CHAPTER 2

# Prospects for food and nutrition

## 2.1 The broad picture: Historical developments and present situation

### 2.1.1 Progress made in raising food consumption per person

Food consumption, in terms of kcal/person/day, is the key variable used for measuring and evaluating the evolution of the world food situation.[1] The world has made significant progress in raising food consumption per person. It increased from an average of 2 360 kcal/person/day in the mid-1960s to 2 800 kcal/person/day currently (Table 2.1). This growth was accompanied by significant structural change. Diets shifted towards more livestock products, vegetable oils, etc. and away from staples such as roots and tubers (Tables 2.7, 2.8). The increase in world average kcal/person/ day would have been even higher but for the declines in the transition economies in the 1990s.

The gains in the world average reflected predominantly those of the developing countries, given that the industrial countries and the transition economies had fairly high levels of per capita food consumption already in the mid-1960s. This overall progress of the developing countries has been decisively influenced by the significant gains made by the most populous among them. There are currently seven developing countries with a population of over 100 million. Of these, only Bangladesh remains at very low levels of food consumption. China, Indonesia and Brazil have made the transition to fairly high levels (in the range 2 900-3 000 kcal). In more recent years (from the late 1980s), India, Pakistan and Nigeria (but see Box 2.2) also started making progress and have now achieved middling levels of per capita food consumption after decades of near stagnation (Figure 2.1).

An alternative way of looking at changes over the historical period is to observe the distribution of world population living in countries having given levels of kcal/person/day. The relevant data are shown in Table 2.2. In the mid-1960s, 57 percent of the population of the whole world (not only the developing countries), including both China and India, lived in countries with extremely low levels,

[1] The more correct term for this variable would be "national average apparent food consumption", since the data come from the national food balance sheets rather than from consumption surveys. The term "food consumption" is used in this sense here and in other chapters.

**Table 2.1 Per capita food consumption (kcal/person/day)**

| | 1964/66 | 1974/76 | 1984/86 | 1997/99 | 2015 | 2030 |
|---|---|---|---|---|---|---|
| World | 2 358 | 2 435 | 2 655 | 2 803 | 2 940 | 3 050 |
| Developing countries | 2 054 | 2 152 | 2 450 | 2 681 | 2 850 | 2 980 |
| Sub-Saharan Africa | 2 058 | 2 079 | 2 057 | 2 195 | 2 360 | 2 540 |
| Near East/North Africa | 2 290 | 2 591 | 2 953 | 3 006 | 3 090 | 3 170 |
| Latin America and the Caribbean | 2 393 | 2 546 | 2 689 | 2 824 | 2 980 | 3 140 |
| South Asia | 2 017 | 1 986 | 2 205 | 2 403 | 2 700 | 2 900 |
| East Asia | 1 957 | 2 105 | 2 559 | 2 921 | 3 060 | 3 190 |
| Industrial countries | 2 947 | 3 065 | 3 206 | 3 380 | 3 440 | 3 500 |
| Transition countries | 3 222 | 3 385 | 3 379 | 2 906 | 3 060 | 3 180 |
| Memo items | | | | | | |
| 1. World, excl. transition countries | 2 261 | 2 341 | 2 589 | 2 795 | 2 930 | 3 050 |
| 2. Developing countries, excl. China | 2 104 | 2 197 | 2 381 | 2 549 | 2 740 | 2 900 |
| 3. East Asia, excl. China | 1 988 | 2 222 | 2 431 | 2 685 | 2 830 | 2 980 |
| 4. Sub-Saharan Africa, excl. Nigeria | 2 037 | 2 076 | 2 057 | 2 052 | 2 230 | 2 420 |

under 2 200 kcal, the great bulk of them being in countries with under 2 000 kcal. At the other extreme, 30 percent of the world population (overwhelmingly in the developed countries) lived in countries with over 2 700 kcal, two-thirds of these in countries with over 3 000 kcal.

It was a world of very pronounced inequality, with at the bottom masses of poor, a very thin middle class and, at the other end, a sizeable group of well-to-do population. By the late 1990s, the situation had changed radically. Only 10 percent of a much larger global population now lives in countries with food consumption below 2 200 kcal, while those in countries with over 2 700 kcal now account for 61 percent of world population. The gains made by some of the very populous developing countries (such as China, Brazil and Indonesia, see Figure 2.1) were largely responsible for this massive upgrading of the world population towards improved levels of per capita food consumption.

**Figure 2.1 Per capita food consumption, developing countries with over 100 million population in 1997/99**

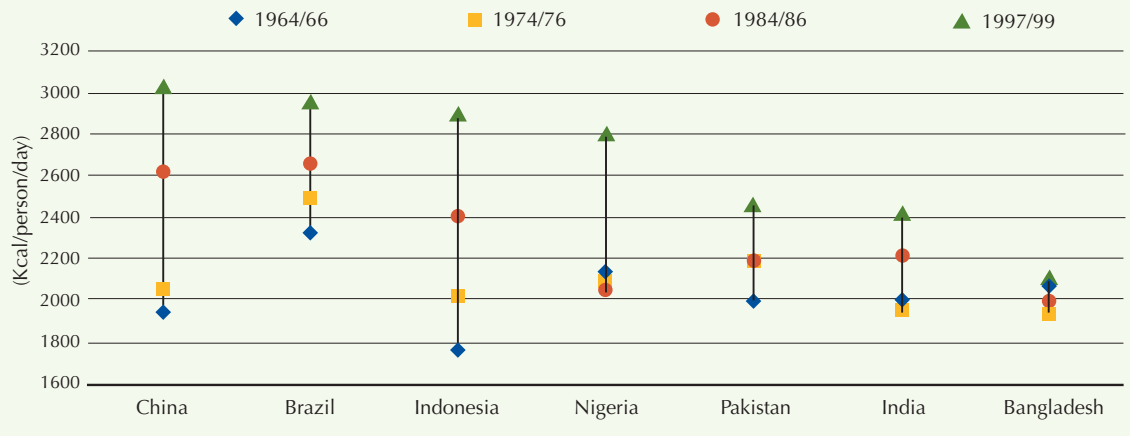


**Table 2.2 Population living in countries with given per capita food consumption**

| Kcal/person/day | 1964/66 | 1974/76 | 1984/86 | 1997/99 | 2015 | 2030 |
|---|---|---|---|---|---|---|
| | Population (million) | | | | | |
| Under 2 200 | 1 893 [a] | 2 281 [a] | 558 | 571 | 462 | 196 |
| 2 200-2 500 | 288 | 307 | 1 290 [b] | 1 487 [b] | 541 | 837 |
| 2 500-2 700 | 154 | 141 | 1 337 [c] | 222 | 351 | 352 |
| 2 700-3 000 | 302 | 256 | 306 | 1 134 | 2 397 [b] | 2 451 [b] |
| Over 3 000 | 688 | 1 069 | 1 318 | 2 464 [c] | 3 425 [c] | 4 392 [c] |
| World total | 3 325 | 4 053 | 4 810 | 5 878 | 7 176 | 8 229 |

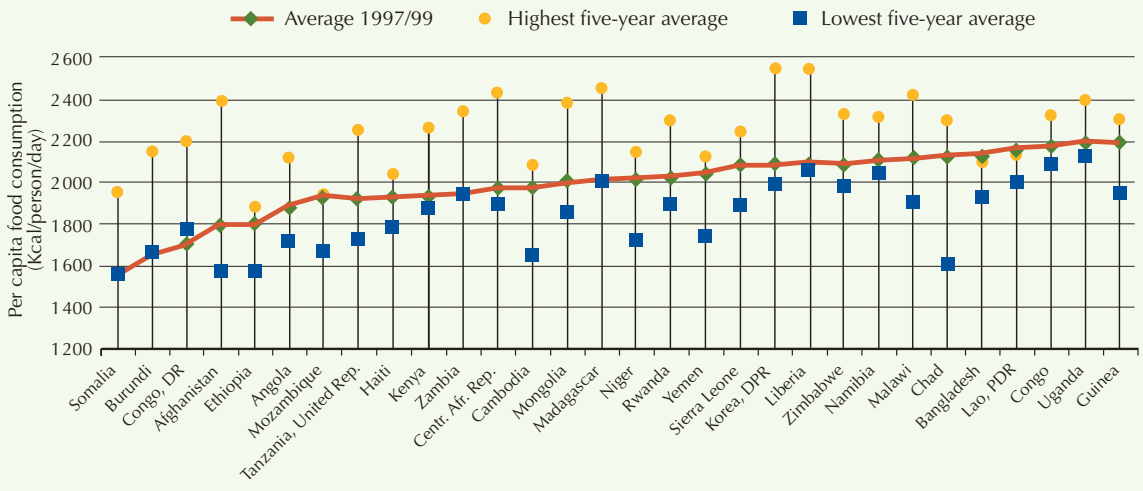
[a] Includes India and China. [b] Includes India. [c] Includes China.

### 2.1.2 Failures

A significant number of countries failed to participate in this general thrust towards increasing average food consumption levels. There are currently 30 developing countries where food consumption is under 2 200 kcal/person/day. Figure 2.2 summarizes their historical experience: present (average 1997/99) levels are compared with the highest and lowest ones recorded in any five-year average (in order to smooth out distortions from yearly fluctuations) in the period 1961-1999. The following comments may be made about these 30 countries:

- Several among them (e.g. the Democratic People's Republic of Korea, the Central African Republic, Madagascar, Liberia, Malawi and Uganda) had achieved middling levels (over 2 400 kcal) in at least one five-year average in the past. They are now in the under-2 200 kcal class because they suffered declines, some particularly deep ones, in the case of Liberia and the Democratic People's Republic of Korea.
- For most other countries in Figure 2.2, the highest level ever achieved was totally inadequate to start with, yet they suffered further declines, some very sharp ones, as was the case in Somalia, Burundi, Haiti and Ethiopia/ Eritrea.[2]
- Finally, a few countries did not suffer declines but have always had very low per capita food

**Figure 2.2 Developing countries with under 2 200 kcal in 1997/99. Highest and lowest five-year average kcal recorded during 1961-1999**




[2] The data used in Figure 2.2 refer to the aggregate Ethiopia and Eritrea, because there are no data for making historical comparisons for the two countries separately.

consumption. That is, they have never had levels that were significantly above the very low ones they have currently. Here belong Bangladesh, Mozambique and the Lao People's Democratic Republic.

The historical evidence from these countries, particularly those that suffered severe declines from better nutritional levels in the past, is a crucial input into the analysis of the evolution of world food insecurity. War or otherwise unsettled political conditions are common characteristics in several of these countries.

Looking at the regional picture, sub-Saharan Africa, excluding Nigeria, stands out as the only region that failed to make any progress in raising per capita food consumption (Table 2.1). Not all countries of the region are in this dire food security situation. Besides Nigeria (but see Box 2.2), a number of other countries made significant progress to over 2 400 kcal/person/day (Mauritius, Mauritania, the Gambia, Ghana, Gabon, Benin and Togo) but their weight in the regional total is too small to have much effect on the total. The regional aggregate picture is dominated by the failures suffered by the larger countries. Of the 12 countries with a population of over 15 million, most have a per capita food consumption (latest five-year average 1995/99) that is lower than attained in the past – some of them much lower, e.g. the Democratic Republic of the Congo, Madagascar, Côte d'Ivoire, Kenya and the United Republic of Tanzania. Only Nigeria, Ghana and the Sudan among these larger countries have higher levels now than any past five-year average.

### 2.1.3 The incidence of undernourishment

The 2001 FAO assessment, *The State of Food Insecurity in the World 2001* (FAO, 2001a), estimates the total incidence of undernourishment in the developing countries at 776 million persons in 1997/99 (17 percent of their population, Table 2.3),[3] when average food consumption reached 2 680 kcal/person/day. The number of undernourished in the developing countries is estimated at 815 million (20 percent of the population) for the three-year average 1990/92. This was the base year used by the 1996 WFS in setting the target of halving the numbers undernourished in the developing countries by 2015 at the latest.

Obviously, the decline between 1990/92 and 1997/99 has been much less than required for attaining the target (see further discussion in Box 2.5). In practice, the entire decline has come from East Asia, which is well on its way to halving undernourishment by the year 2015. In contrast, the two regions with the highest incidence in relative terms (percentage of population), sub-Saharan Africa and South Asia, both registered increases in the absolute numbers affected. If these trends continue, the halving target will certainly not be achieved and whatever other reductions take place will further accentuate the differences among regions and countries.

Changes in the incidence of undernourishment are close correlates of changes in food consumption levels (kcal/person/day), as explained in Box 2.1. The historical data in Table 2.1 show that food consumption levels have improved greatly for most regions over the last three decades. It can be deduced that such improvement must have been accompanied by a lowering of the incidence of undernourishment to the current 17 percent. By implication, the incidence of undernourishment must have been much higher in the past, e.g. in the mid-1960s when there were only 2 055 kcal/ person/day on average in the developing countries. However, it is unlikely that the absolute numbers of persons undernourished declined by much, given that over the same period (1964/66 to 1997/99) the population of the developing countries doubled from 2.3 billion to 4.6 billion.

[3] The term "undernourishment" is used to refer to the status of persons whose food intake does not provide enough calories to meet their basic energy requirements. The term "undernutrition" denotes the status of persons whose anthropometric measurements indicate the outcome not only, or not necessarily, of inadequate food intake but also of poor health and sanitation – conditions that may prevent them from deriving full nutritional benefit from what they eat (FAO, 1999a, p.6).

## Table 2.3 Incidence of undernourishment, developing countries

| | 1990/92[1] | 1997/99 | 2015 | 2030 | 1990/92[1] | 1997/99 | 2015 | 2030 |
|---|---|---|---|---|---|---|---|---|
| | Percentage of population | | | | Million persons | | | |
| Developing countries | 20 | 17 | 11 | 6 | 815 | 776 | 610 | 443 |
| Sub-Saharan Africa | 35 | 34 | 23 | 15 | 168 | 194 | 205 | 183 |
| *excl. Nigeria* | *40* | *40* | *28* | *18* | *156* | *186* | *197* | *178* |
| Near East/North Africa | 8 | 9 | 7 | 5 | 25 | 32 | 37 | 34 |
| Latin America and Caribbean | 13 | 11 | 6 | 4 | 59 | 54 | 40 | 25 |
| South Asia | 26 | 24 | 12 | 6 | 289 | 303 | 195 | 119 |
| East Asia | 16 | 11 | 6 | 4 | 275 | 193 | 135 | 82 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Undernourishment | | | | |
| **Alternative country groups** | **Population (million)** | | | **Kcal/person/day** | | | **Percentage of population** | | | **Million persons** | | |
| | **1997/99** | **2015** | **2030** | **1997/99** | **2015** | **2030** | **1997/99** | **2015** | **2030** | **1997/99** | **2015** | **2030** |
| **I. Countries with kcal in 2015** | | | | | | | | | | | | |
| Under 2 200 kcal (15 countries) | 289 | 462 | 671 | 1 855 | 2 055 | 2 260 | 51 | 35 | 23 | 147 | 164 | 152 |
| 2 200-2 500 kcal (26 countries) | 358 | 517 | 676 | 2 144 | 2 340 | 2 525 | 33 | 22 | 13 | 119 | 111 | 89 |
| 2 500-2 700 kcal (12 countries) | 257 | 336 | 395 | 2 380 | 2 580 | 2 780 | 21 | 12 | 6 | 54 | 41 | 25 |
| 2 700-3 000 kcal (23 countries) | 1 678 | 2 171 | 2 561 | 2 545 | 2 800 | 3000 | 18 | 9 | 4 | 302 | 190 | 109 |
| Over 3 000 kcal (21 countries) | 1 972 | 2 317 | 2 537 | 3 054 | 3 200 | 3310 | 8 | 5 | 3 | 154 | 105 | 68 |
| Total | 4 555 | 5 804 | 6 840 | 2 681 | 2 850 | 2 980 | 17 | 11 | 6 | 776 | 610 | 443 |
| **II. Countries with percentage undernourishment[2]** | | | | | | | | | | | | |
| Under 5 percent | 349 | 1158 | 5129 | 3 187 | 3 130 | 3 150 | 2 | 3 | 3 | 8 | 37 | 178 |
| 5-10 percent | 1 989 | 2 162 | 524 | 2 999 | 3 066 | 2 758 | 8 | 6 | 7 | 167 | 134 | 38 |
| 10-25 percent | 1 632 | 1 939 | 948 | 2 434 | 2 644 | 2 411 | 21 | 13 | 16 | 349 | 250 | 155 |
| Over 25 percent | 586 | 544 | 239 | 1 988 | 2 085 | 2 149 | 43 | 35 | 30 | 251 | 190 | 72 |
| Total | 4 555 | 5 804 | 6 840 | 2 681 | 2 850 | 2 980 | 17 | 11 | 6 | 776 | 610 | 443 |

[1] The estimates for 1990/92 given here differ a little from those used for the same period in the documents for the 1996 WFS (FAO, 1996a). This is due to the revisions after 1996 that take into account new data, mainly for population.

[2] Different countries form each group in the different years.

## 2.2 The outlook for food and nutrition to 2015 and 2030

### 2.2.1 Demographics

The latest United Nations assessment of world population prospects (UN, 2001a) indicates that a rather drastic slowdown in world demographic growth is likely. The data and projections are shown in Table 2.4. The world population of 5.9 billion of our base year (the three-year average 1997/99) and the 6.06 billion of 2000 will grow to 7.2 billion in 2015, 8.3 billion in 2030 and 9.3 billion in 2050. The growth rate of world population peaked in the second half of the 1960s at 2.04 percent p.a. and had fallen to 1.35 percent p.a. by the second half of the 1990s. Further deceleration will bring it down to 1.1 percent in 2010-15, to 0.8 percent in 2025-30 and to 0.5 percent by 2045-50.

Despite the drastic fall in the growth rate, the absolute annual increments continue to be large. Seventy-nine million persons were added to the world population every year in the second half of the 1990s and the number will not have decreased much by 2015. Even by 2025-30 annual additions will still be 67 million. It is only by the middle of the century that these increments will have fallen significantly, to 43 million per year in 2045-50. Practically

**Box 2.1 Measuring the incidence of undernourishment: the key role of the estimates of food available for direct human consumption** [1]

The key data used for estimating the incidence of undernourishment are those of food available for direct human consumption. These data are derived in the framework of the national food balance sheets (FBS). The latter are constructed on the basis of countries' reports on their production and trade of food commodities, after estimates and/or allowances are made for non-food uses and for losses. The population data are used to express these food availabilities in per capita terms. The resulting numbers are taken as proxies for actual national average food consumption. For many countries the per capita food consumption thus estimated of the different commodities (expressed in kcal/person/day) are totally inadequate for good nutrition, hence the relatively high estimates of the incidence of undernourishment reported for them, most recently in FAO (2001a).

This conclusion is inferred from a comparison of the estimated kcal/person/day shown in the FBS data with what would be required for good nutrition. The parameters for the latter are well known, although not devoid of controversy. In the first place, there is the amount of food (or dietary) energy that is needed for the human body to function (breathe, pump blood, etc.) even without allowing for movement or activity. This is the basal metabolic rate (BMR). It is in the general range of 1 300-1 700 kcal/day for adults in different conditions (age, sex, height, bodyweight). Taking the age/sex structure and bodyweights of the adult populations of the different developing countries, their national average BMRs for adults are defined. These refer to the amount of energy as a national average per adult person that must be actually absorbed if all were in a state of rest. For children, in addition to the BMR, an allowance is made for growth requirements.

When an allowance for light activity is added – estimated to be about 54 percent of the BMR – this results in a range of between 1 720 kcal and 1 960 kcal person/day for the different developing countries, given their population structures in 1997/99. This will rise to 1 760-1 980 kcal by 2030 when the demographic structure will be different, with a higher proportion of adults. It follows that population groups in which an average individual has an intake below this level (the threshold) are undernourished because they do not eat enough to maintain health, bodyweight and to engage in light activity. The result is physical and mental impairment, characteristics that are evidenced in the anthropometric surveys. Estimating the incidence of undernourishment means estimating the proportion of population with food intakes below these thresholds. It is noted that the notion, measurement and definition of thresholds of requirements are not devoid of controversy. For example, Svedberg (2001, p. 12) considers that the thresholds used in the FAO measurement of undernourishment for the tropical countries are too high, leading to overestimates of the incidence of undernourishment.

In principle, a country having national average kcal/person/day equal to the threshold would have no undernourishment problem provided all persons engage in only light activity and each person had access to food exactly according to his/her respective requirements. However, this is never the case; some people consume (or have access to) more food than their respective "light activity" requirements (e.g. because they engage in more energy-demanding work or simply overeat) and other people less than their requirement (usually because they cannot

all these increases will be in the developing countries. Within the developing countries themselves, there will be increasing differentiation. East Asia will have a growth rate of only 0.4 percent p.a. in the last five years of the projection period. At the other extreme, sub-Saharan Africa's population will still be growing at 2.1 percent p.a. in the same period 2025-30, despite the drastic downward revision made in recent years in the region's population projections.[4] By that time every third person added annually to the world population will be in that region. By 2050, every second person of the 43 million added annually to the world population will be in sub-Saharan Africa.

The new population projections represent a rather fundamental change in the assumptions

[4] It is tempting to think that a lower population growth rate in the low-income countries where population growth is high would be contributing to improved development. However, in the current projections, the reduced population growth rate is not always a harbinger of good things to come, because in some cases it occurs, at least in part, for the wrong reasons. This is the case of demographic slowdown because of increases in mortality and/or declines in life expectancy, either in relation to present values or to those that would otherwise be in the projections. In the current projections, such cases of increased mortality and reduced life expectancy caused by the AIDS epidemic are a rather significant component of the projected slowdown. Thus, for the 45 most affected countries, the expectation of life at birth by 2015 is projected to stand at 60 years, five years lower than it would have been in the absence of HIV/AIDS (UN, 2001a).

afford more). Thus, an allowance must be made for such unequal access. Empirical evidence suggests that the inequality measure used in these estimates – the coefficient of variation (CV) – ranges from 0.2 to 0.36 in the different countries (a CV of 0.2 means, roughly, that the average difference of the food intake of individuals from the national average – the standard deviation – is 20 percent of the average). Even at the lowest level of inequality generally found in the empirical data (CV=0.2), the national average kcal/person/day must be well above the threshold if the proportion of population undernourished is to be very low. For example, a country with threshold 1 800 kcal and CV=0.20, must have a national average of 2 700 kcal/person/day if the proportion undernourished is to be only 2.5 percent, or 2 900 if it is to be 1 percent. Naturally, if inequality were more pronounced, these requirements would be higher (see Fig. 2.4).

These numbers, or norms, are, therefore, a first guide to assessing the adequacy or otherwise of the national average food consumption levels in the FBS data and expressed in kcal/person/day. This latter number is the principal variable used to generate estimates of the incidence of undernourishment as explained elsewhere (FAO, 1996b).[2] Numerous countries fall below the national average energy level (kcal/person/day) required for undernourishment to be very low, in many cases they fall below by considerable margins. Therefore, even if one knew nothing more about the incidence of undernourishment, the inevitable conclusion for these countries is that the incidence must be significant, ranging from moderate to high or very high in the different countries, even when inequality of access to food is moderate. It follows that progress towards reducing or eliminating undernourishment must manifest itself, in the first place, in the form of increased per capita food consumption. Naturally, this is not equivalent to saying that the food consumption shown in the FBS data is itself a variable that can be operated upon directly by policy. For it to rise, somebody must consume more food, and the food must come from somewhere – production or imports. The policies to raise national average consumption are those that enhance the purchasing power and more general access to food of those who would consume more if they had the means, for example, access to resources and technologies to improve their own food production capacities, access to non-farm employment and social policies. The point made here is that changes in the national average kcal/person/day recorded in the FBS data do signal the direction and magnitude of movement towards improved or worsened food security status. This is shown graphically in Fig. 2.4.

How reliable are the FBS data, since in many cases they show very low or very high levels of national average food consumption or sudden spurts or collapses? The answer is: they are as reliable as the primary data on production and trade supplied by the countries, as well as the population data used to express them in per capita terms (see Box 2.2). It is these data that are processed, in the form of the FBS, to derive the indicators of per capita food consumption as national averages used here. Given the primary data, the conclusion that many countries are in a difficult food security situation follows logically and inevitably.

[1] Reproduced with amendments from FAO (1996a).

[2] These key variables (kcal/person/day and the CV) are used as parameters of the lognormal statistical distribution (with kcal/person/day as the mean) to estimate the percentage of population undernourished.

underlying this and other studies of food and agriculture futures. When our earlier projections study to 2010 (Alexandratos, 1995) was being produced in 1992-93, we were working with a world population projection of 7.2 billion for 2010. The new projections indicate 6.8 billion for the same year, 400 million fewer people. In principle, the lower population projection used now should make for lower growth of demand and production, *ceteris paribus*. Naturally, other things (incomes, poverty, pressures on resources and the environment) are not expected to be equal; slower demographic growth itself will be a factor for change, for example if it contributes to higher incomes. In this exercise, we assume that whatever effects slower population growth has on the overall economy have already been taken into account in the derivation of the income (or GDP) growth assumptions (see below). The latter, just like

**Table 2.4 Population and GDP data and projections**

| | Population | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Million | | | | | | Annual increments (Million) | | | |
| | 1964 /66 | 1974 /76 | 1984 /86 | 1997 /99 | 2015 | 2030 | 1995 -2000 | 2010 -2015 | 2025 -2030 | 2045 -2050 |
| World (UN) | 3 334 | 4 065 | 4 825 | 5 900 | 7 207 | 8 270 | 79 | 76 | 67 | 43 |
| World (countries with FBS*) | 3 325 | 4 053 | 4 810 | 5 878 | 7 176 | 8 229 | 78 | 76 | 66 | 43 |
| Developing countries | 2 295 | 2 925 | 3 597 | 4 572 | 5 827 | 6 869 | 74 | 74 | 66 | 45 |
| Sub-Saharan Africa | 230 | 299 | 400 | 574 | 883 | 1 229 | 15 | 20 | 24 | 23 |
| Near East/North Africa | 160 | 208 | 274 | 377 | 520 | 651 | 8 | 9 | 9 | 7 |
| Latin America and Caribbean | 247 | 318 | 397 | 498 | 624 | 717 | 8 | 7 | 6 | 3 |
| South Asia | 630 | 793 | 989 | 1 283 | 1 672 | 1 969 | 23 | 22 | 19 | 12 |
| East Asia | 1 029 | 1 307 | 1 537 | 1 839 | 2128 | 2 303 | 20 | 16 | 9 | -1 |
| Industrial countries | 695 | 761 | 815 | 892 | 951 | 979 | 5 | 2 | 1 | 0 |
| Transition countries | 335 | 367 | 397 | 413 | 398 | 381 | 0 | -1 | -1 | -2 |

| | Growth rates, percentage p.a. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Population | | | | | Total GDP | | Per capita GDP | | |
| | 1969 -99 | 1979 -99 | 1989 -99 | 1997/99 -2015 | 2015 -2030 | 1997/99 -2015 | 2015 -2030 | 1997/99 -2015 | 2015 -2030 | 1997/99 -2030 |
| World | 1.7 | 1.6 | 1.5 | 1.2 | 0.9 | 3.5 | 3.8 | 2.3 | 2.9 | 2.6 |
| Developing countries | 2.0 | 1.9 | 1.7 | 1.4 | 1.1 | 5.1 | 5.5 | 3.7 | 4.4 | 4.0 |
| Sub-Saharan Africa | 2.9 | 2.9 | 2.7 | 2.6 | 2.2 | 4.4 | 4.5 | 1.8 | 2.3 | 2.0 |
| Near East/North Africa | 2.7 | 2.6 | 2.4 | 1.9 | 1.5 | 3.7 | 3.9 | 1.8 | 2.4 | 2.1 |
| Latin America and Caribbean | 2.1 | 1.9 | 1.7 | 1.3 | 0.9 | 4.1 | 4.4 | 2.8 | 3.5 | 3.1 |
| South Asia | 2.2 | 2.1 | 1.9 | 1.6 | 1.1 | 5.5 | 5.4 | 3.9 | 4.3 | 4.1 |
| East Asia | 1.6 | 1.5 | 1.2 | 0.9 | 0.5 | 6.1 | 6.3 | 5.3 | 5.8 | 5.5 |
| Industrial countries | 0.7 | 0.7 | 0.7 | 0.4 | 0.2 | 3.0 | 3.0 | 2.6 | 2.8 | 2.7 |
| Transition countries | 0.6 | 0.5 | 0.1 | -0.2 | -0.3 | 3.7 | 4.0 | 4.0 | 4.3 | 4.1 |

## Box 2.2 Data problems and the estimation of undernourishment: the case of Nigeria

In this chapter, Nigeria is singled out as being one of the most populous developing countries, and an exception in sub-Saharan Africa. Along with China, Indonesia, etc., Nigeria has been making progress in raising significantly its per capita food consumption and, by implication, in reducing the incidence of undernourishment. This was not so in earlier projection work (Alexandratos, 1995), nor was it considered that Nigeria could be making significant progress by 2010. At the time of the earlier exercise (1992/93), Nigeria's population was reported in the 1990 UN Assessment (UN, 1991) as being 105 million in the base year of the projections, the three-year average 1988/90. With this population and its food production and trade data, the FBS indicated per capita food consumption of 2 200 kcal in 1988/90. These data implied that Nigeria was in a dire food security situation, just like most other countries of sub-Saharan Africa. Under these initial conditions, and given the very high growth rate of population (projected at 3.15 percent p.a. to reach 201 million by 2010), one could not have been optimistic about the prospects for significant improvements. Even as late as 1996, Nigeria was given as having 43 million undernourished in 1990/92 (38 percent of its population) in the documentation of the 1996 WFS (FAO, 1996c).

The drastic revisions of Nigeria's population estimates came successively after 1996. By the time of the 2000 UN Assessment (UN, 2001a), the population estimate for 1988/90 had been reduced to 83.5 million and the 2010 projection to 147 million (having passed through a projection of 139 million for 2010 in the 1998 Assessment), a growth rate of "only" 2.73 percent p.a. These new data and projections put the assessment of present and future food security prospects of Nigeria in an entirely different light. *Ceteris paribus*, the downward revision of the population by 20 percent for 1988/90 should have raised per capita food consumption for that year, from 2 200 to 2 765 kcal. Yet this was not the case. The reason is that there have also been drastic revisions in the production data for some major food crops of Nigeria. For the 1988/90 average, the production of roots and tubers (which in the unrevised data provided over one-third of the national average calories) was reduced by 38 percent. In parallel, the production of maize was revised upwards no less than 165 percent. The end result is that the revised average kcal consumption for 1988/90 was 2 300, only about 5 percent higher than the previous estimate.

The FBS for the most recent years suggest that Nigeria, after about the mid-1980s, made really spectacular progress and broke out of the long-term pattern of stagnation in per capita food consumption typical of the majority of the countries in sub-Saharan Africa. It moved from 2 050 kcal in 1984/86 (and the 2 300 revised kcal for 1988/90) to 2 815 kcal in 1997/99, implying that undernourishment fell to 7.6 million persons, or 7 percent of the population (FAO, 2001a). Fifty percent of the increase in kcal/person/day came from roots/tubers, 12 percent from maize, 11 percent from rice and 17 percent from oilcrops (rapid production increases of groundnuts, soybeans, cotton seed). Production of all these crops registered three- to sixfold increases in the period from the mid-1980s to 1997/99. If these data are correct, we have a case of a large country registering growth of aggregate food consumption, measured in calories, of 5.4 percent p.a. for over ten years (1984/86-1997/99). At first glance, such rapid growth in food demand/consumption (and associated drastic reduction in undernourishment) would seem to be at variance with what one would expect from movements in other indices of the overall economy, e.g. per capita income. There was no economic miracle of the "Asian tiger" type in Nigeria during this period to explain the phenomenon. The country's per capita income was actually falling in the period 1984-99 (the gross domestic income [GDY] was growing at 2.1 percent p.a. when population was growing at 2.9 percent p.a.; data from the World Bank, 2001b). Nigeria is sometimes given as an example of the wider problem of development failures of sub-Saharan Africa (see *The Economist,* 2000).

One possible explanation for these trends in Nigeria is the rapid growth of food-crop agriculture, which probably has a large subsistence component, particularly in the roots and tubers sector which, as noted, accounted for 50 percent of the improvement[1] (see also Chapter 3, Section on roots and tubers). Before we jump to any conclusions concerning the wider potential for food security improvements based predominantly on agriculture, there is an obvious need to validate the primary data on production as well as to find corroborating evidence (e.g. from surveys) that the improvements in consumption suggested by the FBS are real. If these developments proved to be true, they would imply that rapid progress in food-crop production and demand could be made, at least for some time, even when developments in the overall economy would suggest otherwise. Some

[1] The numbers for apparent demand/consumption result largely from the production statistics, hence this explanation, being tautological, crumbles if the production statistics are unreliable.

## Box 2.2 Data problems and the estimation of undernourishment: the case of Nigeria *(continued)*

data on poverty seem to lend support to this proposition. Rural poverty in Nigeria is reported to have declined from 49.5 percent in 1985 to 36.4 percent in 1992/93 and urban poverty from 31.7 percent to 30.4 percent (percentage of population below the national poverty line, World Bank, 2001b, Table 2.6). This was the period of the quantum jumps in food-crop production and consumption (from 2 030 to 2 660 kcal/person/day) according to the FBS data, while the overall economy was not doing particularly well with growth in GDY being only slightly above that of population.[2] These findings provide some foundation for drawing tentative lessons about the food security future of the many developing countries with high dependence on agriculture and no buoyant economic growth prospects (see Section 2.2.3, below).

2 It may be that Nigeria is a special case because of the heavy dependence of the economy on petroleum exports. This could have made for divergent trends between major economy-wide variables such as GDY (which is GDP-corrected for external terms of trade losses/gains, a correction of particular relevance for countries deriving a good part of their income from oil exports) and the food security of the majority of the population whose access to food depends more directly on local production of staples.

the demographic projections, are assumptions exogenous to the food and agriculture projections proper. This is not entirely as it should be, but practical reasons preclude any explicit consideration of the interactions between population growth and development (Box 2.3).

### 2.2.2 Overall economy and poverty

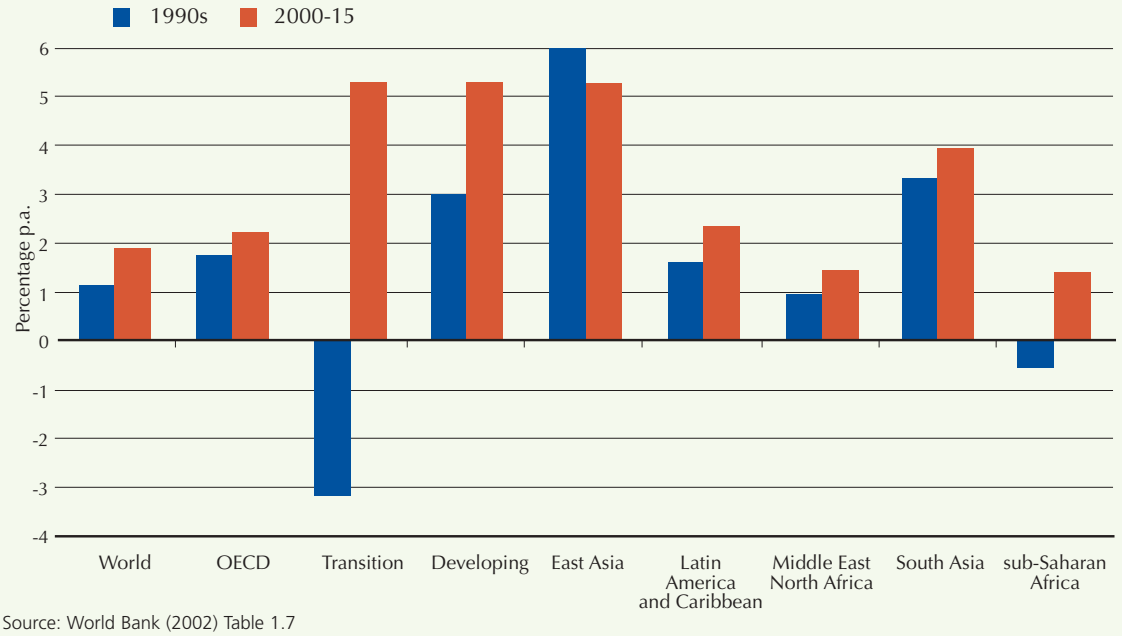
The latest World Bank assessment for the period 2000-15 takes account of the most recent data and views concerning the current (end-2001) slowdown in the world economy. Relatively slow growth in the first five years of the projection period is expected to be followed by faster growth in the subsequent ten years, 2005-15. The current assessment (World Bank, 2001c, Table 1.7) is definitely less optimistic than that of a year earlier (World Bank, 2001a, Table 1.6). Still, it indicates that for the whole period 2000-15 world economic growth is expected to be higher (1.9 percent p.a. in terms of *per capita* GDP) than in the 1990s (1.2 percent p.a.). Higher growth rates in per capita GDP than in the 1990s is foreseen for all regions and country groups (particularly the reversal of declines in the transition economies) with the exception of East Asia. These medium-term projections of the World Bank are shown in Figure 2.3. Earlier versions of these World Bank projections have provided the basis for defining the GDP projections used as exogenous assumptions in the present study. They are shown in Table 2.4.

There is great contrast in the prospects of the two regions with high relative concentrations of poverty and food insecurity, South Asia and sub-Saharan Africa; in the former, a continuation of the relatively high GDP growth holds promise of positive impact on poverty alleviation and increases in food consumption (see below). However, progress may be very limited in sub-Saharan Africa, with per capita incomes growing at only 1.3 percent p.a. in the period to 2015, according to the latest World Bank study (World Bank, 2001c). This is certainly better than in the past which was characterized by declining incomes. However, it will be far from sufficient to make a significant dent on poverty and food insecurity.

The exogenous economic growth assumptions used here, together with the growth of population, are the major determinants of projected food consumption,[5] hence also of the incidence of undernourishment. One of the important questions we shall be asking below is the extent to which such projected food demand will be associated with reductions in undernourishment. Since undernourishment is more often than not closely correlated with poverty, it is relevant to ask to what extent the economic growth and development outlook used as exogenous assumptions is compatible with poverty reduction.

5 Many other factors besides population and average GDP growth influence the demand for food and have to be taken into account in the process of all phases of analytical and evaluation work concerning nutrition, production and trade. See, for example, Box 2.2 (Nigeria) concerning issues involved in understanding the factors that influence changes in apparent food consumption.

**Figure 2.3 Growth rates of per capita GDP, 1990s and 2000-15**




Source: World Bank (2002) Table 1.7

The World Bank has estimated what the baseline economic growth projections may imply for poverty reduction in the year 2015. Their estimates are shown in Table 2.5. They refer to what is commonly known as US$1/day poverty, i.e. the number of persons living in households with per capita expenditure under US$1/day, with dollars defined in units of purchasing power parity (PPP). (For more discussion on concepts and goals relating to poverty, see Chapter 8.) These poverty projections imply that:

- the goal of halving by 2015 *the proportion* (not the absolute numbers) of the population of the developing countries as a whole living in poverty from that prevailing in 1990 may be achieved (the proportion falls from 32 percent in 1990 to 13.2 percent in 2015);
- however, the *absolute numbers* in poverty will not be halved. They are expected to decline from 1.27 billion in 1990 to 0.75 billion in 2015;
- much of the decline is caused by prospective developments in East and South Asia. Indeed, one half of the decline of 400 million foreseen for East Asia from 1990 to 2015 had already occurred by 1999;
- in contrast, the absolute numbers in poverty in sub-Saharan Africa kept increasing in the 1990s and are projected to continue to do so until 2015.

There is a fairly close parallel between these foreseen developments in the incidence of poverty and those projected here for the incidence of undernourishment, which are the subject of the following section. It is noted, however, that poverty and undernourishment are not identical concepts, in particular as concerns the settings of threshold levels for defining them (for discussion, see FAO, 2001a, p. 10).

### 2.2.3 Food security outcomes

**Higher per capita food consumption in the future, but with significant exceptions.** By 2015, and even more by 2030, the key variable used to track developments in food security – per capita food consumption as defined above – will have grown significantly. The world average will be approaching 3 000 kcal/person/day in 2015 and will exceed 3 000 by 2030 (Table 2.1). These changes in world averages will reflect above all the rising consumption of the developing countries, whose average will have risen from 2 680 kcal in 1997/99 to 2 850 kcal in 2015 and close to 3 000 in 2030. More and more people will be living in countries with medium to high levels of per capita food consumption. For example, by 2015 81 percent of the world population will be living in countries

## Box 2.3 Scenarios with alternative population projections

The issue of population-development interactions assumes particular importance if one wishes to explore scenarios of food and agriculture futures under alternative population projections. The demographic projections we use in this study are those of the United Nations *Medium Variant*. There are also *High* and *Low Variants* of future population. They suggest that the world population could be in the range of 7.0-7.4 billion by 2015 and by 2030 in the range 7.7-8.9 billion. Projecting the food and agricultural variables for these other population variants is not just a simple matter of scaling up or down the magnitudes projected under the Medium Variant population scenario. For example, world demand and production of cereals are projected to be 2.84 billion tonnes in 2030, or 344 kg per capita. We cannot just assume that under the High Variant population projection it will still be 344 kg, raising aggregate demand and production to 3.06 billion tonnes. If we did, it would be like saying that population growth does not matter for human welfare since per capita consumption (hence, in principle also per capita income) remains the same.

Such an approach would ignore the whole population-development debate concerning the positive or negative impacts of population growth on human welfare. Taking them into account requires that we estimate (or at least express a view) for each country what such impacts will be, i.e. in what direction and by how much the projected incomes will be different from those in the medium population scenario. We cannot simply adopt a blanket assumption for all countries that either: (i) *total GDP growth will be the same*, in which case it would mean that population growth is immiserizing because the higher it is, the lower the per capita income; or (ii) *per capita income growth will be the same,* implying that the population growth rate does not affect income growth. In some countries the effects may be positive, in others negative. Given the great diversity of situations existing in the world, all sorts of permutations between the growth rates of population and other variables are possible.[1] Doing estimates for over 100 countries can be an impossible task, and this would only be the first step in the work required for estimating scenarios with alternative population projections. The great bulk of the additional work would come from revisiting the country-by-country evaluations of such things as nutritional consistency of a new set of consumption projections, or the agronomic considerations (land, water, yields, etc.) underlying the projections of production. These operations are not done mechanically by a model. They involve fairly detailed reviews by country and subject-matter specialists in an interdisciplinary context.

1 For example, in countries which shift to higher population growth rates mainly because of improvements in mortality and life expectancy, such higher rates would probably be indicators of improving economic and social conditions and should be associated with higher, not lower, per capita income. Similar considerations can be relevant for countries facing acute problems of rapidly ageing populations. The opposite case can be made for very poor countries with high population growth rates. A balanced view on the latter seems to be the following: "A slowing of rapid population growth is likely to be advantageous for economic development, health, food availability, housing, poverty, the environment, and possibly education, especially in poor, agrarian societies facing pressure on land and resources" (Ahlburg, 1998). For latest views on this topic see *Population and Development Review* (2001).

with values of this variable exceeding 2 700 kcal/person/day, up from 61 percent at present and 33 percent in the mid-1970s. Those living in countries with over 3 000 kcal will be 48 percent of the world population in 2015 and 53 percent in 2030, up from 42 percent at present (Table 2.2).

These gains notwithstanding, there will still be several countries in which the per capita food consumption will not increase to levels allowing significant reductions in the numbers undernourished from the very high levels currently prevailing (see below). As shown in Table 2.2, in 2015 6 percent of the world population (462 million people) will still be living in countries with very low levels of food consumption (under 2 200 kcal). As discussed earlier (Box 2.1), in these countries a good part of the population is undernourished almost by definition. At the regional level, in 2015 sub-Saharan Africa will still have medium-low levels of per capita consumption, 2 360 kcal/person/day. The disparity between sub-Saharan Africa and the other regions is even more pronounced if Nigeria is excluded from the regional total (but see Box 2.2), in which case the kcal of the rest of the region will only be 2 230 in 2015. Of the 15 countries still remaining in 2015 in the under 2 200 kcal range (Table 2.2), 12 will be in sub-Saharan Africa. Of the 30 countries in the next range of kcal (2 200-2 500), 17 will be in this region.

**Table 2.5 Estimates and projections of poverty (US$1/day, World Bank, baseline scenario)**

| | Million persons | | | Percentage of population | | |
|---|---|---|---|---|---|---|
| | 1990 | 1999 | 2015 | 1990 | 1999 | 2015 |
| Developing countries | 1 269 | 1 134 | 749 | 32.0 | 24.6 | 13.2 |
| Sub-Saharan Africa | 242 | 300 | 345 | 47.7 | 46.7 | 39.3 |
| Middle East and North Africa | 6 | 7 | 6 | 2.4 | 2.3 | 1.5 |
| Latin America and Caribbean | 74 | 77 | 60 | 16.8 | 15.1 | 9.7 |
| South Asia | 495 | 490 | 279 | 44 | 36.9 | 16.7 |
| East Asia | 452 | 260 | 59 | 27.6 | 14.2 | 2.8 |
| Memo items | | | | | | |
| East Asia, excl China | 92 | 46 | 6 | 18.5 | 7.9 | 0.9 |
| Developing, excl. China | 909 | 920 | 696 | 32.2 | 27.3 | 16.4 |

Source: Adapted from World Bank (2001c), Table 1.8. The definition of regions is not always identical to that used in this study, e.g. Turkey is not included in the developing Middle East/North Africa and South Africa is included in the developing sub-Saharan Africa.

**Modest reductions in the numbers undernourished.** The relatively high average consumption levels of the developing countries projected for 2015 and 2030 could lead one to expect that the problem of undernourishment will be solved or well on its way to solution, in the sense that the numbers undernourished should show significant declines. This would be the corollary of what was said earlier about the importance of the per capita food consumption as the major variable that is a close correlate of the level of undernourishment. Yet the estimates presented in Table 2.3 show that reductions will be rather modest; the 776 million of 1997/99 (17 percent of the population) may become 610 million in 2015 (11 percent) and 440 million by 2030 (6 percent). For developing countries as a whole, we may have to wait until 2030 before the numbers of undernourished are reduced to nearly the target set for 2015 by the WFS, i.e. one half of the 815 million estimated for the base period of 1990/92.

These findings indicate that achieving significant declines in the incidence of undernourishment may prove to be more arduous than commonly thought. A combination of higher national average food consumption and reduced inequality (see below for assumptions) can have a significant impact on the *proportion* of the population undernourished. However, when population growth is added in, such gains do not necessarily translate into commensurate declines in the absolute numbers, because the population of the developing countries will have grown from 4.55 billion in 1997/99 to 5.8 billion in 2015 and 6.84 billion in 2030.

The numbers of undernourished are expected to remain nearly constant in sub-Saharan Africa, even by 2030. This is no doubt an improvement over the historical trend of nearly stagnant food consumption per capita in the region and, by implication, rising undernourishment. It is, however, far from what is needed to meet the WFS target of reducing the numbers by half by no later than 2015. In contrast, rather significant reductions are expected for both South and East Asia, the two regions that contain the bulk of the world's undernourished population. East Asia is expected to have halved undernourishment by 2015 (it had already reduced it by 30 percent in the period 1990/92-1997/99) and South Asia could achieve this target towards the later part of the period 2015-30.

In order to appreciate why these prospects emerge, let us recall briefly that future estimates are generated by applying the same method used for estimating present undernourishment. The only difference is that we use the future values for those variables for each country that we project, or can assume, to be different from the present ones. As noted (Box 2.1), the variables which, in our

method, determine the numbers undernourished are the following:

- The projected population.
- The per capita food consumption in kcal/person/day, taken as a proxy for actual average national consumption. Future values are derived from the projections of per capita food consumption for each commodity discussed in detail elsewhere (Chapter 3) and summarized in Tables 2.7 and 2.8 (major commodities) as well as in Table 2.1 (kcal/person/day).
- The threshold (or cut-off level) of food energy (kcal/day) a person must have in order not to be undernourished. This varies by country depending on age/sex structure of the population. The range of values applicable to different developing countries was given in Box 2.1. It was noted that because of the ageing of the population (growing share of adults in total population) the range will be higher in the projection years than at present. Therefore, this factor would tend to raise the incidence of undernourishment, *ceteris paribus*.
- The coefficient of inequality, as described in Box 2.1. We have no way of knowing how this variable may change in each country in the future. If we applied in the future the same values used for the 1997/99 undernourishment estimates, we would be ignoring the prospect that declining poverty is normally associated with more equal access to food. The World Bank projections of declines in the incidence of poverty (Table 2.5) imply that the share of population below the poverty line (hence also of persons with low food consumption levels) will be smaller in the future compared with the present. Given the nature of food consumption (it increases fast from low levels as incomes rise but then tends to level off as higher levels are attained) it is reasonable to assume that if the reduced poverty projected by the Bank were to materialize, it would be accompanied by reduced inequality in food consumption as measured by the CV. We take this prospect on board by assuming that countries will have lower inequality in the future. How much lower depends on the progress they make in raising their average kcal/person/day (see Box 2.4). The net effect of these assumptions is that the CV of the different developing countries which are currently in the range of 0.21-0.36 would be in the range of 0.20-0.31 in 2015 and 0.20-0.29 in 2030. The estimates of future undernourishment presented in Table 2.3 are based on such assumptions about changes in inequality.

One factor making for the slow decline in the numbers of undernourished is the gradual rise in the threshold (cut-off level) for classifying a person as undernourished. As noted, this rise is caused by the ageing of the population. The (simple arithmetic) average threshold of the developing countries rises from 1 835 kcal in 1997/99 to 1 882 kcal (2.6 percent) in 2030. This rise has important implications for the future incidence of undernourishment in countries with low average food consumption. It implies that consumption must rise by an equal proportion just to prevent the incidence of undernourishment (in percentage of the population) from increasing. If this ageing of the population and the associated rise in threshold requirements had not intervened, the numbers undernourished estimated for 2030 would be 16 percent lower than shown in Table 2.3, i.e. 370 million rather than 440 million.

A second factor is to be found in the very adverse initial conditions several countries started with in 1997/99. For example, nine developing countries started with estimated base year undernourishment of over 50 percent (FAO, 2001a). They are Somalia, Ethiopia, Eritrea, Mozambique, Angola, the Democratic Republic of the Congo, Afghanistan, Haiti and Burundi. The group's average per capita food consumption is 1 790 kcal and undernourishment is 57 percent of the population or 105 million. The food consumption projections imply (according to the method used here) that the *proportion* of the population affected will fall to 39 percent by 2015. This is a significant decline. However, the *absolute numbers* affected will rise to 115 million in 2015, because of the relatively high growth rate of the group's population, 2.7 percent p.a. in 1997/99-2015. The undernourished may still be 106 million (25 percent of the population) by 2030.

Are we perhaps too pessimistic? Readers may judge for themselves on the basis of the following considerations. The per capita food consumption of this group of countries has moved in the range

of 1 735-2 000 kcal in the past three decades. In the projections, it grows from 1 790 kcal in 1997/99 to 2 010 kcal in 2015 and to 2 220 in 2030. Taking into account population growth, aggregate demand for food (expressed in calories) is projected to grow at 3.5 percent p.a. in the 17 years to 2015. This contrasts with the experience of the past three decades when the highest growth rate achieved in any 17-year period (64-81, 65-82, …, 81-98, 1982-99) was 2.3 percent p.a. In parallel, the production evaluation (Chapter 4) concludes that cereal production in this group of countries could grow at 2.8 p.a., compared with 2.1 percent p.a., the highest rate ever achieved in any 17-year period in the past. Overall, therefore, the projections of food consumption and of production, far from being pessimistic, embody a degree of optimism. This is partly justified by the prospect of recovery of agriculture following eventual cessation of war or warlike activities that are, or were recently, present in most countries in this group. Empirical evidence discussed in the next section suggests that in such situations better performance of agriculture is a key factor in making possible rapid increases in food consumption.

There is also an additional element of optimism embodied in the assumed reductions in distributional inequalities, as already discussed. The average CV of this group is assumed to decline from 0.30 in 1997/99 to 0.26 in 2015 and 0.23 in 2030. But for these reductions, the undernourished would have grown to 123 million in 2015 rather than to 115 million. The difference is admittedly small, indicating the limited impact of reduced inequality on the numbers of undernourished in countries with very low national average kcal. The reasons why this happens and why it does not denote limited welfare value of more equal distribution was explained earlier (Box 2.4).

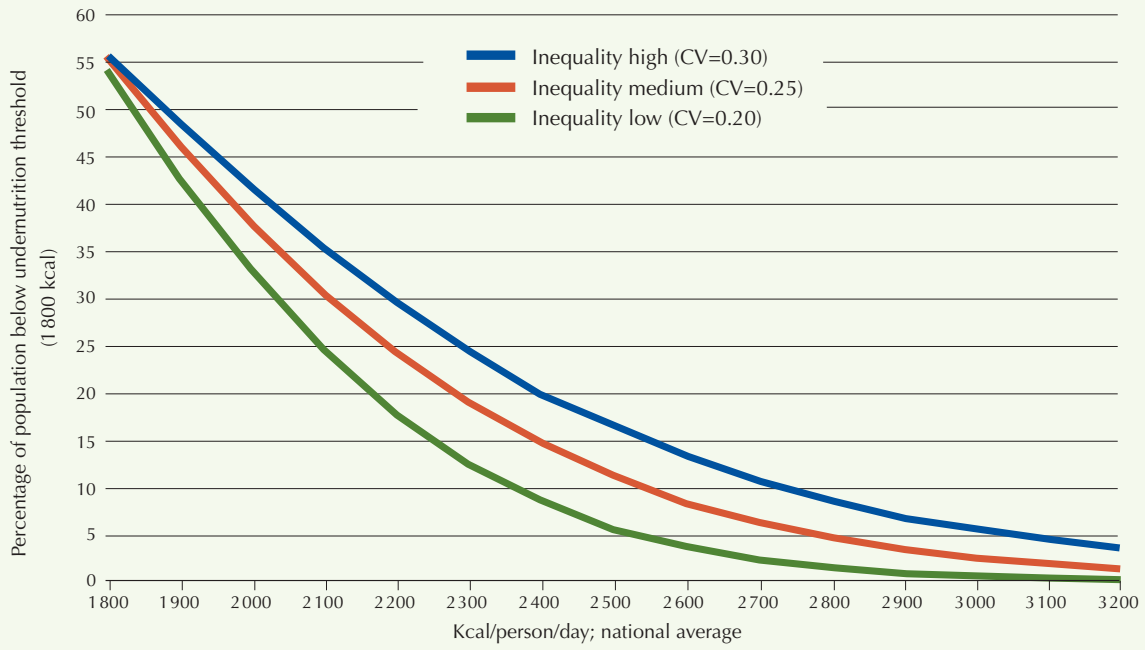
Similar considerations apply, *mutatis mutandis*, to other countries that start from low or very low per capita food consumption and high undernourishment and also have fairly high population growth rates. By 2015, they will still have low to middle levels of food consumption, and the numbers of undernourished will be either higher or not much below the present ones. The middle part of Table 2.3 provides some more disaggregated information on this aspect of the problem. The first two groups of countries, those that in 2015 will still be below 2 500 kcal (41 countries in all), fall in the above-

## Box 2.4 Inequality of access to food and incidence of undernourishment: assumptions about the future

As noted in the text, in deriving future levels of undernourishment from the projected per capita food consumption levels, the assumption is made that countries will have less inequality in the future, if World Bank projections of reduced poverty incidence come about. The measure of inequality (the CV, see Box 2.1) applied in the projections is derived by assuming that the standard deviation (SD, see Box 2.1 for an explanation) will be the same in the future as in 1997/99 in the different countries even as their national average kcal rise, subject to the CV not falling below 0.20. In plain words, this means the following: a country which in 1997/99 had a CV of 0.3 and kcal 2500, had an SD of 750 kcal and 16.5 percent of its population undernourished (assuming its undernourishment threshold is 1 800 kcal). In the future, its average kcal rises to 2 700. If the CV remained at 0.30, undernourishment would fall to 10.9 percent of the projected population. With our assumption (SD constant at 750 kcal), the CV falls to 0.278 and undernourishment falls to 8.8 percent of projected population.

Reductions in inequality have small effects on the incidence of undernourishment when average kcal are very low (e.g. under 2 000). This is so because at that level most of the population is under the undernourishment threshold to start with. The scope of raising many of them above the threshold by redistributing the "surplus" of those above it is limited. Naturally, in no way does this imply that in such countries reduction of inequality has no beneficial effects on the undernourished. It does raise consumption, but not by as much as needed to bring them above the undernourishment threshold. Likewise, the effect is also small when the average kcal is very high, e.g. over 3 000, because at that level the percentage of the population undernourished is already small. The highest beneficial impact from reducing inequality is to be had in the countries in the middle range of per capita food consumption, 2 300-2 600 kcal. These effects are traced in graphic form in Figure 2.4. The vertical distance between the curves shows how far undernourishment (percentage of population) changes when shifting from high to low inequality or vice versa.

**Figure 2.4 Paths of change in undernourishment: raising average consumption versus reducing inequality**




mentioned category, i.e. numbers of undernourished increasing or not declining by much for the reasons just mentioned. The next group (12 countries in the range 2 500-2 700 kcal in 2015) is an intermediate case showing medium reductions in the numbers undernourished.

Almost all the projected reductions in the numbers undernourished by 2015 would occur in the remaining two country groups, those which contain the countries projected to have in 2015 over 2 700 calories. These two groups include some of the most populous developing countries (China, India, Pakistan, Indonesia, Mexico, Nigeria and Brazil) and account for the bulk of the population of the developing countries and some 60 percent of the total numbers of undernourished. The main reason why the gains in these countries are more pronounced than in the earlier groups is that most of them start with kcal in the middle range. As noted, the potential for reducing undernourishment through more equal distribution is highest in this type of countries. It is indeed the projected declines in the numbers in poverty in the most populous countries[6] with already middle to middle-high food consumption levels, and the assumed knock-on effect in reducing inequality in the distribution of food consumption, that generates much of the projected decline in the numbers undernourished in these countries. If inequality were to remain the same, their undernourishment would decline from 456 million in 1997/99 to 400 million in 2015; with the assumed reductions in inequality, undernourishment in 2015 declines by a further 100 million, to 295 million.

In conclusion, rapid reductions in the numbers of undernourished require the creation of conditions that will lead to hefty increases in national average food consumption, particularly in countries starting with low levels, as well as to lower inequality of access to food. Countries with high population growth rates will need stronger doses of policies in that direction than countries with slower growth rates. The projections of population and the overall economic growth used here, and the derived projections of food demand and consumption, indicate that in many countries the decline in the numbers undernourished will be a slow process. Moreover, in several countries with high

6 China and the countries of South Asia account for almost all the reductions in poverty projected by the World Bank for 2015 – see Table 2.5.

population growth rates the absolute numbers undernourished are projected to increase rather than decline by 2015.

From a policy perspective, an appropriate way of looking at the problem at hand is to see how many countries, accounting for what part of the total population, will still have significant percentages of their population undernourished. If the number of countries in this category in the future is smaller than at present – particularly if they are among the less populous ones making for a small percentage of aggregate population – then policy interventions to reduce undernourishment will be more feasible. Relevant data and projections are shown in the third section of Table 2.3. The population living in countries with undernourishment over 25 percent will have been reduced from 13 percent of the total of the developing countries at present to only 3.5 percent by 2030. In parallel the number of countries in this category will have declined from 35 at present to 22 in 2015 and to only five in 2030. None of today's most populous countries (over 100 million in 1997/99) will be in this class in the future. At the other extreme, 75 percent of the population of the developing countries could be in countries with undernourishment below 5 percent. At present only 8 percent live in such countries. The shift to the under 5 percent category of the majority of the most populous countries underlies this dramatic change (China, India, Pakistan, Indonesia, Brazil, Mexico and the Islamic Republic of Iran – all with populations of over 100 million in 2030).

Overall, therefore, considerable progress would be made over the longer term, if the projections of food consumption and the assumptions about reduced inequality were to come true. As more and more countries change from medium-high percentages of undernourishment to low ones, the problem will tend to become more tractable and easier to address through policy interventions within the countries themselves. In addition, the greatly reduced number of countries with severe problems holds the promise that policy responses on the part of the international community will tend to become more feasible.

**Better outcomes possible with emphasis on agriculture.** We have noted that countries that start with very adverse initial conditions (low kcal/person/day, high undernourishment, high population growth) will require very rapid growth in aggregate food consumption if they are to reduce undernourishment significantly, e.g. to halve it by 2015, as per the WFS target – although this target was set for the developing countries as a whole and not for individual countries.

As an example, the Niger starts with very adverse initial conditions. The country's 1997/99 per capita food consumption was only 2 010 kcal/person/day and undernourishment affected 41 percent of its population, or 4.2 million persons (FAO, 2001a). For 1990/92 (the base year of the WFS target) the estimate was 3.3 million, so the situation has worsened since. The 2015 target should be a half of the estimate for 1990/92, i.e. 1.65 million. The Niger is projected to have one of the highest population growth rates in the world, 3.6 percent p.a. to 2015. By then its population will be 18.5 million, up from the current 10.1 million. Reduction of undernourishment to 1.65 million in 2015 would mean reduction from the present 41 percent of the population to only 9 percent in 2015, a really huge change.

What are the characteristics of countries that have around 9 percent of the population undernourished? There are three countries (Gabon, Brazil and China) in this class. They have kcal/person/day of 2 520, 2 970 and 3 040, respectively (FAO, 2001). This implies that even under very low inequality of distribution like Gabon's (CV=0.216), the Niger's per capita food consumption must reach 2 460[7] kcal by 2015 (from the present 2 010 kcal) if it is to halve the numbers suffering undernourishment. In combination with its population growth of 3.6 percent p.a., its aggregate demand for food would need to grow at 4.9 percent p.a. between 1997/99-2015 (1.2 percent p.a. in per capita terms – 22 percent over the entire period of 17 years). The required income growth (normally above 5 percent p.a. given that total demand for food usually grows at rates below those of aggregate income) would be very demanding, if

[7] One significant research question looms large in any attempt to project a likely future outcome. Given that the empirical evidence shows that countries go down as well as up, how does one project which countries will be in which category, particularly in the light of the evidence that declines suffered by many countries are often the result of war?

## Box 2.5 The WFS target of halving undernourishment by no later than 2015. What do the projections imply?

The estimates of undernourishment available at the time of the WFS referred to the three-year average 1990/92. They were based on the data (kcal/person/day, population, inequality parameters) known at the time the estimates were made, in 1995-96. The numbers of undernourished in the developing countries were then put at 839 million. With the revised data for these same years, the aggregate numbers have not changed much; they are now thought to have been 815 million for the base period 1990/92. There have been some very significant revisions for individual countries (see Box 2.2), but in the aggregate the pluses and minuses largely compensated each other.

In principle, progress towards the WFS target is measured from these revised estimates for 1990/92. Halving absolute numbers would mean 408 million undernourished in 2015. The projections presented above indicate that the number could still be 610 million in 2015 and it could still be 440 million in 2030. The reasons why this may be so have been discussed above. The reader will get a better understanding of these projections by reading the considerations underlying future demand/consumption outcomes for the main commodities in Chapter 3.

In examining the projections in relation to the estimates for 1990/92 (as revised) and the WFS target, account must be taken of the changes that have already taken place between 1990/92 and 1997/99. Such changes were taken into account in the projections. Very pronounced changes took place between 1990/92 and 1997/99 in some countries. For example, undernourishment increased significantly in several countries: the Democratic People's Republic of Korea, Cuba, Iraq, the Democratic Republic of the Congo, Burundi, Somalia, the United Republic of Tanzania and Mongolia (see FAO, 2001a). There have also been some spectacular declines in undernourishment over the same period, at least according to the data and methods used in FAO's annual publication The State of Food Insecurity in the World, e.g. in Ghana, Peru, Mozambique, Malawi, Chad and Nigeria (but see Box 2.2). Overall, the rate of decline of the totals between 1990/92 and 1997/99 has been too slow, an average of 5.5 million p.a. If continued, it would not lead to halving in the remaining 17 years (1997/99-2015) of the whole 24-year period (1990/92-2015) considered for the WFS target evaluation. The projections presented here indicate an annual rate of decline of 9.7 million for the remaining 17 years of the period to 2015. This is an improvement over the first five years but still would not lead to a halving of the numbers undernourished.[1]

1 We must admit here to a second serious problem bedevilling all projection methods, in addition to that mentioned in footnote 7. This concerns the impossibility of predicting sudden discontinuities that take place in real life and affect the variables in question in some countries, at least as they appear in the data. For example, war or natural catastrophes lead to sudden collapses of food consumption. By contrast, in some countries there are sudden upward spurts in food availabilities and apparent food consumption. The big aggregates may not be greatly affected by our inability to predict such sudden discontinuities in individual countries, but the numbers for smaller country groups may be seriously affected. The problem is perhaps not serious for longer-term projections like the ones presented here; these sudden spurts (positive or negative) observed in actual life, in most cases exhaust themselves within a few years, after which smoother evolution of key variables resumes.

at all feasible. Naturally, if inequality of access were to be more pronounced, the national average kcal/person/day would need to be higher, e.g. 2 620 if the CV was to be 0.25.

If overall economic growth were to be the primary force making for growth in food demand/consumption, one would have to be quite pessimistic as to the prospect that the Niger and countries in similar conditions could achieve the quantum jumps in food consumption required for reduction of undernourishment. The Niger has had nearly zero economic growth (and a decline of 2.0 percent p.a. in per capita household final consumption expenditure [HHFCE]/capita[8]) in the last two decades.

Yet, empirical evidence does not support such blanket pessimism. We have referred earlier to the case of Nigeria which achieved quantum jumps in food consumption and associated declines in undernourishment despite falling overall incomes per capita. Other countries have had similar experiences, i.e. achievement of food consumption increases of 22 percent or more in per capita terms in 17 years or even over shorter periods, while per capita incomes were not growing or outright falling. For example, Mali increased kcal/person/day from 1 766 to 2 333 (32 percent) in the nine-year period from 1979/81-1988/90, while its HHFCE/capita was falling at -1.7 percent p.a. over the same period.

8 World Bank (2001b) term for what was previously termed private consumption expenditure in national accounts parlance.

Nine developing countries apparently went through such experiences during some time in their history of the last 30 years (countries 1-9 in Table 2.6) They all achieved rapid growth in their kcal/capita/day (increase of 22 percent or more over periods of 17 years or less), while their HHFCE/ capita was either falling or growing at under 1 percent p.a.. What explains these food consumption gains in the midst of stagnant or deteriorating overall economic conditions? Do these countries share some common characteristics? The following comments can shed some light:

- These countries all had very low food consumption levels (from 1 600 to 1 950 kcal/ person/day, see column 4 in Table 2.6) at the inception of the periods of spurts in their food consumption, hence great potential for such increases in consumption when other conditions were propitious.
- The countries all have fairly high dependence on agriculture as measured by the percentage of total GDP coming from agriculture and the percentage of agricultural population in the total population (columns 20-21 in Table 2.6).
- In eight of these nine countries a key common characteristic has been rapid growth in domestic food production. The growth rate of cereal production was in the range of 5.1-8.8 percent p.a. during the periods in question (column 12 in Table 2.6), although in some countries the rapid growth of production of other important staple foods also played a key role, e.g. roots/tubers in Nigeria, Ghana and Benin. In some countries the high growth rates of cereal production reflected recoveries from periods of falling production. For example, in the Gambia cereal production had fallen from 81 thousand tonnes in 1970/72 to 36 thousand tonnes in 1975/77. Recovery led to 96 thousand tonnes in 1985/87 but then there was no further growth for another ten years and production was still 96 thousand tonnes in 1995/97.[9] Other countries had rapid growth following, and continuing beyond, recoveries, e.g. Ghana, Chad and Mauritania.
- The substantial growth in cereal food consumption per capita was supported in all but two countries by the growth of domestic production, while net imports of cereals (kg per capita) often declined and self-sufficiency improved.

In the light of this evidence it is tempting to conclude that progress in raising food consumption levels is possible in countries facing unfavourable overall economic growth prospects, if domestic food production can be made to grow fairly rapidly for some time. However, before we draw any firm conclusions, we must keep in mind that the data concerning what happened to per capita food consumption come from the food balance sheets, i.e. they are the sum of production plus net imports, minus the non-food uses of food commodities, minus an estimate for waste. It is therefore true by definition that a change in consumption is, in an accounting sense, the counterpart of changed production and/or net imports. Naturally, this is not the same thing as saying that increased production and/or imports "caused" the increases in consumption. What we can be sure of is that if the production and trade data are correct, and if the allowances for non-food uses and waste are of the right order of magnitude, the implied food consumption increases did take place, no matter what the national accounts show concerning national incomes. Otherwise, what has happened to the increased food supplies?

We clearly have a situation where the income changes depicted in the national accounts fail to reflect what actually happens to the capacity of people to have access to food, and indeed of the persons in food insecurity. It may be hypothesized that this is the case in many low-income economies where large parts of the population derive a living from agriculture, including those with significant near-subsistence agriculture and autoconsumption. In such cases increased production can translate into improved incomes and access to food of the persons in agriculture and, through indirect effects, also of the persons in the wider rural economy.

[9] Latest data to 2001 show a sudden spurt in production in the last three years (1999-2001). The Gambia's 2001 production is given as 179 thousand tonnes (FAOSTAT, update of February 2002).

## Table 2.6 Developing countries with increases in food consumption (kcal/person/day) of 22 percent or more over 17 years or less

| | | Period of growth in food consumption | | Kcal/person/day | | | | Income growth during period,[1] % p.a. |
|---|---|---|---|---|---|---|---|---|
| | | Beginning | No. years | Beginning | Final year | % increase | Latest (1997/99) | |
| 1 | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | Gambia | 75/77 | 11 | 1 742 | 2 482 | 42.4 | 2 574 | -5.4 |
| 2 | Nigeria | 83/85 | 14 | 1 950 | 2 813 | 44.3 | 2 813 | -2.9 |
| 3 | El Salvador | 72/74 | 17 | 1 918 | 2 445 | 27.5 | 2 493 | -2.0 |
| 4 | Mali | 79/81 | 9 | 1 766 | 2 333 | 32.1 | 2 237 | -1.7 |
| 5 | Benin | 81/83 | 16 | 1 947 | 2 498 | 28.3 | 2 498 | -0.2 |
| 6 | Mauritania | 70/72 | 17 | 1 878 | 2 552 | 35.9 | 2 690 | 0.0 |
| 7 | Chad | 82/84 | 15 | 1 596 | 2 117 | 32.7 | 2 117 | 0.2 |
| 8 | Burkina Faso | 80/82 | 12 | 1 682 | 2 455 | 45.9 | 2 293 | 0.4 |
| 9 | Ghana | 81/83 | 16 | 1 630 | 2 546 | 56.1 | 2 546 | 0.8 |
| 10 | Jordan | 73/75 | 17 | 2 210 | 2 862 | 29.5 | 2 812 | 1.4 |
| 11 | Nepal | 75/77 | 14 | 1 850 | 2 443 | 32.0 | 2 293 | 1.4 |
| 12 | Iran. | 69/71 | 12 | 2 094 | 2 829 | 35.1 | 2 928 | 1.5 |
| 13 | Syria | 69/71 | 13 | 2 345 | 3 246 | 38.4 | 3 328 | 1.7 |
| 14 | Myanmar | 74/76 | 12 | 2 110 | 2 730 | 29.4 | 2 787 | 1.9 |
| 15 | Philippines | 69/71 | 11 | 1 808 | 2 244 | 24.1 | 2 332 | 2.0 |
| 16 | Peru | 90/92 | 7 | 1 978 | 2 551 | 28.9 | 2 551 | 2.4 |
| 17 | Morocco | 69/71 | 17 | 2 474 | 3 020 | 22.1 | 3 030 | 2.5 |
| 18 | Algeria | 69/71 | 17 | 1 840 | 2 778 | 51.0 | 2 933 | 3.5 |
| 19 | Egypt | 69/71 | 17 | 2 348 | 3 105 | 32.2 | 3 317 | 3.8 |
| 20 | Tunisia | 69/71 | 17 | 2 360 | 3 103 | 31.5 | 3 341 | 4.5 |
| 21 | Indonesia | 76/78 | 17 | 2 056 | 2 856 | 38.9 | 2 903 | 5.1 |
| 22 | China | 75/77 | 17 | 2 062 | 2 765 | 34.1 | 3 037 | 7.0 |
| 23 | Saudi Arabia | 72/74 | 13 | 1 774 | 2 940 | 65.7 | 2 957 | 11.9 |
| 24 | Iraq | 72/74 | 14 | 2 251 | 3 506 | 55.7 | 2 416 | no data |
| 25 | Lebanon | 74/76 | 17 | 2 318 | 3 211 | 38.5 | 3 231 | no data |
| 26 | Libya | 69/71 | 7 | 2 456 | 3 444 | 40.2 | 3 291 | no data |
| 27 | Tanzania | 70/72 | 7 | 1 723 | 2 253 | 30.7 | 1 926 | no data |
| 28 | Yemen | 70/72 | 16 | 1 761 | 2 166 | 23.0 | 2 040 | no data |

[1] Household final consumption expenditure per capita, except for Saudi Arabia, Egypt, Myanmar, Syrian Arab Republic and Chad where the growth rates are for per capita gross domestic income.

| | Cereal food/per capita (kg) | | | Cereal production growth rates (% p.a.) | | Cereal self-sufficiency (%) | | | Cereal net trade (kg/person) | | | Agr. GDP % total GDP | Agr. popul. as % of total pop. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Beginning | Final year | Latest (1997/99) | Period of cons. increase | Last ten years (1989-99) | Beginning | Final year | Latest (1997/99) | Beginning | Final year | Latest (1997/99) | 1997/99 | 1997/99 |
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| | 119 | 171 | 163 | 8.8 | 2.7 | 49 | 51 | 44 | -49 | -105 | -121 | 30 | 73 |
| | 122 | 154 | 154 | 5.1 | 2.6 | 84 | 91 | 91 | -26 | -19 | -19 | 36 | 39 |
| | 120 | 153 | 152 | 2.0 | 0.2 | 82 | 75 | 69 | -22 | -55 | -76 | 12 | 34 |
| | 146 | 209 | 193 | 6.9 | 2.3 | 90 | 95 | 94 | -14 | -11 | -12 | 46 | 84 |
| | 96 | 115 | 115 | 5.1 | 5.4 | 76 | 87 | 87 | -30 | -25 | -25 | 38 | 53 |
| | 104 | 159 | 171 | 5.8 | 4.9 | 43 | 42 | 22 | -65 | -114 | -231 | 25 | 49 |
| | 99 | 132 | 132 | 6.2 | 6.7 | 70 | 96 | 96 | -34 | -7 | -7 | 37 | 68 |
| | 156 | 242 | 219 | 7.1 | 2.8 | 93 | 94 | 91 | -14 | -16 | -20 | 32 | 88 |
| | 58 | 85 | 85 | 6.4 | 5.5 | 70 | 84 | 84 | -17 | -17 | -17 | 36 | 54 |
| | 153 | 167 | 174 | 1.9 | -7.0 | 36 | 10 | 4 | -95 | -406 | -364 | 3 | 12 |
| | 160 | 208 | 190 | 3.4 | 1.9 | 112 | 100 | 101 | 8 | -1 | 0 | 41 | 91 |
| | 146 | 186 | 191 | 3.7 | 2.8 | 88 | 71 | 69 | -15 | -88 | -99 | 21 | 30 |
| | 161 | 198 | 221 | 5.0 | 7.5 | 80 | 60 | 76 | -62 | -116 | 4 | no data | 28 |
| | 172 | 212 | 216 | 4.3 | 2.7 | 106 | 101 | 101 | 12 | 9 | 3 | 59 | 70 |
| | 115 | 138 | 138 | 4.4 | 0.3 | 93 | 88 | 75 | -22 | -23 | -63 | 18 | 40 |
| | 105 | 127 | 127 | 7.4 | 4.9 | 42 | 47 | 47 | -90 | -112 | -112 | 7 | 31 |
| | 225 | 253 | 250 | 1.2 | -3.0 | 92 | 84 | 54 | -20 | -76 | -118 | 16 | 38 |
| | 151 | 208 | 228 | -0.4 | -1.9 | 73 | 27 | 21 | -36 | -197 | -202 | 11 | 24 |
| | 175 | 228 | 251 | 1.4 | 4.6 | 77 | 49 | 69 | -31 | -162 | -153 | 18 | 38 |
| | 173 | 221 | 222 | 0.4 | 1.9 | 61 | 36 | 45 | -83 | -201 | -199 | 13 | 26 |
| | 142 | 197 | 202 | 4.3 | 2.0 | 89 | 89 | 88 | -19 | -28 | -27 | 18 | 45 |
| | 165 | 209 | 210 | 3.1 | 2.2 | 98 | 99 | 100 | -3 | 3 | 4 | 18 | 69 |
| | 110 | 145 | 173 | 22.1 | -8.1 | 20 | 13 | 23 | -77 | -457 | -337 | 7 | 14 |
| | 155 | 246 | 166 | 0.2 | -1.6 | 94 | 34 | 40 | -29 | -247 | -137 | no data | 12 |
| | 128 | 135 | 136 | 1.6 | 2.0 | 15 | 12 | 10 | -181 | -253 | -224 | 12 | 5 |
| | 148 | 203 | 197 | 10.2 | -2.9 | 27 | 28 | 10 | -174 | -223 | -427 | no data | 9 |
| | 75 | 130 | 115 | 14.3 | 0.1 | 88 | 99 | 85 | -6 | -4 | -10 | 45 | 72 |
| | 153 | 172 | 165 | -2.6 | 0.0 | 76 | 40 | 24 | -36 | -109 | -143 | 18 | 49 |

Sources: All FAO, except columns 8 and 20 from the World Bank (2001b).

That such links between production and consumption exist and are important for improved food security and development is, of course, nothing new. A body of literature (e.g. Mellor, 1995; de Janvry and Sadoulet, 2000) supports the proposition that, in low-income countries with high dependence on agriculture, facing initial conditions like those of many countries in our sample, strategies promoting in priority agricultural productivity improvements are most appropriate for making progress in poverty reduction and, by implication, in food security. Naturally, one should not just think of production increases in the abstract. The links between increased production and improved food consumption of poor and food-insecure persons are mediated through complex institutional and socio-economic relations. In addition, feedback effects between food production and consumption should be considered, as undernourishment is a handicap to the efforts to improve food production. Better nutrition, in addition to being an end-goal in itself, is also an essential input into the achievement of production increases and overall development (see Chapter 8).

The remaining 19 countries that increased food consumption by 22 percent or more in periods of 17 years or less exhibit a variety of experiences concerning combinations of the different variables underlying the gains in food consumption: the growth of their per capita HHFCE (data not available for the last five countries in Table 2.6), cereal production and net imports. All had positive growth rates in HHFCE/capita. We have here typical cases of the North African countries, where moderate to high growth of incomes fuelled the demand for food, and this was met mainly by quantum jumps in cereal imports rather than production, as in the case of Algeria and Egypt.

In conclusion, if the data used here are anywhere near the reality, the evidence suggests that in the many countries with poor overall economic growth outlook (e.g. most countries of sub-Saharan Africa), priority to raising agricultural productivity holds promise for making progress towards reducing undernourishment. Eventually, sustained agricultural growth will also show up in improved overall national incomes.

## 2.3 Structural changes in the commodity composition of food consumption

The growth in per capita food consumption was accompanied by significant change in the commodity composition, at least in the countries that experienced such growth. The relevant data and projections are shown in Tables 2.7 and 2.8.

Much of the structural change in the diets of the developing countries concerned the rapid increases of livestock products (meat, milk and eggs), vegetable oils and, to a lesser extent, sugar, as sources of food calories. These three food groups together now provide 28 percent of total food consumption in the developing countries (in terms of calories), up from 20 percent in the mid-1960s. Their share is projected to rise further to 32 percent in 2015 and to 35 percent in 2030. However, structural change was not universal and wide intercountry diversity remains in the share of different commodity groups in total food consumption. The major changes, past and projected, are briefly reviewed below. A more extensive discussion of the forces affecting the main commodity sectors is presented in Chapter 3.

*Cereals* continue to be by far the most important source (in terms of calories) of total food consumption. Food use of cereals has kept increasing, albeit at a decelerating rate. In the developing countries, the per capita average is now 173 kg, providing 56 percent of total calories. This is up from 141 kg (61 percent of total calories) in the mid-1960s (Table 2.7). Much of the increase in per capita food consumption of cereals in the developing countries took place in the 1970s and 1980s, reflecting *inter alia* the rapid growth of their cereal imports during the period of the oil boom (see Chapter 3). For the developing countries as a whole, average direct food consumption of cereals is projected to stabilize at around present levels (although it would keep rising if feed use of cereals were added), as more and more countries achieve medium-high levels and diet diversification continues. The share of cereals in total calories will continue to decline, but very slowly, falling from 56 percent at present to 53 percent in 2015 and to 50 percent in 2030.

Food consumption of *wheat* grew the fastest of all cereals in the past and will continue to do so in the future. Such growth in consumption will be accompanied by continued growth in wheat imports in many developing countries, particularly those that are non-producers or minor producers for agro-ecological reasons (see Chapter 3). In contrast, per capita food consumption of *rice* should continue its recent trend towards stabilization and gentle decline, reflecting developments in, mainly, the East Asia region.

Food consumption of *coarse grains* has declined on average, but continues to be important mainly in sub-Saharan Africa (where it accounts for 72 percent of food consumption of cereals) and to a lesser extent in Latin America (42 percent). The decline in other regions, particularly in China, has brought down the average for the developing countries. In future, smaller declines in Asia and some recovery in sub-Saharan Africa could halt the trend towards decline of the average of the developing countries. Aggregate demand for coarse grains will be increasingly influenced by the demand for animal feed. As discussed in Chapter 3, the developing countries will be playing a growing role in the world total demand and trade of coarse grains.

Wide intercountry differences in cereal food consumption will continue to persist. Several countries have per capita food consumption of cereals under 100 kg/year and some below 50 kg (the Democratic Republic of the Congo, Burundi and the Central African Republic). These persistently low levels reflect a combination of climatic factors (favouring dependence of diets on roots and tubers, including plantains, in countries mainly in the humid tropics) as well as persistence of poverty and depressed levels of food consumption overall. It is worth noting that Africa includes countries at the two extremes of the cereal consumption spectrum; the countries with the highest food consumption of cereals are also in Africa, namely those in North Africa, with per capita levels in the range of 200 to 250 kg.

The diversification of diet in developing countries has been most visible in the shift towards *livestock products*. Here again there is very wide diversity among countries as regards both the levels of consumption achieved as well as the speed with which the transformation has been taking place. Several developing countries have traditionally had high meat consumption, comparable to the levels of the industrial countries. They include the traditional meat exporters of Latin America (e.g. Argentina and Uruguay), but also the occasional country with a predominantly pastoral economy, such as Mongolia. However, developments in these countries did not cause the structural change in the diets of the developing countries towards more meat consumption. If anything, they slowed it down as the per capita consumption in many of them either remained flat or actually declined. The real force behind the structural change has been rapid growth in consumption of livestock products in countries such as China[10] (including Taiwan Province of China and Hong Kong SAR), the Republic of Korea, Malaysia, Chile, Brazil and several countries in the Near East/North Africa region. Indeed, as discussed in Chapter 3, the increase in meat consumption of the developing countries from 11 to 26 kg in the period from the mid-1970s to the present was decisively influenced by the rapid growth in China and Brazil. Excluding them from the totals, the average of the other developing countries grew much less over the same period, from 11 kg to only 15 kg (see Chapter 3, Table 3.10).

In the future we may witness a significant slowdown in the growth of demand for meat. This will be the result of slower population growth and of the natural slowdown in consumption accompanying the achievement of high or medium-high levels in the industrial countries but also in some populous developing ones, such as China. The prospects are slim that other large developing countries such as India will emerge as major meat consumers, because of a continuation of low incomes and the influence of dietary preferences favouring meat less than in other societies. Thus, the boost given in the past to world meat consumption by the surge in China (but see footnote 10) is unlikely to be replicated by other coun-

[10] See Chapter 3 for doubts concerning the reliability of the meat sector data in China. If the data actually overstate China's meat production by a considerable margin, the country's impact on the world meat economy and particularly the aggregates of the developing countries would have been more modest than suggested here.

tries with the same force in the future. The major structural changes that characterized the historical evolution of the world livestock economy, particularly in the 1990s, are likely to continue, although in somewhat attenuated form. These are the growing role of the poultry sector in total meat production and the growing share of trade in world output and consumption.

The other major commodity group with very high consumption growth in the developing countries has been *vegetable oil*. The rapid growth in consumption and the high calorie content of oilcrop products[11] have been instrumental in bringing about increases in apparent food consumption (kcal/person/day) of the developing countries, which characterized the progress in food security achieved in the past. In the mid-1970s, consumption of oilcrop products (5.3 kg/ person/year, in oil equivalent) supplied only 144 kcal/person/day, or 6.7 percent of the total availability of 2 152 calories of the developing countries. By 1997/99 consumption per capita had grown to 9.9 kg contributing 262 kcal to total food supplies, or 9.8 percent of a total which itself had risen to 2 680 kcal. In practice, just over one out of every five calories added to the consumption of the developing countries over this period originated in this group of products (see further discussion of the oilcrops sector in Chapter 3).

In the future, vegetable oils are likely to retain, and indeed strengthen, their primacy as major contributors to further increases in food consumption of the developing countries: 44 out of every 100 additional calories in the period to 2030 may come from these products. Some important structural changes of the historical period in the world oilcrops economy are likely to continue. These are:

- the growing share of four oilcrops in the total oilcrops sector (oil palm, soybeans, rape and sunflower);
- the continued dominance of a few countries as major producers and exporters; and
- the growing role of imports in meeting the food demand for vegetable oils of many developing countries.

Consumption of *pulses* in the developing countries stagnated overall and registered drastic declines in several countries, mainly in Asia and sub-Saharan Africa. These trends reflected not just changing consumer preferences but also, in several countries, failure to promote production of such crops. Often this was the result of preference for increasing production and self-sufficiency in cereals. It is thought that where these declines in protein-rich pulses were not accompanied by increases in the consumption of livestock products, the result has been a deterioration in the overall quality of diets, even where per capita dietary energy (kcal/person/day) increased (for the case of India, see Hopper, 1999). For the future, no major changes are foreseen in per capita consumption of pulses, with the average of the developing countries remaining at about 7 kg.

*Roots, tubers and plantains* have traditionally been the mainstay of food consumption in several countries with low-middle levels of overall food consumption, mainly in sub-Saharan Africa and Latin America. Nineteen countries, all in sub-Saharan Africa, depend on these products for over 20 percent of food consumption in terms of calories. These countries account for 60 percent of the region's population. In three of them, the dependence is over 50 percent (the Democratic Republic of the Congo, Rwanda and Ghana). At the same time, the region has countries at the other extreme of the spectrum with only minimal consumption of roots and tubers, such as Mali, Mauritania, the Niger and the Sudan.

The food balance sheet data show that in several of the countries with high dietary dependence on roots and tubers, what happens to the production of these crops is an important determinant of changes in the national average food consumption. As in the case of Nigeria mentioned earlier (Box 2.2), other countries (Ghana, Benin and Peru) also experienced significant increases in per capita food consumption which originated to a large extent in the increases in roots and tubers production. Despite these country examples, the general trend in recent years has been for average per capita food consumption of these products in developing countries to increase only very slowly,

[11] The figures given here refer to the consumption of oils as well as that of oilcrops directly (soybeans, groundnuts, etc.) or in the form of derived products other than oil, all measured in oil equivalent. This consumption of oilcrops in forms other than oil is particularly important in some countries.

## Table 2.7 Changes in the commodity composition of food consumption, major country groups

| Kg/person/year | 1964/66 | 1974/76 | 1984/86 | 1997/99 | 2015 | 2030 |
|---|---|---|---|---|---|---|
| | | | **World** | | | |
| Cereals, food | 147 | 151 | 168 | 171 | 171 | 171 |
| Cereals, all uses | 283 | 304 | 335 | 317 | 332 | 344 |
| Roots and tubers | 83 | 80 | 68 | 69 | 71 | 74 |
| Sugar (raw sugar equivalent) | 21 | 23 | 24 | 24 | 25 | 26 |
| Pulses, dry | 9 | 7 | 6 | 6 | 6 | 6 |
| Vegetable oils, oilseeds and products (oil eq.) | 6 | 7 | 9 | 11 | 14 | 16 |
| Meat (carcass weight) | 24 | 27 | 31 | 36 | 41 | 45 |
| Milk and dairy, excl. butter (fresh milk eq.) | 74 | 75 | 79 | 78 | 83 | 90 |
| Other food (kcal/person/day) | 208 | 217 | 237 | 274 | 280 | 290 |
| Total food (kcal/person/day) | 2 358 | 2 435 | 2 655 | 2 803 | 2 940 | 3 050 |
| | | | **Developing countries** | | | |
| Cereals, food | 141 | 150 | 172 | 173 | 173 | 172 |
| Cereals, all uses | 183 | 201 | 234 | 247 | 265 | 279 |
| Roots and tubers | 75 | 77 | 62 | 67 | 71 | 75 |
| (Developing minus China) | 62 | 61 | 57 | 63 | 69 | 75 |
| Sugar (raw sugar equivalent) | 14 | 16 | 19 | 21 | 23 | 25 |
| Pulses, dry | 11 | 8 | 8 | 7 | 7 | 7 |
| Vegetable oils, oilseeds and products (oil eq.) | 5 | 5 | 8 | 10 | 13 | 15 |
| Meat (carcass weight) | 10 | 11 | 16 | 26 | 32 | 37 |
| Milk and dairy, excl. butter (fresh milk eq.) | 28 | 30 | 37 | 45 | 55 | 66 |
| Other food (kcal/person/day) | 122 | 129 | 155 | 224 | 240 | 250 |
| Total food (kcal/person/day) | 2 054 | 2 152 | 2 450 | 2 681 | 2 850 | 2 980 |
| | | | **Industrial countries** | | | |
| Cereals, food | 136 | 136 | 147 | 159 | 158 | 159 |
| Cereals, all uses | 483 | 504 | 569 | 588 | 630 | 667 |
| Roots and tubers | 77 | 68 | 69 | 66 | 63 | 61 |
| Sugar (raw sugar equivalent) | 37 | 39 | 33 | 33 | 32 | 32 |
| Pulses, dry | 3 | 3 | 3 | 4 | 4 | 4 |
| Vegetable oils, oilseeds and products (oil eq.) | 11 | 15 | 17 | 20 | 22 | 23 |
| Meat (carcass weight) | 62 | 74 | 81 | 88 | 96 | 100 |
| Milk and dairy, excl. butter (fresh milk eq.) | 186 | 192 | 212 | 212 | 217 | 221 |
| Other food (kcal/person/day) | 461 | 485 | 510 | 516 | 540 | 550 |
| Total food (kcal/person/day) | 2 947 | 3 065 | 3 206 | 3 380 | 3 440 | 3 500 |
| | | | **Transition countries** | | | |
| Cereals, food | 211 | 191 | 183 | 173 | 176 | 173 |
| Cereals, all uses | 556 | 719 | 766 | 510 | 596 | 685 |
| Roots and tubers | 148 | 132 | 114 | 104 | 102 | 100 |
| Sugar (raw sugar equivalent) | 37 | 45 | 46 | 34 | 35 | 36 |
| Pulses, dry | 5 | 4 | 3 | 1 | 1 | 1 |
| Vegetable oils, oilseeds and products (oil eq.) | 7 | 8 | 10 | 9 | 12 | 14 |
| Meat (carcass weight) | 43 | 60 | 66 | 46 | 54 | 61 |
| Milk and dairy, excl. butter (fresh milk eq.) | 157 | 192 | 181 | 159 | 169 | 179 |
| Other food (kcal/person/day) | 288 | 356 | 384 | 306 | 330 | 350 |
| Total food (kcal/person/day) | 3 223 | 3 386 | 3 379 | 2 906 | 3 060 | 3 180 |

Note: Cereal food consumption includes the grain equivalent of beer consumption and of corn sweeteners.

and indeed to stagnate if potatoes are excluded. Increases in some countries were compensated by declines in others. The drastic decline in food consumption of sweet potatoes in China had a decisive influence on these trends. Potatoes were the one commodity with consistent increases in per capita consumption in the developing countries.

These trends are expected to continue, as will the high dependence of several countries on roots and tubers as a major source of food. Per capita food consumption of all roots, tubers and plantains in developing countries should increase slowly, from 67 kg in 1997/99 to 75 kg in 2030 (Table 2.7). This increase partly reflects the fact that the downward pressure exerted in the historical period on the overall average by China's lower food consumption of sweet potatoes will be much weaker in the future. Much of the decline in China's per capita consumption of sweet potatoes (from 94 kg in 1974/76 to 40 kg in 1997/99) has already occurred and any future declines will be much smaller. Potatoes will continue to show relatively high-income elasticity in most developing countries, and average food consumption is projected to increase from 17 kg in 1997/99 to 26 kg in 2030. Another factor that could raise consumption is the potential for productivity increases in the other root crops (cassava and yams). It will be possible for more countries in sub-Saharan Africa to replicate the experiences of countries such as Nigeria, Ghana, Benin and Malawi, and increase their food consumption based on rapid productivity improvements in these crops.

*Sugar* shares many of the characteristics of vegetable oils as regards food consumption and trade in the developing countries. It is a fast-rising consumption item and a major export commodity of several countries, such as Brazil, Cuba and Thailand. In addition, several developing countries are becoming large and growing net importers (Egypt, the Islamic Republic of Iran and the Republic of Korea), making up for the lack of growth of imports into the industrial countries. The developing countries' average consumption is 21 kg/person/year, but it is higher (26 kg) if China is excluded; China has only 8 kg as a lot of saccharine is used instead of sugar. About a half of the developing countries consume less than 20 kg, and a quarter under 10 kg. The scope for consumption growth is still considerable and we project an increase in the average consumption of developing countries from 21 to 25 kg over the projection period. China's contribution to total growth should be more than in the past since the country could be discouraging the use of saccharine (see also Chapter 3).

## 2.4 Concluding remarks

Some brief conclusions may be drawn, as follows:

- There will be significant progress in raising food consumption levels and improving nutrition. There will be significant reductions in the relative incidence of undernourishment (percentage of population affected), but these will not be translated into commensurate declines in the numbers undernourished because of population growth. Reduction in the absolute numbers of undernourished is likely to be a slow process. Numbers will decline from 776 million in 1997/99 to 610 million in 2015 and to 440 million in 2030.
- The number of undernourished in developing countries stood at 815 million in 1990/92 (the three-year average used as the basis for defining the WFS target). This number is not likely to be halved by 2015, just as the absolute numbers in poverty will not be halved (from the level of 1990) according to the latest World Bank assessment. However, the *proportion* of the population undernourished could be nearly halved by 2015 – from 20 percent in 1990/92 to 11 percent in 2015.
- The projected slow progress in reducing undernourishment will reflect the failure of many countries to transit to rapid economic development and poverty reduction.However, empirical evidence suggests that in the countries with high dependence on agriculture, assigning priority to the development of food production holds promise of overcoming the constraint to better nutrition represented by the unfavourable overall economic growth prospects.
- In many countries, including some of the more populous ones, the relative incidence of undernourishment (percentage of the population) will decline significantly. Fewer countries

## Table 2.8 Changes in the commodity composition of food consumption, developing regions

| Kg/person/year | 1964/66 | 1974/76 | 1984/86 | 1997/99 | 2015 | 2030 |
|---|---|---|---|---|---|---|
| | | | **Sub-Saharan Africa** | | | |
| Cereals, food | 115 | 115 | 118 | 123 | 131 | 141 |
| Roots and tubers | 186 | 190 | 169 | 194 | 199 | 202 |
| Sugar (raw sugar equivalent) | 6 | 8 | 9 | 10 | 11 | 13 |
| Pulses, dry | 10 | 10 | 9 | 9 | 10 | 11 |
| Vegetable oils, oilseeds and products (oil eq.) | 8 | 8 | 8 | 9 | 11 | 12 |
| Meat (carcass weight) | 10 | 10 | 10 | 9 | 11 | 13 |
| Milk and dairy, excl. butter (fresh milk eq.) | 29 | 28 | 32 | 29 | 31 | 34 |
| Other food (kcal/person/day) | 136 | 144 | 135 | 126 | 135 | 145 |
| Total food (kcal/person/day) | 2 057 | 2 079 | 2 058 | 2 195 | 2 360 | 2 540 |
| | | | **Near East/North Africa** | | | |
| Cereals, food | 172 | 189 | 204 | 209 | 206 | 201 |
| Roots and tubers | 16 | 21 | 31 | 34 | 33 | 33 |
| Sugar (raw sugar equivalent) | 19 | 24 | 29 | 28 | 29 | 30 |
| Pulses, dry | 7 | 7 | 7 | 7 | 7 | 7 |
| Vegetable oils, oilseeds and products (oil eq.) | 7 | 9 | 12 | 13 | 14 | 16 |
| Meat (carcass weight) | 12 | 14 | 20 | 21 | 29 | 35 |
| Milk and dairy, excl. butter (fresh milk eq.) | 69 | 72 | 83 | 72 | 81 | 90 |
| Other food (kcal/person/day) | 223 | 247 | 297 | 327 | 335 | 345 |
| Total food (kcal/person/day) | 2 291 | 2 592 | 2 953 | 3 006 | 3 090 | 3 170 |
| | | | **Latin America and the Caribbean** | | | |
| Cereals, food | 116 | 123 | 132 | 132 | 136 | 139 |
| Roots and tubers | 89 | 79 | 68 | 62 | 61 | 61 |
| Sugar (raw sugar equivalent) | 41 | 46 | 46 | 49 | 48 | 48 |
| Pulses, dry | 15 | 12 | 11 | 11 | 11 | 11 |
| Vegetable oils, oilseeds and products (oil eq.) | 6 | 8 | 11 | 13 | 15 | 16 |
| Meat (carcass weight) | 32 | 36 | 40 | 54 | 65 | 77 |
| Milk and dairy, excl. butter (fresh milk eq.) | 80 | 93 | 94 | 110 | 125 | 140 |
| Other food (kcal/person/day) | 228 | 239 | 251 | 262 | 280 | 300 |
| Total food (kcal/person/day) | 2 393 | 2 546 | 2 689 | 2 824 | 2 980 | 3140 |
| | | | **South Asia** | | | |
| Cereals, food | 146 | 143 | 156 | 163 | 177 | 183 |
| Roots and tubers | 13 | 19 | 19 | 22 | 27 | 30 |
| Sugar (raw sugar equivalent) | 20 | 20 | 23 | 27 | 30 | 32 |
| Pulses, dry | 15 | 13 | 12 | 11 | 9 | 8 |
| Vegetable oils, oilseeds and products (oil eq.) | 5 | 5 | 6 | 8 | 12 | 14 |
| Meat (carcass weight) | 4 | 4 | 4 | 5 | 8 | 12 |
| Milk and dairy, excl. butter (fresh milk eq.) | 37 | 38 | 51 | 68 | 88 | 107 |
| Other food (kcal/person/day) | 81 | 85 | 100 | 129 | 150 | 160 |
| Total food (kcal/person/day) | 2 016 | 1 986 | 2 204 | 2 403 | 2 700 | 2 900 |
| | | | **East Asia** | | | |
| Cereals, food | 146 | 162 | 201 | 199 | 190 | 183 |
| Roots and tubers | 94 | 94 | 67 | 66 | 64 | 61 |
| Sugar (raw sugar equivalent) | 5 | 6 | 10 | 12 | 15 | 17 |
| Pulses, dry | 8 | 4 | 4 | 2 | 2 | 2 |
| Vegetable oils, oilseeds and products (oil eq.) | 3 | 4 | 6 | 10 | 13 | 16 |
| Meat (carcass weight) | 9 | 10 | 17 | 38 | 50 | 59 |
| Milk and dairy, excl. butter (fresh milk eq.) | 4 | 4 | 6 | 10 | 14 | 18 |
| Other food (kcal/person/day) | 100 | 107 | 149 | 290 | 315 | 340 |
| Total food (kcal/person/day) | 1 958 | 2 105 | 2 559 | 2 921 | 3 060 | 3 190 |

Note: Cereal food consumption includes the grain equivalent of beer consumption and of corn sweeteners.

than at present will have high incidence of undernourishment, none of them in the most populous class. The problem of undernourishment will tend to become smaller in terms of both absolute numbers affected and, even more, in relative terms, hence it will become more tractable through policy interventions, both national and international.

- Despite this slow pace of progress in reducing the incidence of undernourishment, the projections imply a considerable overall improvement. In the developing countries the numbers well fed (i.e. not classified as undernourished according to the criteria used here) could increase from 3.8 billion in 1997/99 (83 percent of their population) to 5.2 billion in 2015 (89 percent of the population) and to 6.4 billion (94 percent) in 2030. That will be no mean achievement.