peru .....	36.4	33.6	43.6	...	...	<sup>15</sup> 42.3
Surinam <sup>3</sup> .....	...	—	0.1	0.4	0.5	0.6
Trinidad and Tobago .....	2.2	2.0	4.2	...	12.8	26.1
Uruguay .....	*0.2	*0.5	*1.9	9.1	...	...
Venezuela .....	*1.2	*1.5	*5.5	3.6	2.6	...
<b>TOTAL</b> .....	<b>90</b>	<b>120</b>	<b>270</b>	<b>400</b>	<b>420</b>	<b>470</b>

ANNEX TABLE 18. - CONSUMPTION OF NITROGENOUS FERTILIZERS (*concluded*)

	1949/50	1952/53	1955/56	1959/60	1960/61	1961/62
<b>NEAR EAST</b>						
Cyprus .....	1.0	2.1	4.2	5.9	6.0	8.1
Iran .....	...	...	0.1	5.7	7.6	...
Israel .....	*3.8	8.1	12.2	17.3	18.8	...
Jordan <sup>3</sup> .....	...	0.4	0.2	0.4	0.2	...
Lebanon .....	1.4	3.3	5.9	5.7	6.9	7.9
Lybia (Tripolitania) .....	*0.1	*0.1	*0.7	<sup>14</sup> 2.2	...	...
Sudan .....	*4.4	4.0	9.8	11.4	18.6	...
Syria .....	*0.5	1.6	3.5	4.4	10.8	...
Turkey .....	*3.2	9.4	9.6	20.3	24.8	24.8
United Arab Republic <sup>3</sup> .....	93.0	103.9	122.6	105.7	176.6	191.9
<b>TOTAL</b> .....	110	130	170	180	270	290
<b>FAR EAST</b>						
Burma .....	—	0.2	0.8	3.0	3.8	...
Cambodia .....	—	0.2	...	0.2	0.1	0.1
Ceylon .....	12.5	13.6	*20.4	31.0	30.0	34.7
China: Taiwan .....	42.6	71.3	75.7	110.7	104.3	121.8
Federation of Malaya .....	3.7	4.0	10.7	20.8	21.7	25.3
India .....	64.2	104.8	141.7	230.2	283.1	...
Indonesia .....	12.4	16.9	24.6	45.5	21.1	...
Japan .....	<sup>16</sup> 303.1	<sup>16</sup> 403.0	579.7	584.1	753.1	695.2
Korea, Rep. of <sup>1</sup> .....	98.9	125.9	146.5	160.6	219.3	214.0
North Borneo .....	—	—	0.1	0.3	0.3	0.2
Pakistan .....	*5.0	5.3	10.2	34.1	70.0	62.1
Philippines .....	*14.0	26.7	<sup>17</sup> 13.0	...	42.7	54.7
Ryukyu Islands .....	...	...	2.4	4.5	6.7	...
Singapore .....	...	...	2.8	5.1	6.6	...
Thailand .....	0.9	1.8	...	8.3	11.1	...
Viet-Nam, Rep. of .....	<sup>18</sup> 2.8	1.3	6.5	19.8	19.3	15.5
<b>TOTAL</b> .....	560	780	1 040	1 280	1 590	1 570
<b>AFRICA</b>						
Algeria .....	...	4.9	7.7	13.6	<sup>4</sup> 16.6	...
Bechuanaland .....	...	—	...	1.0	1.0	1.0
Cameroon .....	...	0.4	0.7	1.1	1.5	...
Kenya <sup>3</sup> .....	...	0.6	1.7	1.8	2.6	...
Madagascar .....	*0.1	0.5	*0.6	0.8	0.8	...
Mauritius <sup>3</sup> .....	4.5	6.1	6.4	8.9	8.3	8.0
Morocco <sup>3</sup> .....	...	<sup>19</sup> 2.4	<sup>19</sup> 6.1	6.5	9.2	8.6
Mozambique <sup>3</sup> .....	...	...	...	2.6	...	...
Nigeria .....	...	1.9	1.3	0.9	0.9	0.7
Reunion .....	*0.8	2.2	2.4	2.1	2.6	2.4
Rhodesia-Nyasaland .....	*3.1	*3.2	10.0	16.4	21.0	25.6
South Africa .....	9.0	11.9	23.8	45.1	54.5	70.7
Spanish Equatorial Region .....	—	—	...	0.4	...	...
Swaziland .....	—	—	0.1	1.4	1.6	...
Tanganyika <sup>3</sup> .....	0.3	0.3	...	0.9	1.3	1.4
Tunisia .....	...	0.5	0.9	1.8	...	...
Uganda <sup>3</sup> .....	0.3	0.1	...	1.0	1.2	...
<b>TOTAL</b> .....	30	40	60	110	130	150
<b>OCEANIA</b>						
Australia .....	15.4	16.3	18.3	26.1	24.6	35.3
Fiji Islands .....	...	0.8	0.9	0.1	1.3	...
New Zealand <sup>20</sup> .....	2.8	3.5	*6.4	5.7	8.3	8.4
<b>TOTAL</b> .....	20	20	30	30	30	40
<b>WORLD TOTAL</b> .....	3 800	5 300	6 600	9 200	10 200	10 700

<sup>\*</sup> Estimate.

<sup>1</sup> Fertilizer year: August-July. - <sup>2</sup> Fertilizer year: May-April. - <sup>3</sup> Calendar year referring to the first part of the split year. - <sup>4</sup> Fertilizer year: June-May. - <sup>5</sup> 1960. - <sup>6</sup> 1961. - <sup>7</sup> 1950. - <sup>8</sup> 1953. - <sup>9</sup> Includes Hawaii and Puerto Rico. - <sup>10</sup> 1956. - <sup>11</sup> 1957/58. - <sup>12</sup> 1958. - <sup>13</sup> 1953/54. - <sup>14</sup> 1958/59. - <sup>15</sup> Excluding fish meal. - <sup>16</sup> Includes Ryukyu Islands. - <sup>17</sup> 1956/57. - <sup>18</sup> 1950/51. - <sup>19</sup> Former French zone only. - <sup>20</sup> Includes organics.

ANNEX TABLE 19. - CONSUMPTION OF PHOSPHATE FERTILIZERS

	1949/50	1952/53	1955/56	1959/60	1960/61	1961/62
WESTERN EUROPE						
Austria	33.4	26.5	47.5	74.9	88.1	91.1
Belgium	90.0	83.6	96.7	94.0	88.7	91.9
Denmark <sup>1</sup>	81.7	96.5	98.7	117.2	116.0	114.6
Finland	55.3	63.8	73.1	101.1	105.5	100.7
France <sup>2</sup>	*370.0	451.4	629.3	783.0	877.4	...
Germany, Fed. Rep.	336.0	393.8	473.6	707.0	651.9	624.9
Greece	* 25.0	23.1	30.6	52.2	58.6	65.6
Iceland	* 1.1	1.7	2.8	3.9	3.2	4.3
Ireland	35.7	40.8	54.7	80.4	78.9	92.1
Italy	247.6	338.7	419.7	389.3	378.9	392.2
Luxembourg	5.7	5.2	5.3	6.4	6.3	5.8
Netherlands	125.0	115.0	110.6	110.9	112.1	100.9
Norway	37.0	37.9	35.2	44.5	46.7	44.6
Portugal <sup>3</sup>	* 45.0	69.9	76.1	74.8	73.4	59.4
Spain	126.5	206.2	268.2	274.7	279.4	...
Sweden <sup>4</sup>	98.9	103.6	103.9	108.4	103.6	105.5
Switzerland	30.5	29.5	41.0	43.5	43.0	44.5
United Kingdom	413.2	363.0	369.3	436.5	418.0	...
Yugoslavia	9.2	10.0	19.7	95.9	53.6	58.0
TOTAL	2 170	2 460	2 960	3 600	3 580	* 3 700
EASTERN EUROPE AND U.S.S.R.						
Bulgaria <sup>5</sup>	...	3.9	8.0	77.1	50.0	...
Czechoslovakia <sup>5</sup>	55.1	66.5	98.0	147.4	159.0	...
Germany, Eastern	94.7	81.4	152.4	209.7	225.0	...
Hungary	* 10.0	* 11.0	...	82.8	* 68.1	* 85.0
Poland	102.6	117.5	150.6	180.4	209.2	...
Romania <sup>3</sup>	...	...	* 8.8	* 43.6	* 52.1	* 56.5
U.S.S.R.	* 442.0	<sup>10</sup> 525.0	680.0	838.0	823.0	843.0
TOTAL	720	820	1 120	1 580	1 590	* 1 700
NORTH AMERICA						
Canada	113.2	113.6	107.5	133.4	169.1	...
United States <sup>11</sup>	1 869.0	2 163.0	2 129.4	2 426.9	2 399.6	2 404.0
TOTAL	1 980	2 280	2 240	2 560	2 570	2 590
LATIN AMERICA						
Argentina	* 6.5	4.8	3.1	...	...	...
Brazil <sup>3</sup>	* 25.0	* 33.0	<sup>7</sup> 56.2	62.5	75.7	...
British Guiana <sup>3</sup>	—	0.2	1.6	0.9	1.1	1.9
Chile	15.2	29.8	<sup>12</sup> 35.2	29.6	...	...
Colombia	* 3.5	9.8	18.3	<sup>13</sup> * 17.5	...	...
Costa Rica <sup>3</sup>	...	5.7	...	<sup>14</sup> 5.8	...	...
Cuba	10.2	<sup>15</sup> 7.5	...	<sup>16</sup> 19.6	...	...
Dominican Republic	* 0.4	1.2	2.2	1.1	...	2.7
Ecuador	0.2	* 0.2	2.3	1.5	3.2	...
El Salvador	* 0.2	...	3.1	...	4.1	...
Guadeloupe	...	1.0	...	<sup>13</sup> 1.3	...	...
Guatemala	* 0.8	...	0.9	2.3	3.6	3.9
Honduras <sup>3</sup>	...	0.7	...	0.4	0.3	0.3
Jamaica <sup>3</sup>	0.1	0.4	...	1.4	1.8	1.4
Martinique <sup>3</sup>	...	1.4	...	* 1.5	...	...
Mexico	4.3	14.3	22.1	* 36.6	* 42.7	...
Peru	22.8	24.5	<sup>12</sup> 22.5	7.8	...	22.0
Trinidad and Tobago	0.7	0.4	0.7	0.8	0.4	0.4
Uruguay	* 1.5	* 1.5	...	12.8	...	...
Venezuela	* 0.5	* 0.6	<sup>17</sup> 2.4	4.3	4.9	...
TOTAL	100	140	190	230	* 270	* 290

ANNEX TABLE 19. - CONSUMPTION OF PHOSPHATE FERTILIZERS (concluded)

	1949/50	1952/53	1955/56	1959/60	1960/61	1961/62
<i>Thousand metric tons <math>P_2O_5</math></i>						
NEAR EAST						
Cyprus .....	3.3	4.8	5.4	6.2	6.5	8.0
Iran .....	—	—	0.4	4.1	4.3	...
Israel .....	* 7.4	7.5	12.9	14.4	12.1	...
Jordan <sup>3</sup> .....	...	0.1	0.4	0.5	1.2	...
Lebanon .....	* 0.6	0.8	4.1	2.0	4.2	4.6
Lybia (Tripolitania) .....	...	...	<sup>12</sup> 1.5	<sup>13</sup> 1.4	...	...
Sudan .....	—	—	0.1	0.1	0.3	...
Syria .....	...	0.5	0.6	1.4	8.1	...
Turkey .....	* 0.7	5.0	10.5	12.3	12.2	12.2
United Arab Republic <sup>3</sup> .....	14.0	16.4	20.6	25.0	36.0	48.4
<b>TOTAL</b> .....	<b>30</b>	<b>40</b>	<b>60</b>	<b>70</b>	<b>90</b>	<b>100</b>
FAR EAST						
Burma .....	0.1	0.2	—	1.3	0.8	...
Cambodia .....	...	0.2	—	0.1	—	0.8
Ceylon .....	1.0	2.4	* 1.5	1.6	2.6	1.6
China: Taiwan .....	11.1	24.8	26.2	32.0	36.6	26.1
Federation of Malaya .....	0.2	0.2	2.1	5.4	6.1	5.8
India .....	8.0	19.9	12.2	66.3	58.0	...
Indonesia .....	1.3	7.0	4.8	8.7	9.9	...
Japan .....	<sup>18</sup> 232.6	<sup>18</sup> 247.0	318.8	440.0	491.1	452.5
Korea, Rep. of <sup>1</sup> .....	53.3	1.0	28.2	60.7	55.4	82.1
North Borneo .....	—	—	—	0.3	0.3	0.2
Pakistan .....	...	0.2	0.1	5.4	15.0	10.6
Philippines .....	<sup>19</sup> 6.6	16.4	9.4	...	22.6	26.2
Ryukyu Islands .....	...	...	0.9	1.1	1.3	...
Singapore .....	...	...	0.5	0.3	2.2	...
Thailand .....	0.1	1.4	...	3.6	4.7	...
Viet-Nam, Rep. of .....	<sup>19</sup> 4.3	3.5	1.7	2.4	1.3	3.2
<b>TOTAL</b> .....	<b>320</b>	<b>320</b>	<b>410</b>	<b>640</b>	<b>710</b>	<b>690</b>
AFRICA						
Algeria .....	...	15.1	22.7	26.6	<sup>5</sup> 24.9	...
Basutoland .....	...	...	0.1	0.1	0.2	0.3
Bechuanaland .....	—	—	...	0.1	0.1	0.1
Cameroon .....	...	0.2	0.3	0.2	0.2	...
Kenya <sup>3</sup> .....	* 3.9	6.1	...	3.5	6.1	...
Madagascar .....	...	0.2	* 0.2	0.3	0.3	...
Mauritius <sup>3</sup> .....	0.5	—	0.7	3.5	4.2	5.2
Morocco <sup>3</sup> .....	...	<sup>20</sup> 14.5	<sup>20</sup> 18.3	17.1	17.4	14.5
Nigeria .....	...	0.5	0.9	0.6	0.7	2.7
Reunion .....	...	1.1	1.0	2.7	0.6	0.8
Rhodesia-Nyasaland .....	1.1	* 1.5	15.8	<sup>21</sup> 5.2	26.2	23.5
South Africa .....	90.0	99.9	119.1	144.1	127.0	150.4
Spanish Equatorial Region .....	...	...	...	0.3	...	...
Swaziland .....	...	0.2	0.2	0.8	1.2	...
Tanganyika <sup>3</sup> .....	0.1	0.1	...	0.8	0.8	0.8
Tunisia .....	7.5	12.7	6.2	9.2	...	...
Uganda <sup>3</sup> .....	—	—	...	1.3	1.1	...
<b>TOTAL</b> .....	<b>130</b>	<b>150</b>	<b>190</b>	<b>250</b>	<b>220</b>	<b>250</b>
OCEANIA						
Australia .....	331.0	353.2	474.8	536.5	571.6	577.5
Fiji Islands .....	...	0.2	1.1	0.1	0.1	...
New Zealand .....	144.4	136.4	215.5	196.8	224.5	210.3
<b>TOTAL</b> .....	<b>480</b>	<b>490</b>	<b>690</b>	<b>730</b>	<b>800</b>	<b>790</b>
<b>WORLD TOTAL</b> .....	<b>5 900</b>	<b>6 700</b>	<b>7 900</b>	<b>9 700</b>	<b>9 800</b>	<b>10 100</b>

<sup>\*</sup> Estimate.

<sup>1</sup> Fertilizer year: August-July. - <sup>2</sup> Fertilizer year: May-April. - <sup>3</sup> Calendar year referring to the first part of the split year. - <sup>4</sup> Fertilizer year: June-May. - <sup>5</sup> Includes ground rock phosphate. - <sup>6</sup> 1960. - <sup>7</sup> 1961. - <sup>8</sup> 1956. - <sup>9</sup> 1950. - <sup>10</sup> 1953. - <sup>11</sup> Includes Hawaii and Puerto Rico. - <sup>12</sup> 1956/57. - <sup>13</sup> 1958/59. - <sup>14</sup> 1958. - <sup>15</sup> 1953/54. - <sup>16</sup> 1957/58. - <sup>17</sup> 1955. - <sup>18</sup> Includes Ryukyu Islands. - <sup>19</sup> 1950/51. - <sup>20</sup> Former French zone only. - <sup>21</sup> Excluding local production.

ANNEX TABLE 20. - CONSUMPTION OF POTASH FERTILIZERS

	1949/50	1952/53	1955/56	1959/60	1960/61	1961/62
WESTERN EUROPE						
Austria .....	24.7	28.0	43.5	84.0	86.5	99.0
Belgium .....	93.1	132.0	148.5	155.5	152.2	152.7
Denmark <sup>1</sup> .....	84.1	153.4	157.1	179.4	180.6	179.2
Finland .....	24.9	47.1	55.5	71.3	77.2	76.2
France <sup>2</sup> .....	354.5	370.6	581.3	685.9	749.9	...
Germany, Fed. Rep. .....	589.5	770.8	847.0	1 046.6	1 005.9	1 036.1
Greece .....	* 5.0	3.3	3.8	7.1	9.0	9.8
Iceland .....	* 0.9	1.3	1.8	2.1	1.8	2.5
Ireland .....	9.5	24.2	37.6	58.0	66.4	79.2
Italy .....	16.0	34.9	57.0	108.2	103.8	127.5
Luxembourg .....	3.8	4.8	5.4	6.2	6.1	5.8
Netherlands .....	153.0	157.9	165.4	152.6	138.2	126.3
Norway .....	50.2	47.6	48.7	55.0	53.7	52.8
Portugal <sup>3</sup> .....	* 4.0	3.1	6.1	10.5	6.9	10.4
Spain .....	* 35.0	46.5	82.4	76.0	95.0	...
Sweden <sup>4</sup> .....	53.6	67.8	86.9	86.2	83.5	85.5
Switzerland .....	13.3	19.0	22.0	40.0	42.0	44.0
United Kingdom .....	239.0	235.0	311.0	434.0	438.6	...
Yugoslavia <sup>5</sup> .....	2.0	4.6	...	101.2	96.1	61.4
TOTAL .....	1 760	2 150	2 690	3 360	3 400	3 500
EASTERN EUROPE AND U.S.S.R.						
Bulgaria <sup>3</sup> .....	...	...	0.6	2.5	5.9	...
Czechoslovakia .....	62.9	111.4	149.1	215.4	191.0	...
Germany, Eastern .....	339.0	411.0	457.9	499.4	500.7	...
Hungary .....	...	...	...	20.6	* 13.8	* 23.2
Poland .....	166.2	205.7	273.7	312.9	311.4	...
Romania <sup>3</sup> .....	...	...	...	1.1	4.0	12.0
U.S.S.R. <sup>3</sup> .....	* 422.0	* 519.0	728.0	787.0	766.0	703.0
TOTAL .....	1 000	1 260	1 630	1 840	1 790	* 1 780
NORTH AMERICA						
Canada .....	56.4	71.0	106.1	84.9	99.6	...
United States <sup>6</sup> .....	1 020.0	1 578.0	1 700.7	1 953.4	1 967.2	2 013.9
TOTAL .....	1 080	1 650	1 810	2 040	2 070	2 120
LATIN AMERICA						
Argentina .....	* 1.6	* 1.6	3.2	...	...	...
Barbados .....	2.4	1.2	2.7	2.6	2.8	2.6
Brazil <sup>3</sup> .....	* 8.0	* 16.0	* 41.6	57.4	106.2	...
British Guiana <sup>3</sup> .....	—	0.1	1.2	2.9	1.4	2.2
Chile .....	1.6	3.5	6.0	16.2	...	...
Colombia .....	* 3.0	8.0	12.4	...	...	...
Costa Rica <sup>3</sup> .....	...	...	...	* 15.0	...	...
Cuba .....	11.4	* 12.6.5	...	22.2	...	...
Dominican Republic .....	—	* 0.7	* 13.5	3.1	...	4.2
Ecuador .....	0.1	...	2.0	1.5	3.9	...
El Salvador .....	* 0.2	...	4.0	...	4.8	...
Guadeloupe .....	***	1.4	...	* 14.7.8	...	...
Guatemala .....	* 0.5	...	0.6	2.0	3.1	2.1
Jamaica <sup>3</sup> .....	0.8	1.8	* 10.3.3	5.4	5.0	5.5
Martinique <sup>3</sup> .....	...	2.9	* 10.5.7	* 5.7	...	...
Mexico .....	0.8	2.4	5.5	* 6.0	* 9.0	...
Peru .....	6.0	2.4	* 15.6.0	* 3.3	...	5.8
Trinidad and Tobago .....	0.8	0.9	1.3	2.0	2.7	1.9
Uruguay .....	...	* 12.0.5	...	9.2	...	...
Venezuela .....	* 0.6	* 1.0	4.0	4.0	3.7	...
TOTAL .....	40	50	120	180	* 240	* 250

ANNEX TABLE 20. - CONSUMPTION OF POTASH FERTILIZERS (concluded)

	1949/50	1952/53	1955/56	1959/60	1960/61	1961/62
NEAR EAST						
Cyprus .....	0.2	—	0.3	0.7	0.6	0.7
Iran .....	...	...	0.1	1.0	1.5	...
Israel .....	—	1.1	2.8	2.1	2.2	2.3
Lebanon .....	* 1.3	1.6	1.4	1.7	2.8	3.0
Lybia (Tripolitania) .....	...	...	<sup>15</sup> 0.5	<sup>14</sup> 0.3	...	...
Syria .....	...	0.1	0.1	0.1	0.5	...
Turkey .....	* 1.0	2.5	6.3	4.8	0.1	0.1
United Arab Republic <sup>3</sup> .....	...	0.1	0.1	...	3.2	...
TOTAL .....	—	10	10	10	10	10
FAR EAST						
Ceylon .....	9.0	9.2	22.9	25.4	27.7	30.3
China: Taiwan .....	0.4	14.1	17.9	26.5	36.2	33.4
Federation of Malaya .....	0.8	0.8	3.8	8.8	9.7	10.0
India .....	...	3.0	6.7	31.9	28.9	...
Indonesia .....	2.2	0.4	2.7	6.2	10.4	...
Japan .....	<sup>16</sup> 120.0	<sup>16</sup> 210.0	385.9	524.7	599.7	492.8
Korea, Rep. of <sup>1</sup> .....	4.3	7.0	8.8	6.0	7.1	17.1
North Borneo .....	—	0.1	—	0.4	0.3	0.2
Pakistan .....	...	...	0.1	0.2	9.0	6.0
Philippines .....	...	5.0	4.4	...	19.3	31.1
Ryukyu Islands .....	...	...	0.5	1.5	2.7	...
Singapore .....	...	...	0.9	2.3	3.9	...
Thailand .....	—	—	...	2.4	2.1	...
Viet-Nam, Rep. of .....	<sup>17</sup> 0.7	...	1.0	4.2	3.5	4.8
TOTAL .....	140	250	460	650	760	680
AFRICA						
Algeria .....	...	9.1	8.8	16.8	<sup>4</sup> 16.2	...
Cameroon .....	...	0.2	0.7	1.1	1.4	...
Kenya <sup>3</sup> .....	...	0.1	0.4	0.2	1.1	...
Madagascar .....	...	0.3	0.4	0.7	0.7	...
Mauritius <sup>3</sup> .....	2.2	2.8	3.1	5.2	5.6	5.0
Morocco <sup>3</sup> .....	...	<sup>18</sup> 4.4	<sup>18</sup> 6.1	5.2	6.3	5.8
Mozambique <sup>3</sup> .....	...	...	...	0.3	...	...
Nigeria .....	...	0.2	0.8	0.9	1.7	0.8
Reunion .....	...	1.2	1.5	1.7	2.0	2.9
Rhodesia-Nyasaland .....	0.3	* 7.9	9.2	12.1	17.9	15.0
South Africa .....	6.0	8.6	26.8	32.9	33.4	39.0
Spanish Equatorial Region .....	...	...	...	0.3	...	...
Swaziland .....	...	0.1	0.1	1.3	1.4	...
Tanganyika <sup>3</sup> .....	0.3	0.1	...	0.5	0.5	0.5
Tunisia .....	0.4	0.2	1.3	2.2	...	...
Uganda <sup>3</sup> .....	...	...	...	0.5	0.3	...
TOTAL .....	* 30	40	60	80	90	* 90
OCEANIA						
Australia .....	7.8	8.6	23.3	22.5	33.2	47.4
New Zealand .....	4.3	10.8	21.2	47.5	61.0	74.0
TOTAL .....	10	20	40	70	100	120
WORLD TOTAL .....	4 000	5 400	6 800	8 200	8 500	8 600

\* Estimate.

<sup>1</sup> Fertilizer year: August-July. - <sup>2</sup> Fertilizer year: May-April. - <sup>3</sup> Calendar year referring to the first part of the split year. - <sup>4</sup> Fertilizer year: June-May. - <sup>5</sup> 1960. - <sup>6</sup> 1961. - <sup>7</sup> 1950. - <sup>8</sup> 1953. - <sup>9</sup> Includes Hawaii and Puerto Rico. - <sup>10</sup> 1956. - <sup>11</sup> 1958. - <sup>12</sup> 1953/54. - <sup>13</sup> 1955. - <sup>14</sup> 1958/59. - <sup>15</sup> 1956/57. - <sup>16</sup> Includes Ryukyu Islands. - <sup>17</sup> 1950/51. - <sup>18</sup> Former French zone only.

ANNEX TABLE 21. - GROUND ROCK PHOSPHATE USED FOR DIRECT APPLICATION, 1955/56 - 1961/62

	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62
WESTERN EUROPE							
Austria .....	2 639	2 646	2 835	3 508	5 108	7 672	9 065
Finland .....	10 282	9 357	7 344	8 942	9 216	7 727	5 607
France <sup>1</sup> .....	100 580	97 050	120 230	105 900	98 100	86 600	189 875
Germany, Fed. Rep. .....	5 525	5 900	10 100	26 300	22 400	10 000	9 100
Ireland .....	2 478	1 177	1 591	2 599	2 233	1 664	1 947
Italy .....	1 811	1 146	1 146	1 200	561	525	163
Netherlands .....	300	1 100	400	400	2 000	—	—
Switzerland .....	500	500	500	500	500	500	500
United Kingdom .....	22 714	18 629	16 751	16 600	18 200	12 300	...
TOTAL .....	147 000	138 000	161 000	166 000	158 000	137 000	230 000
EASTERN EUROPE AND U.S.S.R.							
Bulgaria .....	...	...	...	2 643	...	...	...
Poland .....	...	...	7 311	9 980	96 038	125 675	123 276
U.S.S.R. .....	161 900	163 200	202 200	208 000	241 900	264 480	305 710
TOTAL .....	168 900	170 200	212 200	221 000	340 900	393 000	432 000
NORTH AMERICA							
Canada .....	1 340	1 256	893	611	510	338	...
United States .....	268 704	241 238	243 223	241 845	194 564	...	...
TOTAL .....	270 000	242 000	244 000	242 000	195 000	* 180 000	* 17 000
LATIN AMERICA							
Argentina .....	900	1 200	* 1 200	* 1 200	* 1 500	* 1 500	...
Brazil <sup>2</sup> .....	...	...	...	778	23 494	21 731	18 413
British Guiana .....	556	804	652	—	28	23	—
Chile .....	5 637	5 700	6 000	1 500	2 285	...	...
Cuba .....	9 690	...	...	7 315	7 138	* 7 500	...
Guatemala .....	...	49	91	1 765	* 2 000	* 2 500	...
Jamaica <sup>2</sup> .....	200	200	160	—	—	—	—
Martinique .....	350	116	40	14	...	...	...
Peru .....	—	—	900	7 030	...	...	...
Surinam .....	4	29	10	7	3	14	24
Uruguay .....	3 700	...	...	...	10 917	6 992	...
TOTAL .....	25 000	* 28 000	* 33 000	* 42 000	* 58 000	* 56 000	* 54 000
FAR EAST							
Ceylon .....	7 250	8 243	5 528	18 060	14 410	21 084	18 527
Federation of Malaya .....	9 594	12 077	14 552	* 15 000	20 396	22 926	27 444
Indonesia .....	9 900	3 300	...	...	—	—	—
Korea, Rep. of .....	—	2 915	—	—	—	—	—
North Borneo .....	42	64	236	210	212	462	2
Ryukyu Islands .....	...	6 800	13 650	6 418	15 340	15 000	...
Thailand .....	...	64	236	243	213	462	...
Viet-Nam, Rep. of .....	...	...	...	...	897	14 785	17 186
TOTAL .....	40 000	35 000	39 000	44 000	51 000	75 000	79 000

ANNEX TABLE 21. - GROUND ROCK PHOSPHATE USED FOR DIRECT APPLICATION, 1955/56 - 1961/62 (*concluded*)

	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62
<b>AFRICA</b>							
				<i>Metric tons P<sub>2</sub>O<sub>5</sub></i>			
Algeria .....	...	1 731	1 994	2 669	2 669	680	...
Madagascar .....	150	435	450	...	135	135	...
Morocco <sup>2</sup> .....	<sup>3</sup> 5 534	<sup>3</sup> 4 675	5 705	9 890	8 561	10 694	...
Nigeria .....	71	146	—	1	43	114	9
Rhodesia-Nyasaland .....	569	176	3 552	19 949	26 211	24 441	21 389
South Africa .....	20 648	25 157	12 837	17 523	16 151	15 383	17 060
Tunisia .....	...	2 700	* 2 700	* 2 700	* 3 000	* 5 000	...
<b>TOTAL</b> .....	<b>32 000</b>	<b>36 000</b>	<b>28 000</b>	<b>54 000</b>	<b>57 000</b>	<b>57 000</b>	<b>* 60 000</b>
<b>OCEANIA</b>							
New Zealand .....	2 325	241	—	1 737	1 143	—	—
<b>WORLD TOTAL</b> .....	<b>685 000</b>	<b>650 000</b>	<b>720 000</b>	<b>770 000</b>	<b>860 000</b>	<b>890 000</b>	<b>1 030 000</b>

\* Estimate.

<sup>1</sup> Fertilizer year: May-April. - <sup>2</sup> Calendar year referring to the first part of the split year. - <sup>3</sup> Former French zone only.

ANNEX TABLE 22. - FERTILIZER CONSUMPTION IN RELATION TO ARABLE LAND AND TOTAL POPULATION

	Average consumption per 1 000 ha of arable land <sup>1</sup>						Population factor <sup>2</sup> 1960	
	1949/50			1960/61				
	N	P <sub>2</sub> O <sub>5</sub> <sup>3</sup>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub> <sup>3</sup>	K <sub>2</sub> O		
<i>Metric tons</i>								
WESTERN EUROPE	13.80	21.23	17.22	30.72	33.94	32.23	3.1	
Austria .....	9.59	18.20	13.43	26.60	50.20	49.30	* 4.0	
Belgium .....	78.34	90.00	93.08	105.90	93.70	160.71	9.7	
Denmark .....	22.19	30.43	31.31	44.53	41.67	64.88	1.6	
Finland .....	5.41	22.44	10.09	24.14	39.53	28.94	1.7	
France .....	* 10.65	* 17.51	16.78	26.39	40.99	35.03	2.1	
Germany, Fed. Rep. ....	37.87	38.84	68.14	72.34	76.25	117.66	6.5	
Greece .....	* 7.59	* 7.59	* 1.52	19.76	15.82	2.44	2.2	
Ireland .....	4.09	23.68	6.33	18.05	57.95	48.75	2.1	
Italy .....	7.78	16.06	1.04	21.01	23.93	6.55	3.1	
Luxembourg .....	39.60	67.81	44.65	62.65	81.51	79.62	4.1	
Netherlands .....	131.24	114.57	140.24	215.21	107.89	133.01	11.0	
Norway .....	45.40	45.60	61.83	59.36	55.33	63.63	4.2	
Spain .....	2.01	6.60	* 1.83	13.41	13.61	4.63	1.5	
Sweden .....	15.91	26.37	14.29	29.50	28.78	23.20	2.1	
Switzerland .....	16.46	62.37	27.20	<sup>4</sup> 36.92	<sup>4</sup> 98.17	<sup>4</sup> 95.89	12.2	
United Kingdom .....	28.14	55.58	32.15	62.90	57.22	60.04	7.2	
Yugoslavia .....	0.93	1.16	0.25	9.94	6.42	11.61	* 2.2	
EASTERN EUROPE AND U.S.S.R.	2.43	2.65	3.67	6.13	5.91	6.65	1.2	
Bulgaria .....	...	...	...	21.75	10.81	1.28	1.7	
Czechoslovakia .....	7.67	10.00	11.41	26.93	<sup>5</sup> 29.29	35.19	2.5	
Germany, Eastern .....	36.44	18.72	67.00	48.44	44.38	98.76	3.4	
Hungary .....	...	...	...	14.31	11.94	2.43	1.8	
Poland .....	5.57	6.1	9.88	16.89	12.90	19.19	1.8	
U.S.S.R. ....	* 6 1.36	* 6 1.9	* 6 1.88	<sup>7</sup> 3.36	<sup>7</sup> 3.60	<sup>7</sup> 3.35	<sup>7</sup> 0.9	
NORTH AMERICA	4.39	8.96	4.89	12.57	11.37	9.16	0.9	
Canada .....	0.86	3.11	1.55	2.16	4.04	2.38	0.4	
United States <sup>8</sup> .....	5.06	10.12	5.52	14.82	12.94	10.61	1.0	
LATIN AMERICA	1.07	1.19	0.48	4.08	* 2.62	2.33	2.0	
Brazil <sup>9</sup> .....	* 0.52	* 1.31	* 0.42	3.38	3.96	5.56	3.4	
Chile .....	1.21	2.61	0.28	* 4.53	<sup>10</sup> 5.37	<sup>10</sup> 2.94	1.3	
Cuba <sup>11</sup> .....	8.09	5.18	5.79	<sup>10</sup> 13.24	<sup>12</sup> 9.93	<sup>10</sup> 11.28	3.5	
Dominican Republic <sup>11</sup> .....	1.76	* 0.59	0.04	<sup>10</sup> 6.61	<sup>10</sup> 1.67	<sup>10</sup> 4.54	4.4	
Mexico <sup>12</sup> .....	0.17	0.22	0.04	6.77	2.14	0.45	1.7	
Peru .....	22.19	13.93	3.67	<sup>14</sup> 21.61	<sup>14</sup> 11.24	<sup>14</sup> 2.97	5.6	
NEAR EAST	2.44	0.67	0.05	3.46	1.15	0.13	1.7	
Israel .....	...	...	—	45.62	29.47	5.42	5.1	
Turkey .....	* 0.22	* 0.05	* 0.07	0.98	0.48	—	1.1	
United Arab Republic .....	38.04	5.73	...	<sup>7</sup> 71.19	<sup>7</sup> 14.49	<sup>7</sup> 1.31	<sup>7</sup> 10.5	
FAR EAST (excluding Mainland China and North Korea)	2.62	1.50	0.65	6.05	2.70	2.89	3.4	
Ceylon .....	8.50	0.67	6.13	<sup>15</sup> 19.45	<sup>15</sup> 1.67	18.04	<sup>15</sup> 6.4	
China: Taiwan .....	49.73	13.00	0.48	120.08	42.06	41.67	12.2	
India .....	0.52	0.06	...	1.76	0.36	0.18	2.7	
Indonesia .....	1.13	0.12	0.20	...	...	...	...	
Japan .....	50.58	38.82	20.03	124.03	80.88	98.77	15.3	
Korea, Rep. of .....	50.59	27.30	2.22	104.69	26.45	3.38	11.8	
Philippines .....	* 1.71	...	...	6.30	3.33	2.85	* 4.1	

ANNEX TABLE 22. - FERTILIZER CONSUMPTION IN RELATION TO ARABLE LAND AND TOTAL POPULATION (*concluded*)

	Average consumption per 1 000 ha of arable land <sup>1</sup>						Population factor <sup>2</sup> 1960	
	1949/50			1960/61				
	N	P <sub>2</sub> O <sub>5</sub> <sup>3</sup>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub> <sup>3</sup>	K <sub>2</sub> O		
<i>Metric tons</i>								
AFRICA	0.16	0.71	0.16	0.58	0.97	0.40	1.0	
Algeria .....	...	...	...	2.35	3.52	2.29	1.6	
South Africa .....	1.48	14.75	0.98	<sup>14</sup> 5.30	<sup>14</sup> 12.36	<sup>14</sup> 3.25	1.5	
OCEANIA	1.05	25.26	0.53	1.07	28.57	3.57	0.6	
Australia .....	1.19	25.54	0.61	<sup>17</sup> 0.83	<sup>17</sup> 19.23	<sup>17</sup> 1.12	<sup>17</sup> 0.3	
New Zealand .....	2.87	147.95	4.41	<sup>18</sup> 12.79	<sup>18</sup> 349.19	<sup>18</sup> 94.88	<sup>18</sup> 3.7	
WORLD TOTAL (excluding Mainland China and North Korea)	3.34	5.19	3.52	7.86	7.55	6.55	1.8	

\* Estimate.

<sup>1</sup> Data on arable land and land under permanent crops have been taken from FAO's *Production yearbook*, Table I: "Land Use." Arable land includes land planted to crops (double-cropped area counted only once), land temporarily fallow, temporary meadows for mowing or pasture, garden land and land under fruit trees, vines and fruit-bearing shrubs. - <sup>2</sup> Number of total population per hectare of arable land. - <sup>3</sup> Data exclude ground rock phosphate. - <sup>4</sup> Arable land excludes land under tree crops. - <sup>5</sup> Includes ground rock phosphate. - <sup>6</sup> Consumption refers to 1950. - <sup>7</sup> Area of arable land refers to 1961. - <sup>8</sup> Includes Hawaii and Puerto Rico. - <sup>9</sup> Arable land refers to land in agricultural holdings as per 1950 agriculture census. - <sup>10</sup> Consumption refers to 1959/60. - <sup>11</sup> Area of arable land refers to 1946. - <sup>12</sup> Consumption refers to 1957/58. - <sup>13</sup> Area of arable land refers to 1950 agriculture census. - <sup>14</sup> Consumption refers 1961/62. - <sup>15</sup> Area refers to arable land plus permanent meadows and pastures. - <sup>16</sup> Arable land includes area of wattle plantations. - <sup>17</sup> Arable land includes cultivated grassland. - <sup>18</sup> Arable land refers to agricultural holdings exceeding 10 acres (4.047 hectares) and situated outside of boroughs.



# THE STATE OF FOOD AND AGRICULTURE

## SPECIAL CHAPTERS

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In addition to the usual review of the recent world food and agricultural situation, each issue of this report from 1956 has included one or more special studies of problems of longer-term interest. Special chapters in earlier issues have covered the following subjects:

**1956** Some factors influencing the growth of international trade in agricultural products  
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**1957** Factors influencing the trend of food consumption  
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**1959** Agricultural incomes and levels of living in countries at different stages of economic development  
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**1960** Programming for agricultural development

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