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Abstract: *After a brief overview of the current state of food insecurity and FAO's strategic vision in this field, the paper describes the position of soybean in agricultural production and in food consumption at both the global and developing country level. The importance of soybean in overall agriculture and trade, its contribution to food supply and related nutritional issues are discussed. The paper then attempts to identify the key policy and market factors that actually shape the global soybean economy, leading into a discussion of implications for food security in developing countries. Overall, the study confirms the current and likely future importance of soybean for human nutrition at the global level. However, it also shows that determining the crop's contribution to combating hunger in food-insecure, import-dependent developing countries is a complex task that can lead to different results depending on the country involved. The paper reveals that the discussion of food security issues using a global, single-commodity perspective faces some important limitations.*

1. FAO'S STRATEGIC ACTION IN RELATION TO WORLD HUNGER

This section is aimed at providing some basic information about the state of food insecurity in the world and about the approach followed and main activities undertaken by FAO in pursuing increased food security. This will form the basis for analysing, in the following chapters, the role that soybean as a commodity can play to this same end.

(a) Hunger reduction and definition of food security:

Since the mid 1990s, FAO has devoted increased efforts in the definition of a strategic framework for eradicating hunger on a global basis. In 1996, the *World Food Summit* (WFS) endorsed the *Rome Declaration* and the accompanying *Plan of Action*, which aim at reducing by 50% the number of undernourished persons in the world by year 2015.

“Food Security at the individual, household, national, regional and global level will be achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious

¹ This study is based on a paper presented at the VIIth World Soybean Research Conference held in Foz do Iguassu, Brazil, 1-5 March 2004. The paper has been prepared by P. Thoenes, Commodity Specialist, with the assistance of other officers in the Commodities and Trade Division and contributions from the Plant Production and Protection Division, the Food and Nutrition Division, the Agricultural and Development Economics Division, and the Global Perspective Studies Unit. The statistics and graphical work were provided by M. Milo. The text reflects the views and opinions of the author and so should not be attributed to FAO or its members.

² The subject of this paper is a comprehensive one that raises far-reaching questions, the answering of which constitutes an ambitious task. Dealing with such complex topic in a satisfactory manner would require systematic research, including extensive data compilation and quantitative analysis, both at the global and country-specific level. Doing so certainly goes beyond the scope of this mainly qualitative study. Essentially, this paper attempts to identify and discuss in as coherent as possible a manner some of the numerous dimensions that directly or indirectly link soybean to the global problem of hunger. While consideration will be given to a wide range of technical, economic and political issues, the paper will necessarily tend to generalize and may lack empirical evidence and statistical detail.

food to meet their dietary needs and food preferences for an active and healthy life”. This definition, accepted by the 1996 Summit, includes the following three dimensions:

1. food availability - as it results at the country level from production, imports and food aid;
2. food access and utilization - as it results at the household and individual level from income availability, access to assets and to food related market infrastructure etc., and
3. stability of both access and availability - as defined by weather and production conditions, price variability, and the individual and household’s ability to cope with it.

(b) The state of food insecurity in the world:

FAO has the mandate to monitor progress in hunger reduction based on accurate, reliable and timely methods that measure the prevalence of hunger, food insecurity and vulnerability and that also illustrate changes over time.

Available historical series show that, in the developing countries, the number of chronically undernourished and their proportion of total population has declined markedly over the 1970-2000 period (see table 1 in annex 2). This reduction was associated with a substantial increase in calories available per person per day. In parallel, some important improvements in nutrition have occurred: diets have become more diverse, with shifts away from cereals, roots and tubers towards more meat, milk, fruits and vegetables, sugar and vegetable oils (see graph 1 in annex 2).

The main findings of FAO’s latest report on the status of food insecurity are as follows: For 1999-2001 the number of undernourished people is estimated at 842 million. Of these, almost 800 million live in the developing countries. What raises concern is that FAO’s latest estimates seem to indicate that progress in reducing the number of undernourished in the developing world has come to a halt. While in the first half of the 1990s the numbers of undernourished seemed to decline, their number increased again in the second half of the 1990s. Thus, the net reduction since the WFS reference period (which is 1990-92) is only 19 million people. It is certainly too early to judge whether the recent increase represents a major shift in the historical decline of global hunger or a short-term spike caused *inter alia* by a series of crises and conflicts.

Regarding the distribution of hunger, FAO’s estimates show that most of the undernourished live in Asia (see graph 2). Of the nearly 800 million undernourished people in the developing countries, Asia and the Pacific accounts for more than 60%. Countries in Sub-Saharan Africa account for 25%. A different picture emerges when the share of the undernourished in total population is considered (see graphs 3 and 4): by far, the highest prevalence of undernourishment is found in Sub-Saharan Africa, where one third of the population does not have access to enough food for an active and healthy life on average. This percentage is twice that found in any of the other developing country regions.

Without intensified efforts, FAO projects that the number of undernourished in 2015 will have been reduced to 610 million people under a “business-as-usual” scenario, clearly falling short of the WFS target (see graph 5). If we are to reach the original target, from now on an annual reduction of 26 million people chronically undernourished will be necessary, as opposed to the average of 2 million per year achieved over the 1990s.

It appears that, in numerous developing countries, improvements in the overall availability of food are not accompanied by a commensurate reduction in the prevalence of undernourishment, which suggests that availability may be less of a problem than access, indicating inadequacies in income distribution, access to assets and market infrastructure.

It needs to be added here that in addition to undernourishment we observe also a rising problem of overnourishment and related chronic diseases – a trend which is no longer limited to industrial nations and includes more and more developing countries.

(c) FAO's initiatives to fight hunger:

Recent FAO initiatives to fight hunger can be placed in the context of a twin track approach that takes into account the multi-faceted nature of the problem to be addressed.

The two main objectives are:

- (i) to foster - through policy reform and by attracting investment - rural and agricultural development (raising production and productivity in a stable and sustainable way) so as to create opportunities for the hungry;
- (ii) to take direct and immediate measures to enhance access to food, thus equipping the hungry to take advantage of opportunities in agriculture or other sectors.

Under this approach, actions taken contribute directly to the three dimensions of food security listed under (a) above, while at the same time responding to a particular policy and regulatory framework. Furthermore, FAO's initiatives are designed to integrate three types of action, namely (i) advocacy and information, (ii) policy advice, and (iii) technical assistance projects and programmes.

The main programmes currently under implementation are:

- International Alliance Against Hunger (IAAH)
- Anti-hunger Programme (AHP)
- Food Insecurity and Vulnerability Mapping System (FIVIMS)
- Intergovernmental Working Group on the Right to Food (IGWG)
- National Strategies for Food Security and Agricultural Development: Horizon 2015
- Regional Programmes for Food Security
- Comprehensive African Agricultural Development Programme (CAADP)
- Special Programme for Food Security (SPFS)

2. DEFINING THE ROLE OF SOYBEAN

This chapter reviews the relevance of soybean production, consumption and trade at both the global and developing country level, paying attention to economic and technical aspects as well as issues related to food security.

2.1 The overall importance of soybean

Consistent improvements in average yield levels and reductions in production costs have steadily improved the competitive position of soybeans among arable crops. Among oilcrops, soybean covers a leading role at the global scale. Currently, soybeans account for about 35% of total harvested area devoted to annual and perennial oilcrops. The crop's share in global oilcrop output is estimated at 44%. Cultivation is highly concentrated geographically (see table 2), with only four countries - USA, Brazil, Argentina and China - accounting for almost 90% of world output. Asia - excluding China - and Africa, the two regions where most of the food insecure countries are

located, together account for only 5% of production. Among countries classified as 'undernourished'¹, only India and Bolivia are significant producers of soybeans.

How important is soybean for human nutrition, in particular in developing countries? The contribution of oils and fats to human diets is best estimated by measuring their contribution to overall available dietary energy supplies (DES) expressed in calories (see table 3). While total oils/fats (from all sources) in the diet account for about 24% of DES globally, the percentage figure is 21 for developing countries and 33 for developed nations. Among developing nations, this percentage appears to be consistently below the group average in countries with a high prevalence of hunger. These figures refer to the total intake of oils/fats in whatever form and from whatever origin.

Finding a meaningful way to measure the importance of an individual oil, such as soyoil, is less straightforward. If the contribution of soyoil to total caloric intake from oils and fats is measured, the following picture emerges (see table 4): globally, soyoil occupies an important position in the diet; its role tends to be more important in developed than in developing countries, though variations at the regional and sub-regional level appear to be considerable. Measuring the contribution of soymeal to the diet - via livestock products - is even more problematic. It would require detailed information - at the country level - on the utilization of soymeal in individual livestock subsectors as well as detailed meat consumption data. In the absence of such data, per caput availability of soymeal can be calculated and used as approximate indicator of the importance of soymeal utilization in individual country groups, and the picture emerging is as follows (see table 5): average per caput availability of soymeal in developed countries exceeds that of developing ones by more than four times; and availability of soymeal in countries classified as undernourished is less than half of that calculated for developing countries as a whole, which suggests that soybean meal tends to be relatively unimportant in the most food insecure countries.

2.2 Crop production

Soybean has been grown as a commercial crop primarily in temperate ecologies for thousands of years, first in northern Asia and in more recent years in North America and countries of the Southern Cone of Latin America. The remarkable success of this crop in temperate zones is well known to all, but there is also a very important potential role for soybean in many cropping systems of the tropics and subtropics, where often the farms are mostly small and with little mechanization. Smallholder participation in development is one of FAO's major interests and concerns in regard to soybean expansion and utilization as it contributes to sustainable development and meeting goals of the World Food Summit. The driving forces for growth of such smallholder based soybean production include potential increases in farm family income to help lift them out of poverty, and also - in relation to sustainability - the need for an easy-to-grow, leguminous, rotation crop for the millions of hectares in cereal and root crop production. Farmers need to rotate crops to break disease and pest cycles and to maintain soil fertility, and the rotation crops need to be profitable. There are, in some cases, other options for rotation crops, but soybean can be a good choice especially when other legumes are subject to heavy insect and disease pressures and where there is a clear market link from the grower to the industry. Soybean is one of the few choices where major expansion in production area might be possible because of the crop's demand in the vegetable oil and feed sub-sectors, while in contrast the market for other legumes with food-only uses (e.g.

¹ Throughout this paper (text and annexed tables), this group of countries is defined as those nations where, in 1999-2001, the undernourished were estimated to account for 20% or more of the total population. A person is defined as suffering from undernourishment when his/her daily calorie intake is estimated to be below 154 % of his/her Basal Metabolic Rate (BMR). The BMR takes into account country-specific values for population age, age-structure and height.

cowpea, *Phaseolus* beans, lentils, pigeon peas, etc) becomes rather quickly saturated when the area of cereal crop rotation reaches even 10% of total cereal crop lands.

What are the constraints for tropical soybean, and can they be overcome? The initial problem that most commercial high-yielding varieties from temperate ecologies flower too early under the short day-length conditions of the tropics has already been overcome through breeding programmes such as those in Brazil, India, Thailand, Nigeria, etc. Another constraint - the effective symbiosis with rhizobium for nitrogen fixation - has also been largely overcome by use of selected seed inoculants and/or the selection of soybean varieties capable of effective nodulation with indigenous rhizobial populations existing already in the soils (Nigeria is a good example of this approach of promoting promiscuously nodulating varieties). The issue of poor seed longevity of soybean stored between growing seasons in humid tropical zones remains problematic. For this reason, soybean is often excluded as a crop option in humid ecologies unless sophisticated seed processing is available. In some cases this seed viability problem is being managed by transporting seed at the time of planting from dry areas, where seed keeps well. Varieties can be developed with improved seed longevity but sustained efforts are required. Like for other crops, pest and disease control in soybean can be problematic, requiring IPM approaches to reduce costs and environmental problems.

Access to local markets appears to be the main constraint in many developing countries in the tropics and sub-tropics where local soybean production could improve farmer incomes and the sustainability of the production system. Often soybean is imported into countries by the local vegetable oil and feed industries and as a consequence no demand for the crop is felt in the farming community. Where good market links from processors to local farmers have been made, as in Nigeria and especially in India, the farmers generally respond and the crop finds a good home in diverse cereal and root crop based production systems. Farmer incomes improve and the production systems become more sustainable. The rate of smallholder-based soybean production increase in India is one of the most remarkable stories in recent agricultural history. Many farm communities where the crop has found a niche have had substantive improvements in income and quality of life. Soybean can be a valuable alternative crop for many small-holder producers and FAO would like to see such opportunities replicated where the crop fits.

Much criticism has been raised about expansive mono-crop soybean in fragile ecologies such as the savannahs of Brazil. Improved policy on use of forest margins and promotion of good agricultural and forestry practices are under review in Brazil and elsewhere. There were and still are, however, serious problems. Some of these problems are being addressed by changes in production practices of farmers with technical support from research institutions, such as EMBRAPA. Perhaps the biggest improvement is the rapid farmer adoption of zero tillage technologies in both North and South America. Brazilian farmers are world leaders in adoption of no-till in response to both environmental concerns and also because it improves their income. FAO and other organizations are promoting conservation agriculture based on zero-tillage technologies for small as well as largeholder farmers in many production systems and ecologies. Another improvement is crop rotations, including maize, rice, wheat, and in some cases the incorporation of under-sown pasture and other cover-crops to ensure soils are always protected from erosive forces.

Oil palm is a major competitor with soybean oil, but while the palm produces far more oil per unit area than soybean, soybean's role is expected to be secure as the protein meal derived from soybean is in huge demand and oil is a very lucrative by-product. It is also true that oil palm is generally grown in different ecologies than soybean, so there is a certain amount of geographical complementarity.

Finally, soybean is one of the crops where biotechnology applications are particularly important. Commercial production of genetically modified soybeans has increased fast in recent years, with

important repercussions for consumption and trade. For FAO, the issue of GM soybean or any other crop is dependent on country policy. In general, FAO's position on GMOs is that the technologies involved merit consideration on a case by case basis, when food safety and biosafety aspects have been analyzed scientifically in the context of the local situation. The advent of GMO soybeans has created enormous debate and the scope of the arguments cannot be described here. The assessment of GMO soybean in terms of its impact on trade, food security, poverty, and the sustainability of agriculture represents a complex task that goes beyond the scope of this paper.

2.3 Economic aspects

Soybean is a high value and profitable crop. The economic viability of soy production is determined by the commercial utilization of both its subproducts, meal and oil, which, respectively, account for about two thirds and one third of the crop's economic value. Soybean oil and meal are consumed worldwide as food and animal feedstuff respectively. Soybean meal accounts for over 60% of world output of vegetable and animal meals and occupies a prominent position among protein feedstuffs used in the production of feed concentrates (see table 6), while soybean oil is the single most important vegetable oil, accounting for 20% of global vegetable oil production (see table 7). Its dominance over other vegetable oils has diminished somewhat following the advent of palm oil, which now accounts for at least 18% of total production. The widespread use of soybean oil in particular as edible oil is mainly due to (i) its plentiful and dependable supplies, (ii) its competitive price and (iii) its neutral flavour and its stability in both unhydrogenated and partially hydrogenated form. Indirectly, the rapid rise in the demand for compound feed has contributed considerably to the rise in soybean and soybean oil production.

What is the current contribution of soybeans to income generation at the national, sectorial and household level and how could it be measured? Soybean contributes significantly to the total value added by the agricultural sector in the major producing countries and particularly so in Brazil, Argentina, Paraguay and the USA. In these countries, soybeans and its two main sub-products also occupy an important position in export earnings from agriculture as well as in terms of total merchandise exports (see table 8). A few other countries, notably India and China, are also involved in exports (mainly soybean meal) but these play a more limited role and are subject to considerable year-to-year variation. Among the group of undernourished countries, apart from India, Bolivia is the only country that derives significant income from exportation of soybean and derived products.

Moving to the farm household level, it appears that the bulk of the world's soybean production comes from medium to large-size farms that are characterized by capital intensive production methods and a high level of mechanization. In addition to producers in North America and the EU, this also applies to the average soybean farm in South America. The situation is different, however, in Asia (China, India, Indonesia, Japan, PDR of Korea, Thailand, Vietnam) and in Africa (Uganda, Nigeria), where soybean tends to be produced - sometimes predominantly - on a smaller scale, normally involving labour intensive cultivation methods. In these regions, the contribution of soybeans to the food security of small rural households tends to be relatively more significant, albeit its overall importance remains low due to the crop's limited role in total cultivated area.

A particular feature of the soybean economy is that considerable value addition occurs at the downstream stages of the production and processing chain. On-farm storage of soybean plays a minor role and small-scale processing and marketing at local level is only relevant in those - statistically less important - areas where soybeans are directly consumed as food. At the global level, the bulk of soybeans produced is stored and shipped in bulk to large-scale industrial units for further processing into oil and meal. Downstream transformation and subsequent - partly export oriented - marketing of end products can thus be considered as completely separate economic

activities that generate considerable value outside the agricultural sector as such, which explains the economic importance of soybean for food industries and markets at the national as well as international level.

2.4 Consumption patterns

While soyoil is produced in a limited number of countries only, it is widely traded and thus available in almost every country of the world. At the global level, annual per caput consumption is estimated at 3.2 kg (see table 9). However, when disaggregated, consumption levels differ widely, with average consumption levels in industrialized countries almost three times that observed in developing nations. Also the share of soybean oil in total vegetable oil consumption or total oils & fats intake varies considerably between regions and countries (see table 10), depending on numerous factors such as the availability of locally produced oils, consumer habits and preferences, local and international market prices and national trade policies. Overall, during the last two decades, two oils, soyoil and palm oil, have strengthened their position vis-à-vis all other oils and fats, with palm oil recording the fastest growth rates (see table 11). These two oils are close substitutes and both products are widely traded - at comparable price levels - on the global market (see graph 6).

Regarding vegetables oils & fats in general, available statistics indicate that consumption tends to increase faster in poor countries than in middle- and high-income countries, and some national studies seem to confirm that extra income enhances fat intake of the poor more than that of the rich. Consequently, in the long term (i.e. by the year 2030), FAO anticipates oilcrop products to account for as much as 45 out of every 100 extra kcal added to average diets in developing countries, which implies a continuation and intensification of the recent trend. Relatively high income elasticities of demand explain why there is considerable scope for increasing average per caput consumption of vegetable oils in developing countries. Soyoil, together with palm oil, is certainly well placed to play a central role in this expansion.

Also soymeal is widely consumed and has penetrated markets in most regions - thanks to the expansion of intensive livestock production methods that are based on the use of high protein compound feed not only in developed countries but also in parts of the developing world, e.g. broiler production in Asia. Although close to 60% of global utilization occurs in developed countries, annual growth in consumption in developing countries by far exceeds the expansion recorded in developed countries, mainly reflecting changes in consumer habits triggered by income growth (see table 12). However, it needs to be emphasized that in the diet of low-income and chronically food insecure populations meat consumption generally occupies a secondary role as most of the protein consumed tends to come from vegetable origin.

2.5 Trade patterns and trends

Within the soy complex, beans account for about half of the total value of trade; the shares of soymeal and soyoil are 35 and 15% respectively, while that of soyfoods is negligible. Soyoil occupies a dominant position in global vegetable oil trade both in volume and value terms. However, over the years, palm oil has become a major competitor, and the two oils directly compete for market share, based on their relative price. Soymeal, on the other hand, as a high value ingredient for compound feed, occupies a leading position in global feedstuffs trade.

The widespread consumption of soyoil and soymeal is made possible by the exportation of soybeans and their products by a few major producing countries to a large number of importing

countries. Around one third of global soybean, soyoil and soymeal production enters trade (see table 13). This proportion is significantly above that recorded for other agricultural commodities. The key producing countries export a combination of beans and their two subproducts, depending on the requirements of the market and domestic policies. A main feature of the market is the high level of concentration, with five countries (two developed and three developing) accounting for over 90% of the market (see table 14). The main competitors on the export market are USA, Brazil and Argentina.

A large number of countries are involved in the importation of soybeans and/or products for domestic consumption and, in some cases, for re-exportation purposes. Depending on domestic demand, which is also determined by the structure of the local processing industry, countries import either the raw material, soybeans, or directly soyoil and/or soymeal. In recent years, a number of importing countries have shifted from the importation of soyoil or meal to purchases of beans, which reflects efforts to promote processing - and thus value addition - at the domestic level.

During the 1990s, developing country imports of soybeans and derived products more or less tripled in volume terms; this group of countries contributed to about three quarter of the expansion in global trade, reaching market shares, in 2000, around 50 and 70% respectively for soymeal and soyoil (see table 15). The extraordinary growth experienced by trade in soybeans and products has thus been largely driven by economic expansion in developing countries, with Africa and in particular Asia playing a central role. It needs to be emphasized here that, among developing countries, the contribution of imported soybean products to the rising average intake of dietary energy and protein has been and will likely continue to be of utmost importance.

Typically, imports have surged where domestic demand has expanded faster than production. As a result, the contribution of net imports to domestic consumption has surged in numerous developing countries in recent years (see tables 16 and 17), in some cases involving big upward leaps in import volumes, with corresponding rises in import bills. Outstanding examples include China and India. In the former, roughly one third of domestically consumed soymeal originates from imported soybeans, while in the latter, almost 40% of domestic vegetable oil supply is covered by imports.

2.6 Nutrition and related health issues

The role of soybean products in overall food consumption has been outlined briefly in section 2.1 above. In what follows, the nutritional value and health benefits associated with the consumption of soyfoods on one hand and soy oil on the other shall be discussed.

(a) Soyfoods:

The consumption of soy-based foods derived from the whole fresh bean has a long tradition in numerous Far Eastern countries (Taiwan and other parts of China, Japan, Indonesia, DPRRep. of Korea, Rep. of Korea, India, Thailand, Vietnam) as well as in specific pockets of Africa (notably Nigeria and Uganda). Traditional soyfoods - such as miso, tofu, tempeh, soya sauce etc. - are derived either directly from the whole fresh bean or after processing of the bean into soymilk and are consumed either in fermented or non-fermented form. In the recent past, the range of soyfoods has expanded to include (i) fresh beans and sprouts, (ii) dairy substitutes such as soy milk, cheese etc., (iii) grain products such as soybread, pasta and flour, (iv) meat substitutes, and (v) soy spreads and pastes. Although, in recent years, soyfoods have been introduced in many more countries in the developed and developing world, the share of domestic soybean supplies intended for direct consumption - as opposed to crushing - remains below 10% at the global level, an average figure that masks strong differences between main geographical regions.

Soy-foods are generally considered to be nutritious and healthy based on their nutrient composition which includes protein, fat, carbohydrates, dietary fibres as well as minerals and phytoestrogens (or isoflavones). With regard to the latter, recent scientific studies associate the consumption of phytoestrogen-rich diets – e.g. Asian diets rich in soybeans - with a lower risk of the so-called “western” diseases, i.e. coronary heart diseases, osteoporosis, hormone-dependent forms of cancer and menopausal symptoms. The health-benefits of isoflavones contained in soyfoods have been explained by their structural resemblance to endogenous oestrogen, showing oestrogenic and anti-oestrogenic properties as well as anti-oxidative, anti-proliferative and anti-angiogenic properties which are non-hormonally dependent.

Based on the above and considering the economic and technical limitations prevailing in tropical developing countries, the direct consumption of soybeans as a nutritious food that is economically accessible for large parts of the population appears to be appealing. However, the observed slow spreading of soyfoods outside the prevailing traditional areas of consumption seems to suggest that a relatively low level of consumer acceptability of these products is likely to stand in the way of a significant expansion in consumption.

(b) Soy oil:

Soybean oil is the most widely consumed vegetable oil worldwide. Although it is used as cooking oil in private households its main use is that of key fat ingredient in industrial food manufacturing, where, closely followed by palm oil, it represents the most commonly used fat.

The role of oils & fats in general and soyoil in particular in human nutrition and specific health aspects associated with their presence in the diet deserves particular attention. Of particular interest is their potential contribution to the prevention of diseases. In general, the incidence of chronic, non-communicable diseases (NCDs) is growing rapidly. In developing countries, these diseases exist alongside hunger and undernutrition and are becoming increasingly important. One major determinant of this growing health burden is the so-called ‘nutrition transition’ observed in many developing countries, that is rapid socio-economic, demographic and technological changes in society that induce a shift in habitual dietary consumption. Nutrition transition does affect vegetable oil consumption in developing countries, in that urban as well as rural populations seem to be undergoing a gradual shift away from traditional, locally produced oils and fats towards other, readily available and attractively priced vegetable oils, notably imported soy oil and palm oil, that are consumed either directly or as ingredients in commercial food products.

In this context, an evaluation of consumption trends against broad population nutrient intake goals appears to be of interest. With regard to ranges proposed for the total intake of oils/fats ¹,

¹ In this paper, reference shall be made to the following ranges that have been proposed by an expert consultation convened by WHO and FAO in January 2002; ranges are expressed in percent of total dietary energy consumed:

Total Fat	15 - 30%
Polyunsaturated fatty acids	6-10 %
Saturated fatty acids	< 10 %
Trans fatty acids	< 1 %

The above ranges reflect broad population intake goals - not individual dietary guidelines - that aim at ensuring that average population moves towards the recommended targets in order to reduce the risk within the population of diet-related diseases. Obviously, these broad goals need to be interpreted in country-specific situations, i.e. adapted to specific diets and sub-groups of population by taking local circumstances and the individuals’ needs into account.

preliminary statistical analyses conducted by FAO suggest that, on average, total fats intake is within recommended ranges in developing countries but has exceeded the upper limits in developed countries. The steady and strong expansion of global soyoil and palm oil consumption has played and is likely to continue playing an important role in this regard. A number of developing countries, notably in Sub-Saharan Africa and South Asia, are expected to remain below the recommended lower limits; notwithstanding, a growing number of developing nations are anticipated to reach and then exceed the recommended upper limits. Many mid-income developing countries and most developed nations will rapidly exceed the recommended upper consumption limits, often by a considerable margin, leading to malnutrition and potentially raising the exposure of populations to health risks, for example regarding obesity. The observed rise in soy and palm oil consumption may thus be associated with benefits as well as disadvantages and risks depending on the country and population group concerned.

Nutrition goals also refer to the desirable fatty acid composition in the diet. Each oil/fat is characterized by a particular fatty acid composition, and maximum and minimum levels have been proposed regarding the presence of individual fatty acid groups in diets.¹ Reportedly, diets with potentially negative health implications are those where saturated fatty acids and/or trans fatty acids are in excess of certain desirable levels, while diets including oils/fats rich in mono or poly-unsaturated fatty acids tend to be considered as more healthy. In individual countries and population groups, diets include different proportions of these fatty acids depending on the oils and fats consumed. A meaningful evaluation of consumption trends by population groups or countries requires detailed information on the pattern of oils/fats consumption, based on representative individual and household consumption surveys in both urban and rural environments. At the present time, such information is not available, and thus no general conclusions can be drawn.

In conclusion, it is important to recognize, in many developing countries, the coexistence of conditions which predispose them to the “double burden” of undernutrition on the one side and partly diet-related NCDs on the other - a circumstance that further complicates the assessment of the role of an individual foodstuff like soy oil in the food security context. While soyoil can be expected to maintain and further strengthen its position in global consumption of oils and fats, nutritional considerations are likely to play an increasing role in the future.

In the longer term, dietary recommendations relating to the intake of oils and fats could modify consumption behaviour, initially in developed countries but gradually also in developing countries. In turn, crop production patterns, trade as well as food processing, distribution and marketing could be affected. At the same time, any dietary adjustment process will take place in the presence of other changes, notably the ongoing liberalization of trade, globalization of food production, processing and distribution, urbanisation, technological progress etc. The entire prospect is raising considerable concern in the global oil/fats industry - a highly specialized and competitive sector that, due to high costs associated with changes in the production chain, is particularly susceptible to changing market conditions. The industry is expected to increase efforts to adjust to possible health related shifts in demand. For instance, investments into technologies that allow altering the fatty acid composition of individual vegetable oils via genetic modification of the underlying crop can be expected to rise. Also, the manufacture of vegetable oil blends that combine the nutritional

¹ Soyoil is, on average, composed of 14% saturated fatty acids, 23% monounsaturated and 58% polyunsaturated fatty acids. Due to its relatively low melting temperature, soy oil (as several other major vegetable oils) needs to undergo hydrogenation when it is used in food manufacturing where hardened fats are required. In this process, trans fatty acids are formed. The fatty acid composition of palm oil - the main competitor to soyoil at the global level - shows more saturated and monounsaturated fatty acids and less polyunsaturated fatty acids. However, as a semi-solid oil (thanks to a higher melting point) palm oil can be used in food processing without hydrogenation, thereby potentially limiting the trans fatty acid content of the end products.

characteristics of individual oils in an optimal manner is likely to become increasingly important as is research on the beneficial health properties of nutrients contained in specific vegetable oils and oilcrops. Over the next few years, attention could focus in particular on oilcrops other than soybeans, notably oil palm and coconut, possibly leading to changes in their competitive position vis-à-vis other oils.

3. MAIN FACTORS SHAPING THE SOYBEAN ECONOMY AND RELATED FOOD SECURITY ISSUES

The previous chapter has illustrated the important position hold by soybean with regard to agricultural production and trade as well as food consumption, making special reference to developing countries and to technical, economic and nutritional aspects. This chapter will attempt to identify the key factors that actually shape the global soybean economy and discuss related implications for developing countries' food security. The interplay of market forces on the one hand and government policies on the other is believed to be the main determinant in this regard.

3.1 The role of government policies

It is commonly recognized that the pattern of national and global agricultural production, consumption and trade and the accompanying allocation of production factors within and between individual countries are strongly influenced by national as well as international policies. Therefore, the assessment presented in the previous chapter - which highlighted the potential benefits (from an agronomic, economic, food security and nutritional perspective) associated with soybean production and consumption especially in low-income food insecure countries - needs to be re-examined against the prevailing policy setting.

The scope of this paper does not allow providing a comprehensive account of national policies affecting soybean production, trade and consumption. A brief summary of relevant policies currently in place and of the main trends observed is annexed to this paper (see annex 1). The review of those policies confirms that a wide range of government measures is in place and strongly affects the allocation of resources among agricultural crops at both the national and global level. In the specific context of this paper, the question arises whether such policy measures are being or could be used to encourage the expansion of soybean production or consumption in food insecure developing countries. The following observations seem to point toward a negative answer:

- (i) the global pattern of oilcrop production and consumption appears to be strongly conditioned by domestic support policies implemented in developed countries, which used to (and to some extent continues to) significantly distort overall markets in such a way to prevent most developing countries from moving into soybean cultivation;
- (ii) national agricultural and food policies tend to be strongly influenced by a country's overall economic and trade interests; as a result, the scope for sector or crop-specific support measures tends to be limited, particularly in developing countries;
- (iii) often governments face the need to satisfy a wide range of potentially contradicting policy objectives; as a result, support measures tend to be designed in such a way that they serve multiple purposes and benefit larger sections of the market rather than just one particular crop, group of farmers or consumers; single-commodity oriented food security policies are rarely favoured by policy makers in developing countries;
- (iv) in developing nations, where public support is severely limited by budgetary constraints, the preferred means of governments intervention appears to be trade control measures; the latter, however, carry the risk of protecting domestic processing industries' interests more than those of farmers or consumers of agricultural products;

- (v) the on-going global liberalization of trade is strongly favouring the integration of developing countries into international markets, possibly weakening the incentive of these countries to develop food production for domestic use;
- (vi) in general, government programmes appear to be primarily directed toward agricultural production/income and trade policies; the level of complementarity between such programmes on the one hand and food and nutrition policies on the other seems to be low.

From the above assessment it emerges that, given the current policy context, the implementation of food security policies that focus specifically on the promotion of oilcrop production in food insecure developing countries are prone to face a number of obstacles, thus limiting the prospects for soybean cultivation to move into new regions.

3.2 Key market forces and related food security aspects

This last section attempts to describe in a comprehensive manner the set of forces that determine the shape of the global soybean economy and to discuss related food security aspects.

Over the last decades, the global soybean economy has undergone important changes under the influence of technological innovations, national and international policy measures and gradual shifts in demand. In the process, South and North America established themselves as the world's leading producers and suppliers of soybeans, aided by a rich natural and/or financial resource base, the swift introduction of new technologies and production incentives coming from government support programmes and other national policies.

This process has resulted in today's global soybean economy being characterized by a high level of concentration and specialization throughout the commodity chain. The type of technological advances introduced in soybean cultivation and processing have been such that economies of scale have become a key determinant for the industry's structure at the national and global level. High investment costs involved in soybean cultivation, storage, crushing and marketing have fostered vertical integration within the sector as well as horizontal operations across commodity sectors and countries. As a result, today's global soybean economy tends to be shaped by a relatively small number of countries and international business conglomerates that control a highly competitive and mature market. Strong price competition, high levels of market concentration and further private sector consolidation are expected to persist and possibly increase further in the coming years, driven by, inter alia, increased pressure from competing commodities (e.g. palm oil) and the prospect of further technical innovations, particularly in the area of biotechnology.

The above described structure of the industry explains why, as reported in section 2.2 above, small countries/producers in Asia or Africa are facing major difficulties in taking up commercial production of soybeans. In these countries, which normally have easy access to imported soy or palm oil, price competition is increasingly felt down to the level of rural markets, thus lowering farmers' production incentives. This situation also undermines private sector investment into research and development activities aimed at improving soybean productivity, for example the introduction of traits of economic importance into locally adapted varieties. These disincentive effects are compounded by the recent tendency of governments to scale down direct production support and related protection measures, which, in the case of oilcrop products, is leading to increased integration into international markets and rising levels of import dependence.

Therefore, although technically feasible and generally desirable from an agronomic, income generation and nutritional point of view, the prospects for a widespread introduction or significant expansion of soybean cultivation in low-income, food-insecure countries in Asia or Africa remain

rather uncertain (notwithstanding some positive exceptions like India and Nigeria¹). For these countries, diversification into other commodity sectors that offer better market opportunities at the local, regional or international level may prove to be more remunerative than moving into soybean cultivation, where, in addition to facing highly competitive international markets, producers would need to overcome a technology gap.

How does the situation described here affect domestic food security in developing countries? The reliable supply of competitively priced soyoil and meals, together with the on-going liberalization of agricultural trade have allowed imports of many low-income, food insecure developing countries to grow at a steady and fast pace, contributing to stable and normally rising levels of per caput consumption. In general, the fact that this development tends to increase the dependence on imports is not in conflict with strategies aimed at improving national food security.² However, the question whether or not the described path does represent an optimal solution can only be answered on a country-specific basis, using an across-commodity perspective that takes into account a country's overall production pattern, total food balance, net trade position, balance of payments and national policy goals - just to name the main factors.

While the above general observations hold for the average food insecure country importing soybeans or soybean products, a few qualifications need to be made, especially with reference to the particular structure of the world market for soybeans and derived products. The high level of concentration observed in global soybean production and exportation can lead to instabilities in the market that are potentially detrimental for both exporters and importers, and thus producers and consumers. Producers and exporters in major soybean supplying countries tend to be susceptible to external shocks that are outside the direct control of the industry. Major destabilizing factors include unusual weather conditions and biotic stresses, which, through their direct impact on production, can lead to increased price volatility on world markets that, in turn, risk to negatively affect consumers in importing countries. Furthermore, markets can be strongly affected by macro-economic policies: for instance, sudden changes in the exchange rates can easily alter the competitive position of exporters and/or the trade opportunities of importing countries. Finally, markets can be destabilized by sudden shifts in demand, for example as a result of food safety scares, as witnessed in recent years by the soymeal market through its link with the livestock industry.

Given the increasingly liberalized trade policy environment, small or food insecure countries tend to find it particularly difficult to absorb the negative effects emanating from market instability. At the same time, however, the relatively high substitutability of soybean products can be considered as a mitigating factor, which guarantees a high level of price responsiveness in the concerned markets. In fact, in the event of market shortages, both soybean meal and, above all, soybean oil can be easily replaced with comparable products available on either international or domestic markets.

One more aspect appears to be relevant with regard to food security. In the current market and policy environment, utilization of and investment into indigenous or traditionally established oil-

¹ As mentioned in section 2.2, policies to encourage soybean production could have some merit when consideration is given to diversification of cereal and root crop based production systems. The nitrogen fixed by soybean can enhance the productivity of other crops in the system, and India and Nigeria are examples where the crop is promoted in this context.

² Across agricultural commodities and on a global scale, the analysis of available data seems to suggest that engaging in agricultural trade generally tends to be associated with less hunger, not more. Statistics show that, on average, at a national level, the proportions of undernourished people tend to be lower where agricultural trade is large in proportion to agricultural production (see graph 7). Furthermore, countries where more than 15% of the population goes hungry import less than 10% of their food, compared to more than 25% in more food secure countries. These findings seem to suggest that the relative isolation from international trade is more a measure of vulnerability than of self-sufficiency.

bearing seed or tree crops tends to be neglected in many developing countries. A wide range of such crops exist in virtually all developing countries, including the resource poor, chronically food-insecure countries, and there is widespread evidence of underexploitation of these resources. Typically, the crops in question are well adapted to local soil and climate conditions, integrated into the prevailing farming systems and known to local populations, which are used to include them in their diets. The contribution of such oils to the food security of especially rural populations can be significant - either through direct consumption and through income generation where products can be marketed. However, experience from several countries seems to suggest that the ready availability on the market of attractively priced imported oils tends to gradually displace such alternative, locally produced oil crops. Making appropriate use of the nutritional and economic potential of these crops appears to be highly desirable. Without having to modify a country's food and trade policies, specifically targeted support measures could help to attract private investment into some of these high potential, traditional oil crops.

4. CONCLUSIONS

The following major findings emerge from the above assessment:

- While the reduction of world hunger remains FAO's main strategic thrust, the specific target set in this regard by the 1996 *World Food Summit* looks unlikely to be met at the current pace. Increasingly, the problems to overcome in this regard seem to be related to distribution and access to food in addition to production and global availability of food.
- As one of the world's major and fastest expanding crops, soybean contributes significantly to overall human nutrition in terms of both calorie and protein intake; the crop appears to be well placed to meet the fast growing demand for vegetable oil and animal feed in developing countries.
- In principle, soybean can be encouraged in smallholder based production systems in the tropics and subtropics to diversify production, generate income, and capture positive rotation effects that improve productivity of other crops being grown. However, economic viability depends critically on local marketing opportunities.
- Global soybean production, processing and marketing is characterized by a high level of concentration, specialization, vertical integration and economies of scale, meaning that small producers - especially in developing countries - find it very difficult to compete, in particular when confronted with fast expanding and highly efficient trade.
- Furthermore, current national and international agricultural policy settings seem to constrain the opportunities for the development of smallholder soybean production in low income, food insecure countries while at the same time favouring global trade in soybeans and derived products.
- There seems to be a strong general trend towards increased integration of developing countries into international markets for foodstuffs and other agricultural commodities - a development that fully applies to vegetable oils and meals. While the resulting increased dependence on imports is not in conflict with food security objectives expressed in terms of overall food availability, it may expose countries concerned to a number of risks.
- Raising food availability through domestic production or importation of, *inter alia*, soybean products certainly remains an important objective for developing countries struggling with high levels of undernourishment. This applies in particular to food insecure countries in Africa, and pockets in Asia and Latin America. However, in several other countries, hunger seems to be increasingly related to inadequate access to food and less to insufficient supplies - a situation that appears to apply in particular to countries in Asia. For this reason, it will be important to integrate supply oriented policies with access based strategies that - specifically targeting areas

with a high incidence of poverty and hunger - focus on income generation and distribution, access to assets, markets and education, improvement in infrastructure etc. FAO's current initiatives to fight poverty and hunger are increasingly adopting such approach.

In general, this paper shows that assessing the potential contribution of soybeans in fighting world hunger is a complex task that meets with several obstacles. The focus on a single commodity entails numerous limitations - and may actually be problematic from a developmental point of view - as it does not adequately reflect the complexity of the markets and the policies involved. Treating soybean - a commodity that has numerous substitutes/competitors - in isolation proves to be particularly problematic. Furthermore, the value of some of the conclusions drawn in this paper remains limited in light of the diversity of situations faced by individual countries. In order to obtain more meaningful results, assessments would need to be conducted on a country-by-country basis and include in-depth qualitative as well as quantitative analyses.

Selected references:

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ANNEX 1

Overview of national and international policy measures affecting the oilseeds sector¹

(a) Production policies:

- **OECD countries:** In recent years, under the influence of the URAA, agricultural policies have been characterized by a lower overall level of support to producers together with movement towards policy measures that are less production and trade distorting. This is true for most commodities including oilseeds. Notwithstanding, farmers in many countries remain shielded from world market signals. Although less strong than for most cereal crops, support to oilseed producers continues to be important in OECD countries as it reacts to and itself affects world markets changes. It appears that farmers in some countries have been shielded from the recent period of low prices reflected in the decrease in market returns. Support has encouraged supply in these countries despite market signals that would otherwise serve as disincentive against any expansion of production. Support extended to oilseed farmers now primarily takes the form of income payments (based on output or area) as opposed to market price support used in the past. Although price support is no longer the common choice for intervention, world price signals are still dampened by government support before they reach the oilseed producer. Output- and area-based income payments clearly have the potential to provide incentive to producers to plant beyond what market prices alone would justify.
- **Non-OECD countries:** The number of countries providing producer price support for oilcrops with a view to protecting farmers' incomes and to providing sufficient supplies for domestic markets continues to fall. Where support prices are still in place, these are regularly increased in nominal terms but do not keep pace with inflation. As a result, open market prices tend to be more attractive than state-administered prices. Public procurement of oilseeds has been discontinued in most countries, mainly due to budgetary constraints. In several major producing countries, the trend in support policies described here has contributed to reduced investment in oilseed crops, leading to a stagnation in yields and domestic production and resulting in a widening of the domestic supply gap (and increased reliance on imports) in oilseed products. While some countries have introduced indirect forms of production support in an attempt to stimulate productivity and total output of oilcrops, the effect of such programmes is generally limited.

(b) Trade policies:

- **OECD countries:** The choice of OECD countries not to apply market price support for oilseeds is manifest in the low import barriers and disuse of export subsidies even where these are allowed under WTO rules. Thus, unlike for some other commodity markets, the formation of market prices of oilseeds tends not to be directly affected by trade policy measures. Although some countries do impose tariffs on the importation of oilseeds and derived products, their incidence on the world market is low nor are these tariffs affected by WTO reduction commitments. Although the option to directly subsidize oilseed exports is generally avoided,

¹ As in many instances national policy measures are not crop-specific, and considering that individual oilseeds compete directly for resources between each other as well as with other crops, this review covers policies that affect the oilseeds sector as a whole rather than focusing on soybeans alone.

other export competition policies may serve in place of export subsidies: export credit programmes to facilitate trade are in place and some of these schemes have been estimated to distort trade. Questions have also been raised about the role of state-trading enterprises and the effect of food aid and other concessional trade involving oilseed products.

- Non-OECD countries: Governments in developing countries tend to rely on import policies to protect domestic oilseed interests given the reduced use of price guarantee and government procurement schemes and other forms of direct market intervention. In recent years, numerous countries, including some of the world's main importers of oilseeds and derived products, have exercised firm control over import access via higher tariffs or other border measures - a development mainly triggered by the general decline in world market prices for oilseed products, which strongly stimulated imports, thus adversely affecting domestic oilseed production and crushing. Several countries have raised their import duties for oilcrops and products to levels close to their WTO bound limits. Other common features in import policies are the use of tariff rate quotas and tariff escalation. The latter tries to favour the importation of lower value products (e.g. seeds as opposed to oil/meals or crude rather than refined oil) for subsequent processing at the domestic level. As to export policies, while the use of export subsidies schemes remains limited, some countries promote shipments by a variety of other incentives (including export tax reductions or exemptions, export credit guarantees, government-to-government barter contracts) in response to increased competition on global export markets for oilcrop and derived products. A number of countries use export taxation schemes with the explicit objective to support their domestic crushing industries and related export activities.
- Technical import barriers have become increasingly relevant for international trade in oilseeds and derived products. Health and environment related consumer concerns are leading governments in both developed as well developing countries to introduce sanitary, phytosanitary and other technical requirements. In a number of cases, these measures have resulted in reduced access to import markets and, eventually, changes in the overall pattern of trade. Exporting countries are increasingly concerned that trade partners may use such technical measures as a means of protecting domestic markets.

(c) Other policies

- Marketing policies: In some mid-income countries and economies in transition, the oilseeds trade benefits from support programmes aimed at enhancing the storage, transportation, processing and marketing of agricultural products in general or oilcrops in particular. Direct intervention and financial support by governments tends to be limited and efforts concentrate on measures that contribute to raising the efficiency of market operations and to stimulating private sector investment.
- Consumption policies: Regular programmes to raise the vegetable oil intake in certain target populations are maintained by few developing countries only. Some countries implement, often in conjunction with trade policies, temporary measures aimed at supporting consumption from domestic sources and reducing dependency on imports or at guaranteeing adequate supplies where domestic production is primarily export oriented.
- Non-food uses: In numerous countries, governments are pursuing efforts to promote non-food uses of vegetable oils. An increasing number of countries, both developed as well as developing, are introducing policies that encourage the production of bio-diesel from various oilcrops including soybeans. Recent commitments to meet specific targets regarding the reduction of greenhouse gas emissions have increased the interest in bio-diesel production. Under the prevailing market conditions, regular provision of public subsidies and/or tax breaks to refiners are required to guarantee the economic viability of bio-diesel production from oilcrops. In a number of countries, Also investments in non-food uses other than biofuel

continue to be pursued in some countries, in particular regarding tropical oils. This includes research on a variety of industrial uses, recycling, bio-engineering, utilization of biomass and oleochemical applications. Generally, these activities are based on government-backed private sector initiatives.

ANNEX 2

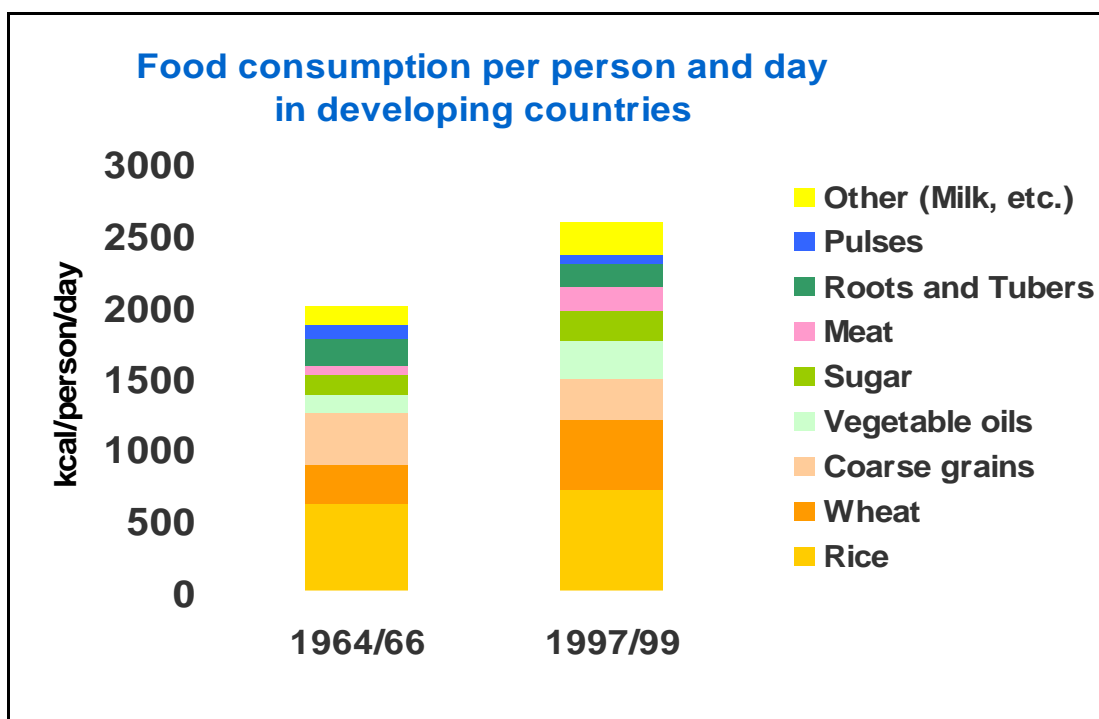
Tables and graphs

(following the order of the respective references in the main text)

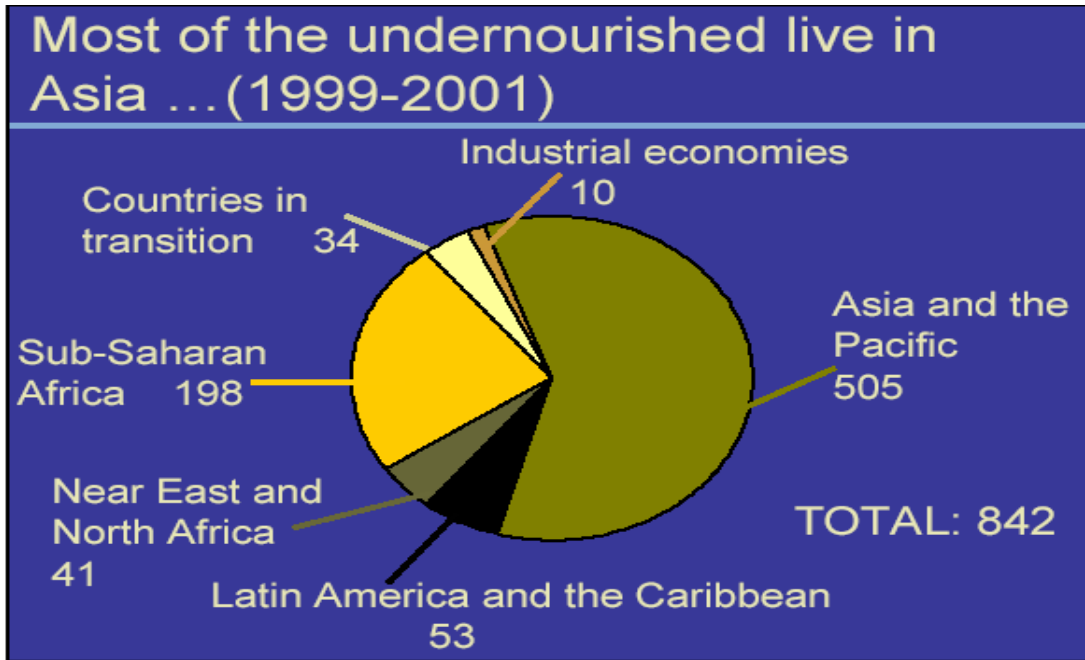
Table 1

Undernourishment in the developing countries			
	1969/71	1979/81	1998/00
Chronically undernourished (millions)	959	937	799
As a percentage of the total population	37	29	17
Calorie availability (per person/day)	2113	2311	2680

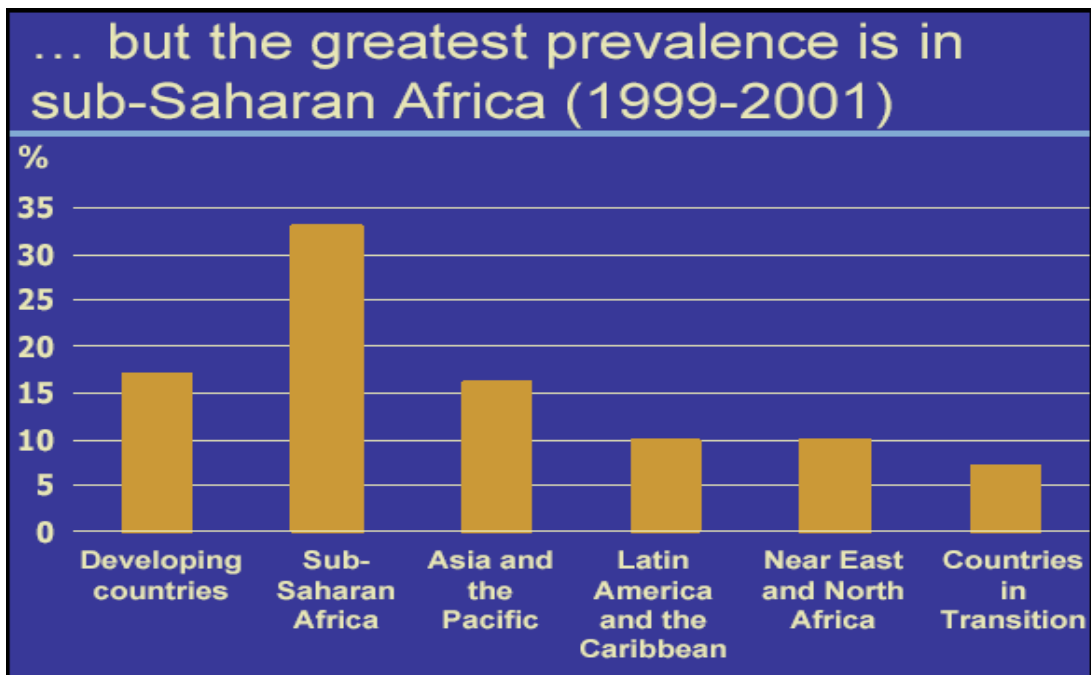
Graph 1



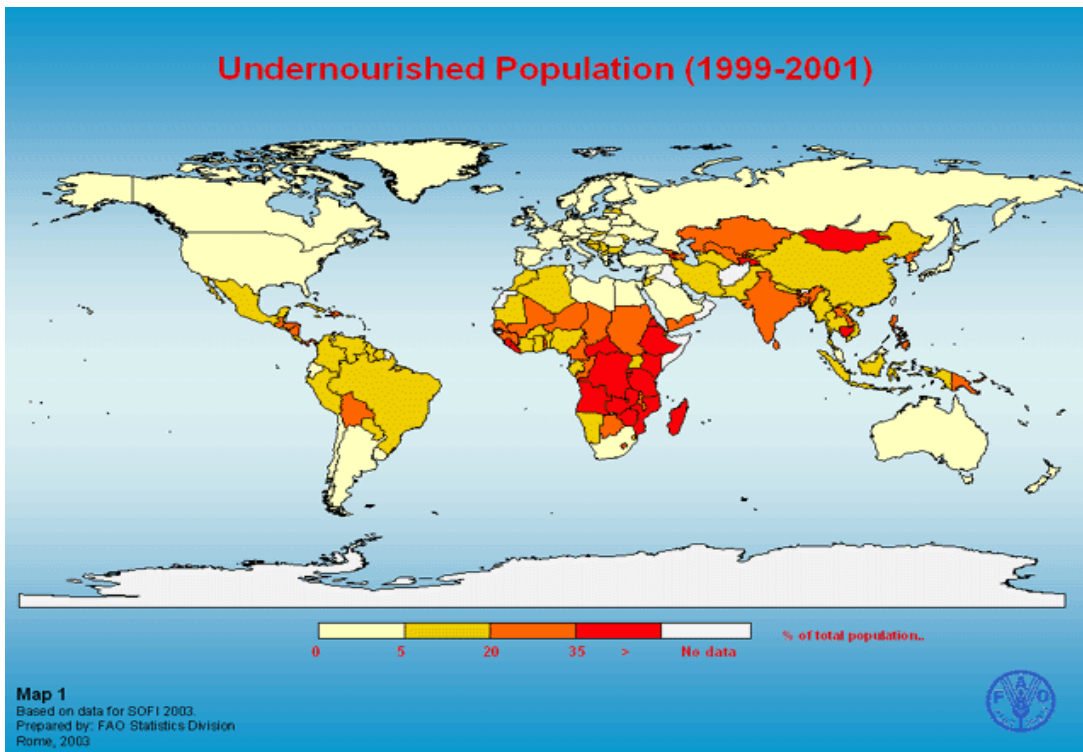
Graph 2



Graph 3



Graph 4



Graph 5

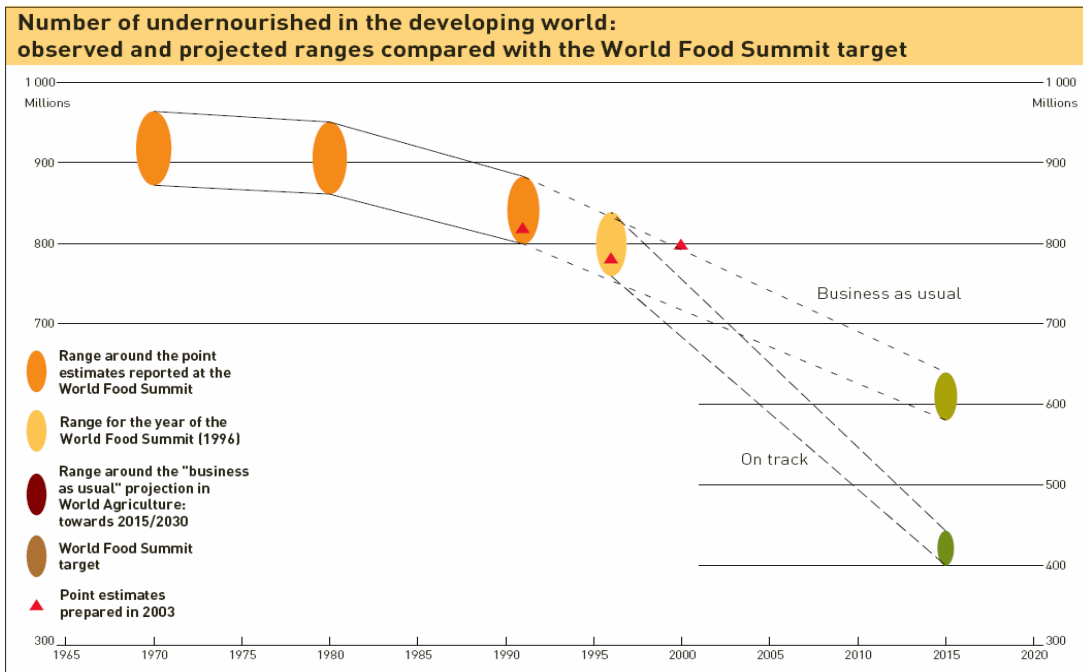


Table 2

<i>Distribution of soybean production</i>		
	total production in million mt (avg. 2001-03)	Share in global output %
World	182.2	
1 United States of America	73.1	40
2 Brazil	43.8	24
3 Argentina	30.1	17
4 China, Mainland	16.2	9
5 India	5.6	3
6 Paraguay	3.7	2
7 Canada	2.1	1
8 Bolivia	1.2	0.6
9 European Union (15)	0.9	0.5
10 Indonesia	0.7	0.4
11 Nigeria	0.4	0.2
12 Russian Federation	0.4	0.2
13 Korea, Dem People's Rep	0.4	0.2
14 Thailand	0.3	0.2
15 Japan	0.3	0.2
Zimbabwe	0.1	0.1
Asia+Africa excluding China and India	3.4	1.8

Source: Faostat

Table 3

<i>Contribution of total oils & fats to overall available dietary energy supply (avg 1999-2001)</i>	
	%
<i>World</i>	24
<i>Developed</i>	33
<i>N.America Developed</i>	36
<i>Developing</i>	22
<i>Low-Income Food Deficit Countries</i>	21
<i>Africa South of Sahara</i>	18
<i>Central America</i>	24
<i>Undernourished countries 1999-2001</i>	19

Source: Faostat

Table 4

Contribution of soyoil to total caloric intake from oil/fats (avg 1999-2001)	
	%
World	11.0
Developed	14.4
<i>N.America developed</i>	33.8
<i>EU(15)</i>	5.6
Developing	9.2
<i>Asia</i>	13.8
<i>Africa</i>	5.6
<i>South America</i>	23.4
<i>Oceania</i>	3.6
<i>Undernourished countries 1999-2001</i>	10.5
 <i>number of undernourished countries below 5%:</i>	 27
Source Faostat	

Table 5

Average utilization of soymeal per caput in kg (1999-2001)	
	kg
<i>Developed</i>	49.8
<i>Developing</i>	9.0
<i>Undernourished countries 1999-2001</i>	4.4
 <i>number of undernourished countries utilizing less than 1 kg: 31</i>	
Source: Faostat	

Table 6

World meal/cake production (1999-2001)		
	<i>mill mt</i>	<i>% of total</i>
<i>Total meals</i>	<i>174.2</i>	<i>100</i>
<i>Soyabean Cake</i>	<i>106.3</i>	<i>61</i>
<i>Rape and Mustard Cake</i>	<i>20.4</i>	<i>11.7</i>
<i>Cottonseed Cake</i>	<i>12.6</i>	<i>7.1</i>
<i>Sunflowerseed Cake</i>	<i>10.7</i>	<i>6.1</i>
<i>Groundnut Cake</i>	<i>6.8</i>	<i>3.9</i>
<i>Palmkernel Cake</i>	<i>3.3</i>	<i>1.9</i>
<i>Copra Cake</i>	<i>1.8</i>	<i>1</i>
<i>Sesameseed Cake</i>	<i>0.8</i>	<i>0.4</i>
<i>Fish Meal</i>	<i>0.7</i>	<i>0.4</i>
<i>Meat Meal</i>	<i>0.7</i>	<i>0.4</i>
<i>Oilseed Cakes, Other</i>	<i>10.0</i>	<i>5.7</i>

Source: Faostat

Table 7

World production of vegetable/animal oils & fats				
	<i>1984-1986 avg.</i>		<i>1999-2001 avg.</i>	
	<i>mill mt</i>	<i>% of tot.</i>	<i>mill mt</i>	<i>% of tot.</i>
<i>Oil of Soya Beans</i>	<i>13.7</i>	<i>17.0</i>	<i>24.4</i>	<i>19.7</i>
<i>Oil of Palm</i>	<i>7.5</i>	<i>9.4</i>	<i>22.6</i>	<i>18.2</i>
<i>Oil of Rapeseed</i>	<i>6.0</i>	<i>7.5</i>	<i>12.8</i>	<i>10.3</i>
<i>Oil of Sunflower Seed</i>	<i>6.5</i>	<i>8.1</i>	<i>9.3</i>	<i>7.5</i>
<i>Oil of Groundnuts</i>	<i>3.0</i>	<i>3.9</i>	<i>5.0</i>	<i>4.0</i>
<i>Oil of Cotton Seed</i>	<i>3.3</i>	<i>4.2</i>	<i>3.7</i>	<i>3.0</i>
<i>Oil of Coconuts</i>	<i>2.8</i>	<i>3.4</i>	<i>3.3</i>	<i>2.6</i>
<i>Oil of Palm Kernels</i>	<i>1.1</i>	<i>1.4</i>	<i>2.8</i>	<i>2.3</i>
<i>Oil of Olive</i>	<i>1.6</i>	<i>2.1</i>	<i>2.6</i>	<i>2.1</i>
<i>Other oils</i>	<i>4.3</i>	<i>5.3</i>	<i>5.7</i>	<i>4.6</i>
<i>Animal Fats</i>	<i>30.1</i>	<i>37.6</i>	<i>31.8</i>	<i>25.6</i>

Source: Faostat

Table 8

<i>Share of soybean, soymeal & soyoil in export earnings (avg. 2000-2002)</i>		
	% of total agric. exp. value	% of total merch. exp. value
Selected exporting countries:		
<i>United States of America</i>	15.8	1.2
<i>Argentina</i>	50.3	21.0
<i>Brazil</i>	34.5	9.1
<i>India</i>	15.6	1.8
<i>China Mainland</i>	5.6	0.2
<i>Bolivia</i>	79.4	25.0
<i>Paraguay</i>	62.2	26.3

Source: Faostat

Table 9

<i>Average per caput food consumption of soyoil in Kg (avg 1999-2001)</i>	
	Kg
<i>World</i>	3.2
<i>Developed</i>	6.7
<i>Developing</i>	2.2
<i>Low-Income Food Deficit Countries</i>	1.6
<i>undernourished countries 1999-2001</i>	1.6
<i>number of undernourished countries consuming less than 1kg:</i>	29

Source: Faostat

Table 10

Share of soyoil in total oil consumption in % (avg. 2000-2002)	
	% in tot.
World	23.7
Developed:	
EU(15)	11.8
North America	47.4
Japan	29.1
Australia	4.8
Developing:	
South America	52.8
North Africa,,	32.0
Sub-Saharan Africa	8.2
Asia:	
India	16.2
China Mainland	22.7
Pakistan	6.1
Bangladesh	37.9
Philippines	9.2
Korea D.P.R.	33.0

Source: FAO - Commodities & Trade Division

Table 11

Global consumption of soy oil and palm oil		
	share in tot.oils & fats consumption (%)	
	1992-93	2002-2003
Soyoil		
Palm oil	21.5	24.2
	15.4	22.1
	avg. annual growth rate (in %)	
	1992-93 to 2002-03	
Soyoil		
Palm oil		5.2
Total oil & fats		7.6
		4.0

Source: FAO - Commodities & Trade Division

Graph 6

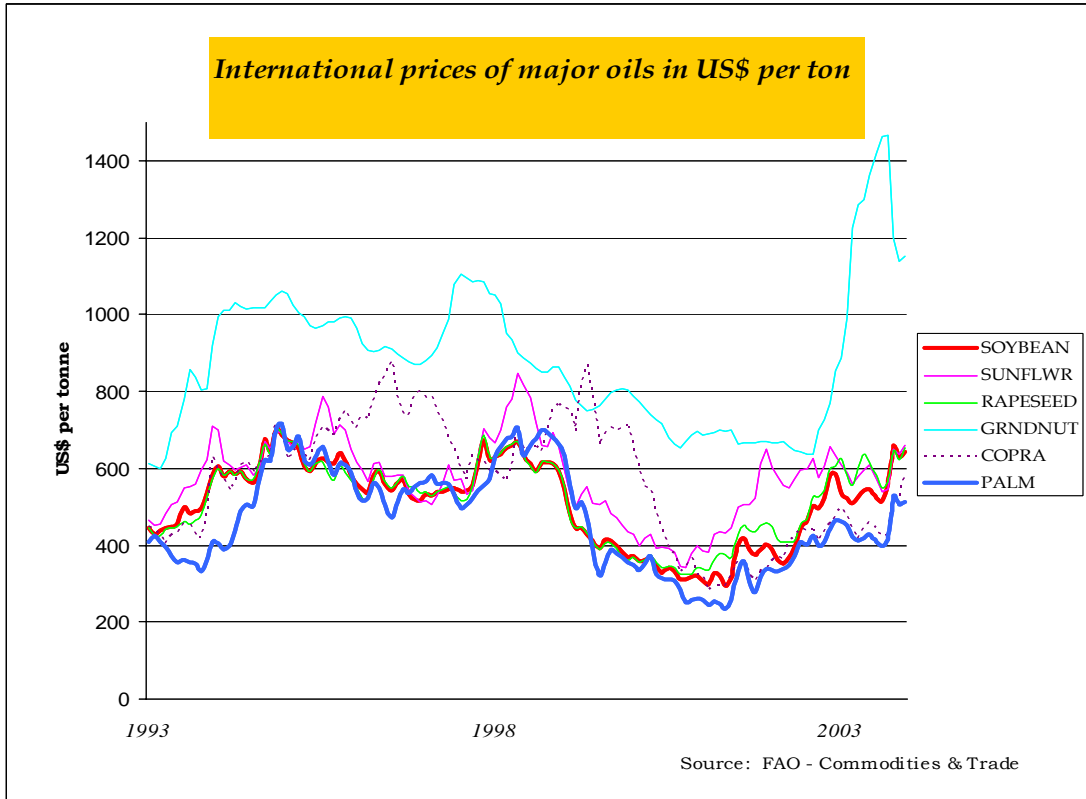


Table 12

Soybean meal utilization				
	1993-1994		2002-2003	
	<i>mill. mt</i>	<i>% in tot.</i>	<i>mill. mt</i>	<i>% in tot.</i>
World	81.7	100	137.2	100
Developed	57.0	69.8	75.5	55.0
Developing	24.7	30.2	61.7	45.0
avg. annual growth rate in % 1993-94 to 2002-03				
World				6
Developed				3
	<i>EU(15)</i>			3
	<i>USA</i>			3
Developing				10
	East & South East Asia			12
	<i>Indonesia</i>			17
	<i>Thailand</i>			13
	<i>India</i>			8
	<i>China Mainland</i>			18
	Africa			10
	<i>Egypt</i>			12
	<i>Morocco</i>			29

Source: FAO - Commodities & Trade Division

Table 13

Share of production traded (avg. 2000-2002)	
	<i>Global exports as % of global production (in volume terms)</i>
<i>Soybean meal</i>	37.4
<i>Soybean oil</i>	34.3
<i>Soybeans</i>	29.3
<i>Wheat</i>	23.0
<i>Pulses</i>	18.1
<i>Maize</i>	13.7
<i>Rice (paddy equiv.)</i>	6.4
<i>Roots & tubers (dry equiv.)</i>	5.3

Source: Faostat

Table 14

World export market of soybeans and derived products (avg. 2000-2003)			
Country shares in the global market (%)			
	Soybean oil*		Soybean meal*
1 USA	31.3	1 USA	32.1
2 Brazil	26.8	2 Brazil	29.8
3 Argentina	26.6	3 Argentina	26.3
4 EU (15)	5.5	4 Paraguay	2.9
5 Paraguay	2.9	5 EU (15)	2.5
Group-total (1-5)	93.1	Group-total (1-5)	93.6
* including oil/meal equivalent contained in soybeans traded			
Source: FAO - Commodities & Trade Division			

Table 15

Imports of soybeans and derived products				
Soybean meal*				
	share in global imports (%)		increase over	contribution to
	early 90's	early 00's	the decade in %	global increase in %
Developed	71	52	38	31
Developing	29	48	208	69
Soybean oil*				
	share in global imports (%)		increase over	contribution to
	early 90's	early 00's	the decade in %	global increase in %
Developed	47	30	34	15
Developing	53	70	172	85
* including oil/meal equivalent contained in soybeans traded				
Source: FAO - Commodities & Trade Division				

Table 16

<i>Share of net imports in domestic utilization</i>		
	Total meals*	
	<i>early 90's</i>	<i>early 00's</i>
<i>All developing countries</i>	37	52
<i>Selected developing countries:</i>		
<i>Korea Rep.</i>	97	99
<i>Venezuela</i>	99	98
<i>Mexico</i>	80	94
<i>Colombia</i>	71	90
<i>Morocco</i>	52	89
<i>Algeria</i>	83	87
<i>Thailand</i>	65	86
<i>Egypt</i>	58	86
<i>Syria</i>	46	86
<i>Iran</i>	73	84
<i>Vietnam</i>	10	76
<i>Chile</i>	39	68
<i>Bangladesh</i>	25	59
<i>Turkey</i>	39	58
<i>Philippines</i>	32	51
<i>Korea D.P.R.</i>	24	46
<i>China Mainland</i>	7	34
<i>Pakistan</i>	4	23
<i>Indonesia</i>	0	18
*including Meal equivalent contained in soybeans traded		
Source: FAO - Commodities & Trade Division		

Table 17

Share of net imports in domestic utilization (cont'd)		
	Total oils & fats*	
	<i>early 90's</i>	<i>early 00's</i>
<i>All developing countries</i>	37	48
<i>Selected developing countries:</i>		
<i>Iran</i>	78	96
<i>Korea Rep.</i>	91	94
<i>Egypt</i>	82	91
<i>Algeria</i>	87	88
<i>Bangladesh</i>	76	86
<i>Mexico</i>	80	85
<i>Morocco</i>	76	85
<i>Pakistan</i>	65	64
<i>Turkey</i>	48	55
<i>Thailand</i>	14	45
<i>India</i>	2	37
<i>Colombia</i>	30	36
<i>China Mainland</i>	10	35
<i>Myanmar</i>	40	28
<i>Nigeria</i>	5	17
*including oil equivalent contained in soybeans traded		
Source: FAO - Commodities & Trade Division		

Graph 7

