

3. **Global and regional food consumption patterns and trends**

3.1 **Introduction**

Promoting healthy diets and lifestyles to reduce the global burden of noncommunicable diseases requires a multisectoral approach involving the various relevant sectors in societies. The agriculture and food sector figures prominently in this enterprise and must be given due importance in any consideration of the promotion of healthy diets for individuals and population groups. Food strategies must not merely be directed at ensuring food security for all, but must also achieve the consumption of adequate quantities of safe and good quality foods that together make up a healthy diet. Any recommendation to that effect will have implications for all components in the food chain. It is therefore useful at this juncture to examine trends in consumption patterns worldwide and deliberate on the potential of the food and agriculture sector to meet the demands and challenges posed by this report.

Economic development is normally accompanied by improvements in a country's food supply and the gradual elimination of dietary deficiencies, thus improving the overall nutritional status of the country's population. Furthermore, it also brings about qualitative changes in the production, processing, distribution and marketing of food. Increasing urbanization will also have consequences for the dietary patterns and lifestyles of individuals, not all of which are positive. Changes in diets, patterns of work and leisure – often referred to as the “nutrition transition” – are already contributing to the causal factors underlying noncommunicable diseases even in the poorest countries. Moreover, the pace of these changes seems to be accelerating, especially in the low-income and middle-income countries.

The dietary changes that characterize the “nutrition transition” include both quantitative and qualitative changes in the diet. The adverse dietary changes include shifts in the structure of the diet towards a higher energy density diet with a greater role for fat and added sugars in foods, greater saturated fat intake (mostly from animal sources), reduced intakes of complex carbohydrates and dietary fibre, and reduced fruit and vegetable intakes (1). These dietary changes are compounded by lifestyle changes that reflect reduced physical activity at work and during leisure time (2). At the same time, however, poor countries continue to face food shortages and nutrient inadequacies.

Diets evolve over time, being influenced by many factors and complex interactions. Income, prices, individual preferences and beliefs, cultural traditions, as well as geographical, environmental, social and economic

factors all interact in a complex manner to shape dietary consumption patterns. Data on the national availability of the main food commodities provide a valuable insight into diets and their evolution over time. FAO produces annual Food Balance Sheets which provide national data on food availability (for almost all commodities and for nearly all countries). Food Balance Sheets give a complete picture of supply (including production, imports, stock changes and exports) and utilization (including final demand in the form of food use and industrial non-food use, intermediate demand such as animal feed and seed use, and waste) by commodity. From these data, the average per capita supply of macronutrients (i.e. energy, protein, fats) can be derived for all food commodities. Although such average per capita supplies are derived from national data, they may not correspond to actual per capita availability, which is determined by many other factors such as inequality in access to food. Likewise, these data refer to “average food available for consumption”, which, for a number of reasons (for example, waste at the household level), is not equal to average food intake or average food consumption. In the remainder of this chapter, therefore, the terms “food consumption” or “food intake” should be read as “food available for consumption”.

Actual food availability may vary by region, socioeconomic level and season. Certain difficulties are encountered when estimating trade, production and stock changes on an annual scale. Hence three-year averages are calculated in order to reduce errors. The FAO statistical database (FAOSTAT), being based on national data, does not provide information on the distribution of food within countries, or within communities and households.

3.2 **Developments in the availability of dietary energy**

Food consumption expressed in kilocalories (kcal) per capita per day is a key variable used for measuring and evaluating the evolution of the global and regional food situation. A more appropriate term for this variable would be “national average apparent food consumption” since the data come from national Food Balance Sheets rather than from food consumption surveys. Analysis of FAOSTAT data shows that dietary energy measured in kcals per capita per day has been steadily increasing on a worldwide basis; availability of calories per capita from the mid-1960s to the late 1990s increased globally by approximately 450 kcal per capita per day and by over 600 kcal per capita per day in developing countries (see Table 1). This change has not, however, been equal across regions. The per capita supply of calories has remained almost stagnant in sub-Saharan Africa and has recently fallen in the countries in economic transition. In contrast, the per capita supply of energy has risen dramatically in East Asia

(by almost 1000 kcal per capita per day, mainly in China) and in the Near East/North Africa region (by over 700 kcal per capita per day).

Table 1
Global and regional per capita food consumption (kcal per capita per day)

Region	1964–1966	1974–1976	1984–1986	1997–1999	2015	2030
World	2358	2435	2655	2803	2940	3050
Developing countries	2054	2152	2450	2681	2850	2980
Near East and North Africa	2290	2591	2953	3006	3090	3170
Sub-Saharan Africa ^a	2058	2079	2057	2195	2360	2540
Latin America and the Caribbean	2393	2546	2689	2824	2980	3140
East Asia	1957	2105	2559	2921	3060	3190
South Asia	2017	1986	2205	2403	2700	2900
Industrialized countries	2947	3065	3206	3380	3440	3500
Transition countries	3222	3385	3379	2906	3060	3180

^a Excludes South Africa.

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In short, it would appear that the world has made significant progress in raising food consumption per person. The increase in the world average consumption would have been higher but for the declines in the transition economies that occurred in the 1990s. It is generally agreed, however, that those declines are likely to revert in the near future. The growth in food consumption has been accompanied by significant structural changes and a shift in diet away from staples such as roots and tubers towards more livestock products and vegetable oils (4). Table 1 shows that current energy intakes range from 2681 kcal per capita per day in developing countries, to 2906 kcal per capita per day in transition countries and 3380 kcal per capita per day in industrialized countries. Data shown in Table 2 suggest that per capita energy supply has declined from both animal and vegetable sources in the countries in economic transition, while it has increased in the developing and industrialized countries.

Table 2
Vegetable and animal sources of energy in the diet (kcal per capita per day)

Region	1967–1969			1977–1979			1987–1989			1997–1999		
	T	V	A	T	V	A	T	V	A	T	V	A
Developing countries	2059	1898	161	2254	2070	184	2490	2248	242	2681	2344	337
Transition countries	3287	2507	780	3400	2507	893	3396	2455	941	2906	2235	671
Industrialized countries	3003	2132	871	3112	2206	906	3283	2333	950	3380	2437	943

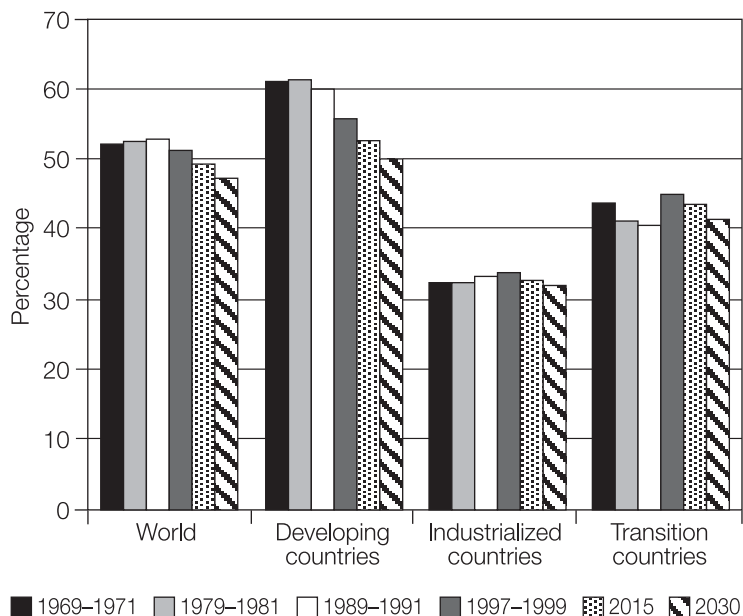
T, total kcal; V, kcal of vegetable origin; A, kcal of animal origin (including fish products).

Source: FAOSTAT, 2003.

Similar trends are evident for protein availability; this has increased in both developing and industrialized countries but decreased in the transition countries. Although the global supply of protein has been increasing, the distribution of the increase in the protein supply is unequal. The per capita supply of vegetable protein is slightly higher in developing countries, while the supply of animal protein is three times higher in industrialized countries.

Globally, the share of dietary energy supplied by cereals appears to have remained relatively stable over time, representing about 50% of dietary energy supply. Recently, however, subtle changes appear to be taking place (see Fig. 1). A closer analysis of the dietary energy intake shows a decrease in developing countries, where the share of energy derived from cereals has fallen from 60% to 54% in a period of only 10 years. Much of this downwards trend is attributable to cereals, particularly wheat and rice, becoming less preferred foods in middle-income countries such as Brazil and China, a pattern likely to continue over the next 30 years or so. Fig. 2 shows the structural changes in the diet of developing countries over the past 30–40 years and FAO’s projections to the year 2030 (3).

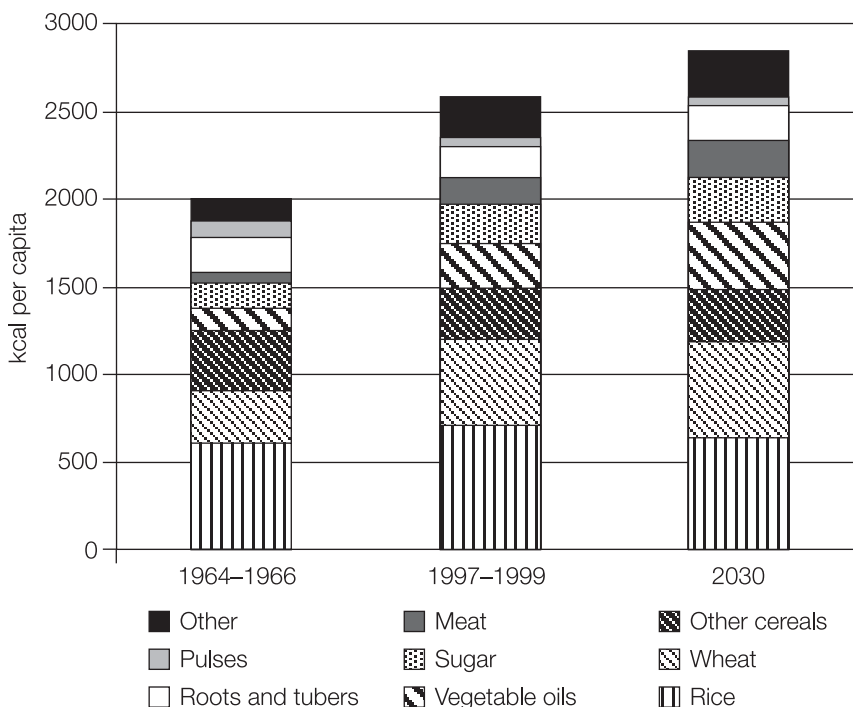
Figure 1
The share of dietary energy derived from cereals



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Figure 2
Calories from major commodities in developing countries



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3.3 Availability and changes in consumption of dietary fat

The increase in the quantity and quality of the fats consumed in the diet is an important feature of nutrition transition reflected in the national diets of countries. There are large variations across the regions of the world in the amount of total fats (i.e. fats in foods, plus added fats and oils) available for human consumption. The lowest quantities consumed are recorded in Africa, while the highest consumption occurs in parts of North America and Europe. The important point is that there has been a remarkable increase in the intake of dietary fats over the past three decades (see Table 3) and that this increase has taken place practically everywhere except in Africa, where consumption levels have stagnated. The per capita supply of fat from animal foods has increased, respectively, by 14 and 4 g per capita in developing and industrialized countries, while there has been a decrease of 9 g per capita in transition countries.

Table 3
Trends in the dietary supply of fat

Region	Supply of fat (g per capita per day)				
	1967–1969	1977–1979	1987–1989	1997–1999	Change between 1967–1969 and 1997–1999
World	53	57	67	73	20
North Africa	44	58	65	64	20
Sub-Saharan Africa ^a	41	43	41	45	4
North America	117	125	138	143	26
Latin America and the Caribbean	54	65	73	79	25
China	24	27	48	79	55
East and South-East Asia	28	32	44	52	24
South Asia	29	32	39	45	16
European Community	117	128	143	148	31
Eastern Europe	90	111	116	104	14
Near East	51	62	73	70	19
Oceania	102	102	113	113	11

^a Excludes South Africa

Source: FAOSTAT, 2003.

The increase in dietary fat supply worldwide exceeds the increase in dietary protein supply. The average global supply of fat has increased by 20 g per capita per day since 1967–1969. This increase in availability has been most pronounced in the Americas, East Asia, and the European Community. The proportion of energy contributed by dietary fats exceeds 30% in the industrialized regions, and in nearly all other regions this share is increasing.

The fat-to-energy ratio (FER) is defined as the percentage of energy derived from fat in the total supply of energy (in kcal). Country-specific analysis of FAO data for 1988–1990 (5) found a range for the FER of 7–46%. A total of 19 countries fell below the minimum recommendation of 15% dietary energy supply from fat, the majority of these being in sub-Saharan Africa and the remainder in South Asia. In contrast, 24 countries were above the maximum recommendation of 35%, the majority of these countries being in North America and Western Europe. It is useful to note that limitations of the Food Balance Sheet data may contribute much of this variation in the FER between countries. For instance, in countries such as Malaysia with abundant availability of vegetable oils at low prices, Food Balance Sheet data may not reflect real consumption at the individual household level.

Rising incomes in the developing world have also led to an increase in the availability and consumption of energy-dense high-fat diets. Food balance data can be used to examine the shift in the proportion of energy from fat over time and its relationship to increasing incomes (6).

In 1961–1963, a diet providing 20% of energy from fat was associated only with countries having at least a per capita gross national product of US\$ 1475. By 1990, however, even poor countries having a gross national product of only US\$ 750 per capita had access to a similar diet comprising 20% of energy from fat. (Both values of gross national product are given in 1993 US\$.) This change was mainly the result of an increase in the consumption of vegetable fats by poor countries, with smaller increases occurred in middle-income and high-income countries. By 1990, vegetable fats accounted for a greater proportion of dietary energy than animal fats for countries in the lowest per capita income category. Changes in edible vegetable oil supply, in prices and in consumption equally affected rich and poor countries, although the net impact was relatively much greater in low-income countries. An equally large and important shift in the proportion of energy from added sugars in the diets of low-income countries was also a feature of the nutrition transition (1).

Examinations of the purchasing habits of people, aimed at understanding the relationship between level of education or income and the different amounts or types of commodities purchased at different times were also revealing. Research conducted in China shows that there have been profound shifts in purchasing practices in relation to income over the past decade. These analyses show how extra income in China affects poor people and rich people in a differential manner, enhancing the fat intake of the poor more than that of the rich (7).

A variable proportion of these fat calories are provided by saturated fatty acids. Only in the two of the most affluent regions (i.e. in parts of North America and Europe) is the intake of saturated fat at or above 10% of energy intake level. In other less affluent regions, the proportion of dietary energy contributed by saturated fatty acids is lower, ranging from 5% to 8%, and generally not changing much over time. National dietary surveys conducted in some countries confirm these data. The ratio of dietary fat from animal sources to total fat is a key indicator, since foods from animal sources are high in saturated fat. Data sets used to calculate country-specific FERs can also be used to calculate proportions of animal fat in total fat. Such analysis indicated that the proportion of animal fat in total fat was lower than 10% in some countries (Democratic Republic of Congo, Mozambique, Nigeria, Sao Tome and Principe, and Sierra Leone), while it is above 75% in some other countries (Denmark, Finland, Hungary, Mongolia, Poland and Uruguay). These findings are not strictly divided along economic lines, as not all of the countries in the high range represent the most affluent countries. Country-specific food availability and cultural dietary preferences and norms to some extent determine these patterns.

The types of edible oils used in developing countries are also changing with the increasing use of hardened margarines (rich in trans fatty acids) that do not need to be refrigerated. Palm oil is becoming an increasingly important edible oil in the diets of much of South-East Asia and is likely to be a major source in the coming years. Currently, palm oil consumption is low and the FER ranges between 15% and 18%. At this low level of consumption, the saturated fatty acid content of the diet comprises only 4% to 8%. Potential developments in the edible oil sector could affect all stages of the oil production process from plant breeding to processing methods, including the blending of oils aimed at producing edible oils that have a healthy fatty acid composition.

Olive oil is an important edible oil consumed largely in the Mediterranean region. Its production has been driven by rising demand, which has increasingly shifted olive cultivation from traditional farms to more intensive forms of cultivation. There is some concern that the intensive cultivation of olives may have adverse environmental impacts, such as soil erosion and desertification (8). However, agricultural production methods are being developed to ensure less harmful impacts on the environment.

3.4 **Availability and changes in consumption of animal products**

There has been an increasing pressure on the livestock sector to meet the growing demand for high-value animal protein. The world's livestock sector is growing at an unprecedented rate and the driving force behind this enormous surge is a combination of population growth, rising incomes and urbanization. Annual meat production is projected to increase from 218 million tonnes in 1997–1999 to 376 million tonnes by 2030.

There is a strong positive relationship between the level of income and the consumption of animal protein, with the consumption of meat, milk and eggs increasing at the expense of staple foods. Because of the recent steep decline in prices, developing countries are embarking on higher meat consumption at much lower levels of gross domestic product than the industrialized countries did some 20–30 years ago.

Urbanization is a major driving force influencing global demand for livestock products. Urbanization stimulates improvements in infrastructure, including cold chains, which permit trade in perishable goods. Compared with the less diversified diets of the rural communities, city dwellers have a varied diet rich in animal proteins and fats, and characterized by higher consumption of meat, poultry, milk and other dairy products. Table 4 shows trends in per capita consumption of livestock products in different regions and country groups. There has been a remarkable increase in the consumption of animal products in

countries such as Brazil and China, although the levels are still well below the levels of consumption in North American and most other industrialized countries.

As diets become richer and more diverse, the high-value protein that the livestock sector offers improves the nutrition of the vast majority of the world. Livestock products not only provide high-value protein but are also important sources of a wide range of essential micronutrients, in particular minerals such as iron and zinc, and vitamins such as vitamin A. For the large majority of people in the world, particularly in developing countries, livestock products remain a desired food for nutritional value and taste. Excessive consumption of animal products in some countries and social classes can, however, lead to excessive intakes of fat.

Table 4
Per capita consumption of livestock products

Region	Meat (kg per year)			Milk (kg per year)		
	1964–1966	1997–1999	2030	1964–1966	1997–1999	2030
World	24.2	36.4	45.3	73.9	78.1	89.5
Developing countries	10.2	25.5	36.7	28.0	44.6	65.8
Near East and North Africa	11.9	21.2	35.0	68.6	72.3	89.9
Sub-Saharan Africa ^a	9.9	9.4	13.4	28.5	29.1	33.8
Latin America and the Caribbean	31.7	53.8	76.6	80.1	110.2	139.8
East Asia	8.7	37.7	58.5	3.6	10.0	17.8
South Asia	3.9	5.3	11.7	37.0	67.5	106.9
Industrialized countries	61.5	88.2	100.1	185.5	212.2	221.0
Transition countries	42.5	46.2	60.7	156.6	159.1	178.7

^a Excludes South Africa.

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The growing demand for livestock products is likely to have an undesirable impact on the environment. For example, there will be more large-scale, industrial production, often located close to urban centres, which brings with it a range of environmental and public health risks. Attempts have been made to estimate the environmental impact of industrial livestock production. For instance, it has been estimated that the number of people fed in a year per hectare ranges from 22 for potatoes and 19 for rice to 1 and 2, respectively, for beef and lamb (9). The low energy conversion ratio from feed to meat is another concern, since some of the cereal grain food produced is diverted to livestock production. Likewise, land and water requirements for meat production are likely to become a major concern, as the increasing demand for animal products results in more intensive livestock production systems (10).

3.5 Availability and consumption of fish

Despite fluctuations in supply and demand caused by the changing state of fisheries resources, the economic climate and environmental conditions, fisheries, including aquaculture, have traditionally been, and remain an important source of food, employment and revenue in many countries and communities (11). After the remarkable increase in both marine and inland capture of fish during the 1950s and 1960s, world fisheries production has levelled off since the 1970s. This levelling off of the total catch follows the general trend of most of the world's fishing areas, which have apparently reached their maximum potential for fisheries production, with the majority of stocks being fully exploited. It is therefore very unlikely that substantial increases in total catch will be obtained in the future. In contrast, aquaculture production has followed the opposite path. Starting from an insignificant total production, inland and marine aquaculture production has been growing at a remarkable rate, offsetting part of the reduction in the ocean catch of fish.

The total food fish supply and hence consumption has been growing at a rate of 3.6% per year since 1961, while the world's population has been expanding at 1.8% per year. The proteins derived from fish, crustaceans and molluscs account for between 13.8% and 16.5% of the animal protein intake of the human population. The average apparent per capita consumption increased from about 9 kg per year in the early 1960s to 16 kg in 1997. The per capita availability of fish and fishery products has therefore nearly doubled in 40 years, outpacing population growth.

As well as income-related variations, the role of fish in nutrition shows marked continental, regional and national differences. In industrialized countries, where diets generally contain a more diversified range of animal proteins, a rise in per capita provision from 19.7 kg to 27.7 kg seems to have occurred. This represents a growth rate close to 1% per year. In this group of countries, fish contributed an increasing share of total protein intake until 1989 (accounting for between 6.5% and 8.5%), but since then its importance has gradually declined and, in 1997, its percentage contribution was back to the level prevailing in the mid-1980s. In the early 1960s, per capita fish supply in low-income food-deficit countries was, on average, only 30% of that of the richest countries. This gap has been gradually reduced, such that in 1997, average fish consumption in these countries was 70% of that of the more affluent economies. Despite the relatively low consumption by weight in low-income food-deficit countries, the contribution of fish to total animal protein intake is considerable (nearly 20%). Over the past four decades, however, the share of fish proteins in animal proteins has declined slightly, because of faster growth in the consumption of other animal products.

Currently, two-thirds of the total food fish supply is obtained from capture fisheries in marine and inland waters, while the remaining one-third is derived from aquaculture. The contribution of inland and marine capture fisheries to per capita food supply has stabilized, around 10 kg per capita in the period 1984–1998. Any recent increases in per capita availability have, therefore, been obtained from aquaculture production, from both traditional rural aquaculture and intensive commercial aquaculture of high-value species.

Fish contributes up to 180 kcal per capita per day, but reaches such high levels only in a few countries where there is a lack of alternative protein foods grown locally or where there is a strong preference for fish (examples are Iceland, Japan and some small island states). More typically, fish provides about 20–30 kcal per capita per day. Fish proteins are essential in the diet of some densely populated countries where the total protein intake level is low, and are very important in the diets of many other countries. Worldwide, about a billion people rely on fish as their main source of animal proteins. Dependence on fish is usually higher in coastal than in inland areas. About 20% of the world's population derives at least one-fifth of its animal protein intake from fish, and some small island states depend almost exclusively on fish.

Recommending the increased consumption of fish is another area where the feasibility of dietary recommendations needs to be balanced against concerns for sustainability of marine stocks and the potential depletion of this important marine source of high quality nutritious food. Added to this is the concern that a significant proportion of the world fish catch is transformed into fish meal and used as animal feed in industrial livestock production and thus is not available for human consumption.

3.6 Availability and consumption of fruits and vegetables

Consumption of fruits and vegetables plays a vital role in providing a diversified and nutritious diet. A low consumption of fruits and vegetables in many regions of the developing world is, however, a persistent phenomenon, confirmed by the findings of food consumption surveys. Nationally representative surveys in India (12), for example, indicate a steady level of consumption of only 120–140 g per capita per day, with about another 100 g per capita coming from roots and tubers, and some 40 g per capita from pulses. This may not be true for urban populations in India, who have rising incomes and greater access to a diverse and varied diet. In contrast, in China, — a country that is undergoing rapid economic growth and transition — the amount of fruits and vegetables consumed has increased to 369 g per capita per day by 1992.

At present, only a small and negligible minority of the world's population consumes the generally recommended high average intake of fruits and vegetables. In 1998, only 6 of the 14 WHO regions had an availability of fruits and vegetables equal to or greater than the earlier recommended intake of 400 g per capita per day. The relatively favourable situation in 1998 appears to have evolved from a markedly less favourable position in previous years, as evidenced by the great increase in vegetable availability recorded between 1990 and 1998 for most of the regions. In contrast, the availability of fruit generally decreased between 1990 and 1998 in most regions of the world.

The increase in urbanization globally is another challenge. Increasing urbanization will distance more people from primary food production, and in turn have a negative impact on both the availability of a varied and nutritious diet with enough fruits and vegetables, and the access of the urban poor to such a diet. Nevertheless, it may facilitate the achievement of other goals, as those who can afford it can have better access to a diverse and varied diet. Investment in periurban horticulture may provide an opportunity to increase the availability and consumption of a healthy diet.

Global trends in the production and supply of vegetables indicate that the current production and consumption vary widely among regions, as indicated in Table 5. It should be noted that the production of wild and indigenous vegetables is not taken into account in production statistics and might therefore be underestimated in consumption statistics. In 2000, the global annual average per capita vegetable supply was 102 kg, with the highest level in Asia (116 kg), and the lowest levels in South America (48 kg) and Africa (52 kg). These figures also include the large amount of horticultural produce that is consumed on the farm. Table 5 and Figure 3 illustrate the regional and temporal variations in the per capita availability of vegetables per capita over the past few decades.

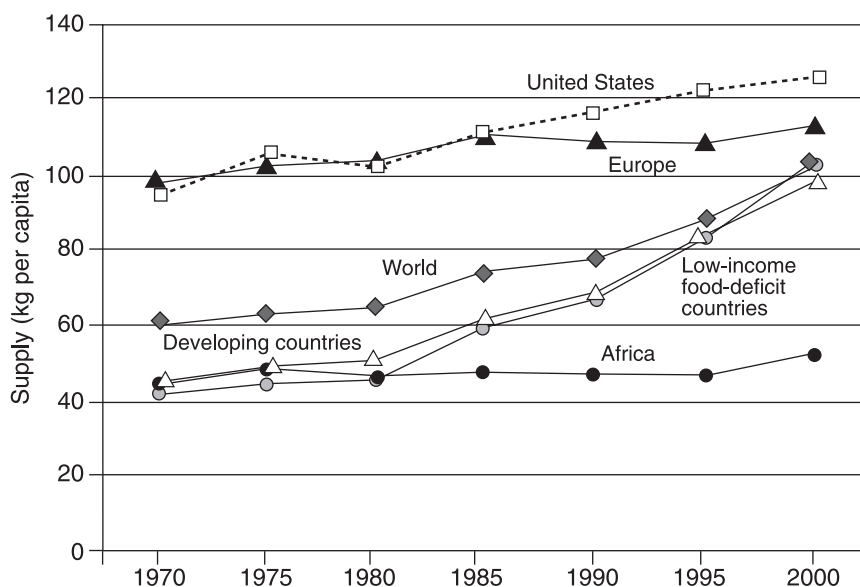
Table 5
Supply of vegetables per capita, by region, 1979 and 2000 (kg per capita per year)

Region	1979	2000
World	66.1	101.9
Developed countries	107.4	112.8
Developing countries	51.1	98.8
Africa	45.4	52.1
North and Central America	88.7	98.3
South America	43.2	47.8
Asia	56.6	116.2
Europe	110.9	112.5
Oceania	71.8	98.7

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Figure 3

Trends in the supply of vegetables per capita, by region, 1970–2000



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3.7 Future trends in demand, food availability and consumption

In recent years the growth rates of world agricultural production and crop yields have slowed. This has raised fears that the world may not be able to grow enough food and other commodities to ensure that future populations are adequately fed. However, the slowdown has occurred not because of shortages of land or water but rather because demand for agricultural products has also slowed. This is mainly because world population growth rates have been declining since the late 1960s, and fairly high levels of food consumption per person are now being reached in many countries, beyond which further rises will be limited. It also true that a high share of the world's population remains in poverty and hence lacks the necessary income to translate its needs into effective demand. As a result, the growth in world demand for agricultural products is expected to fall from an average 2.2% per year over the past 30 years to an average 1.5% per year for the next 30 years. In developing countries the slowdown will be more dramatic, from 3.7% per year to 2% per year, partly as a result of China having passed the phase of rapid growth in its demand for food. Global food shortages are unlikely, but serious problems already exist at national and local levels, and may worsen unless focused efforts are made.

The annual growth rate of world demand for cereals has declined from 2.5% per year in the 1970s and 1.9% per year in the 1980s to only 1% per

year in the 1990s. Annual cereal use per person (including animal feeds) peaked in the mid-1980s at 334 kg and has since fallen to 317 kg. The decline is not a cause for alarm, it is largely the natural result of slower population growth and shifts in human diets and animal feeds. During the 1990s, however, the decline was accentuated by a number of temporary factors, including serious economic recessions in the transition countries and in some East and South-East Asian countries.

The growth rate in the demand for cereals is expected to rise again to 1.4% per year up until 2015, slowing to 1.2% per year thereafter. In developing countries overall, cereal production is not expected to keep pace with demand. The net cereal deficits of these countries, which amounted to 103 million tonnes or 9% of consumption in 1997–1999, could rise to 265 million tonnes by 2030, when they will be 14% of consumption. This gap can be bridged by increased surpluses from traditional grain exporters, and by new exports from the transition countries, which are expected to shift from being net importers to being net exporters.

Oil crops have seen the fastest increase in area of any crop sector, expanding by 75 million hectares between the mid-1970s and the end of the 1990s, while cereal area fell by 28 million hectares over the same period. Future per capita consumption of oil crops is expected to rise more rapidly than that of cereals. These crops will account for 45 out of every 100 extra kilocalories added to average diets in developing countries between now and 2030.

There are three main sources of growth in crop production: expanding the land area, increasing the frequency at which it is cropped (often through irrigation), and boosting yields. It has been suggested that growth in crop production may be approaching the ceiling of what is possible in respect of all three sources. A detailed examination of production potentials does not support this view at the global level, although in some countries, and even in whole regions, serious problems already exist and could deepen.

Diets in developing countries are changing as incomes rise. The share of staples, such as cereals, roots and tubers, is declining, while that of meat, dairy products and oil crops is rising. Between 1964–1966 and 1997–1999, per capita meat consumption in developing countries rose by 150% and that of milk and dairy products by 60%. By 2030, per capita consumption of livestock products could rise by a further 44%. Poultry consumption is predicted to grow the fastest. Productivity improvements are likely to be a major source of growth. Milk yields should improve, while breeding and improved management should increase average carcass weights and off-take rates. This will allow increased production with lower growth in animal numbers, and a corresponding

slowdown in the growth of environmental damage from grazing and animal wastes.

In developing countries, demand is predicted to grow faster than production, resulting in a growing trade deficit. In meat products this deficit will rise steeply, from 1.2 million tonnes per year in 1997–1999 to 5.9 million tonnes per year in 2030 (despite growing meat exports from Latin America), while in the case of milk and dairy products, the rise will be less steep but still considerable, from 20 million tonnes per year in 1997–1999 to 39 million tonnes per year in 2030. An increasing share of livestock production will probably come from industrial enterprises. In recent years, production from this sector has grown twice as fast as that from more traditional mixed farming systems and more than six times faster than that from grazing systems.

World fisheries production has kept ahead of population growth over the past three decades. Total fish production has almost doubled, from 65 million tonnes in 1970 to 125 million tonnes in 1999, when the world average intake of fish, crustaceans and molluscs reached 16.3 kg per person. By 2030, annual fish consumption is likely to rise to some 150–160 million tonnes, or between 19–20 kg per person. This amount is significantly lower than the potential demand, as environmental factors are expected to limit supply. During the 1990s the marine catch levelled out at 80–85 million tonnes per year, and by the turn of the century, three-quarters of ocean fish stocks were overfished, depleted or exploited up to their maximum sustainable yield. Further growth in the marine catch can only be modest.

Aquaculture compensated for this marine slowdown, doubling its share of world fish production during the 1990s. It is expected to continue to grow rapidly, at rates of 5–7% per year up to 2015. In all sectors of fishing it will be essential to pursue forms of management conducive to sustainable exploitation, especially for resources under common ownership or no ownership.

3.8 Conclusions

A number of conclusions can be drawn from the preceding discussion.

- Most of the information on food consumption has hitherto been obtained from national Food Balance Sheet data. In order to better understand the relationship between food consumption patterns, diets and the emergence of noncommunicable diseases, it is crucial to obtain more reliable information on actual food consumption patterns and trends based on representative consumption surveys.

- There is a need to monitor how the recommendations in this report influence the behaviour of consumers, and what further action is needed to change their diets (and lifestyles) towards more healthy patterns.
- The implications for agriculture, livestock, fisheries and horticulture will have to be assessed and action taken to deal with potential future demands of an increasing and more affluent population. To meet the specified levels of consumption, new strategies may need to be developed. For example, a realistic approach to the implementation of the recommendation concerning high average intake of fruit and vegetables, requires attention to be paid to crucial matters such as where would the large quantities needed be produced, how can the infrastructure be developed to permit trade in these perishable products, and would large-scale production of horticultural products be sustainable?
- A number of more novel matters will need to be dealt with, such as:
 - the positive and negative impacts on noncommunicable diseases of intensive production systems, not only in terms of health (e.g. nitrite in vegetables, heavy metals in irrigation water and manure, pesticide use), but also in terms of dietary quality (e.g. leaner meats in intensive poultry production);
 - the effects of longer food chains, in particular of longer storage and transport routes, such as the higher risk of deterioration (even if most of this may be bacterial and hence not a factor in chronic diseases), and the use and misuse of conserving agents and contaminants;
 - the effects of changes in varietal composition and diversity of consumption patterns, for example, the loss of traditional crop varieties and, perhaps even more significantly, the declining use of foods from “wild” sources.
- Trade aspects need to be considered in the context of improving diet, nutrition and the prevention of chronic diseases. Trade has an important role to play in improving food and nutrition security. On the import side, lower trade barriers reduce domestic food prices, increase the purchasing power of consumers and afford them a greater variety of food products. Freer trade can thus help enhance the availability and affordability of food and contribute to a better-balanced diet. On the export side, access to markets abroad creates new income opportunities for domestic farmers and food processors. Farmers in developing countries in particular stand to benefit from the removal of trade barriers for commodities such as sugar, fruits and vegetables, as well as tropical beverages, all these being products for which they have a comparative advantage.
- The impact that agricultural policies, particularly subsidies, have on the structure of production, processing and marketing systems – and

ultimately on the availability of foods that support healthy food consumption patterns – should not be overlooked.

All these issues and challenges need to be addressed in a pragmatic and intersectoral manner. All sectors in the food chain, from “farm to table”, will need to be involved if the food system is to respond to the challenges posed by the need for changes in diets to cope with the burgeoning epidemic of noncommunicable diseases.

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