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. In the three decades to 1999/01, it increased from an average of 2400 kcal/person/day to almost 2800 kcal/person/day (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 and 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 past.

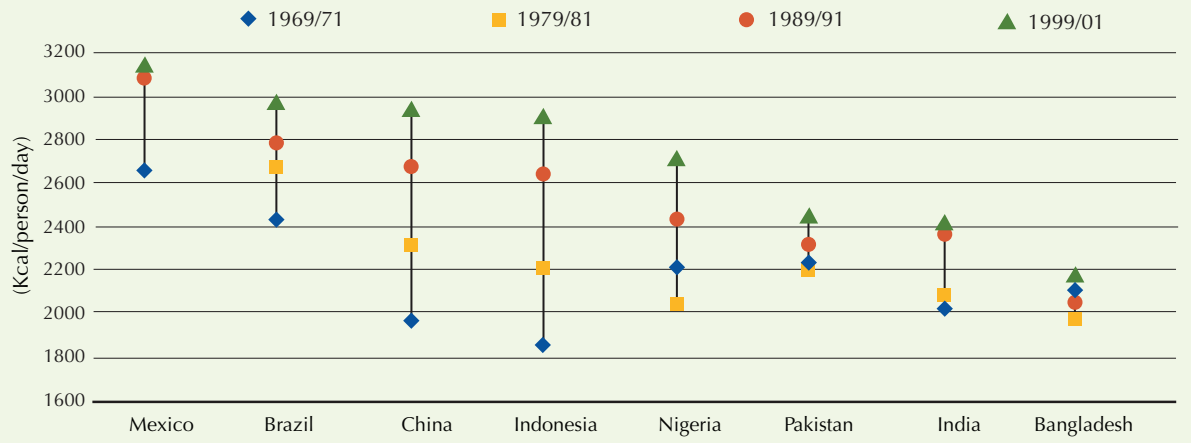
**Table 2.1 Per capita food consumption (kcal/person/day)**

| | 1969/71 | 1979/81 | 1989/91 | 1999/01 | 2015 | 2030 | 2050 |
|---|---|---|---|---|---|---|---|
| World | 2411 | 2549 | 2704 | 2789 | 2950 | 3040 | 3130 |
| Developing countries | 2111 | 2308 | 2520 | 2654 | 2860 | 2960 | 3070 |
| sub-Saharan Africa | 2100 | 2078 | 2106 | 2194 | 2420 | 2600 | 2830 |
| *- excluding Nigeria* | *2073* | *2084* | *2032* | *2072* | *2285* | *2490* | *2740* |
| Near East / North Africa | 2382 | 2834 | 3011 | 2974 | 3080 | 3130 | 3190 |
| Latin America and Caribbean | 2465 | 2698 | 2689 | 2836 | 2990 | 3120 | 3200 |
| South Asia | 2066 | 2084 | 2329 | 2392 | 2660 | 2790 | 2980 |
| East Asia | 2012 | 2317 | 2625 | 2872 | 3110 | 3190 | 3230 |
| Industrial countries | 3046 | 3133 | 3292 | 3446 | 3480 | 3520 | 3540 |
| Transition countries | 3323 | 3389 | 3280 | 2900 | 3030 | 3150 | 3270 |

Note: See Appendix for country classifications

[1] The more correct term for this variable would be "national average apparent food consumption or availability", since the data come from the national Food Balance Sheets rather than from food consumption surveys (see Box 2.2). The term "food consumption" is used in this sense in this report.

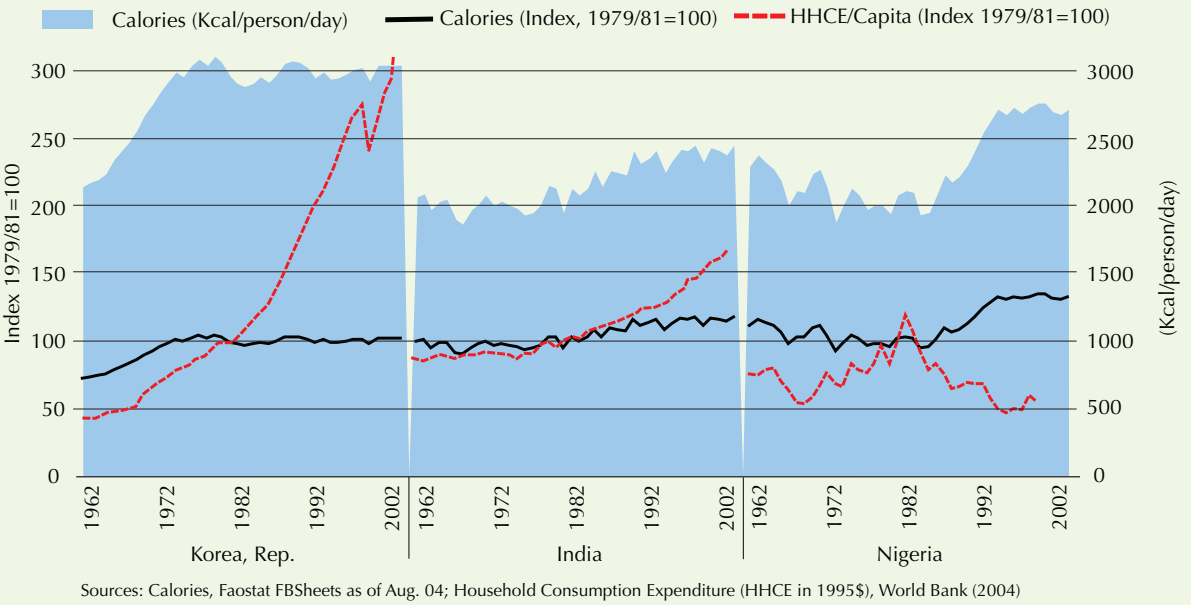
**Figure 2.1 Per capita food consumption, developing countries with over 100 million population in 2000**




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 8 developing countries with a population of 100 million or more. Of them, only Bangladesh remains at very low levels of food consumption. China, Indonesia, Brazil and Mexico have made the transition to fairly high levels (in the range 2900-3150 kcal). In more recent years (from the late 1980s) India and Pakistan also made some progress and are now approaching middling levels of per capita food consumption after long periods of near stagnation (Figure 2.1). Nigeria's data show that the country raised per capita food consumption significantly to medium-high levels in the decade starting in the mid-eighties (but see Bruinsma, 2003: 37 for data problems in Nigeria).

However, the data on apparent food consumption in some of these large countries reveal some contradictory evidence when confronted with those depicting the broader economic situation. Precisely, and as Figure 2.1 shows, in India the gradual rise in apparent average consumption came to a virtual standstill in the 1990s and seems to have remained stuck at around 2400 kcal/person/day. Yet it was in the decade of the 1990s that India's economic growth accelerated and per capita incomes, or rather the more

**Figure 2.2 Evolution of apparent food consumption/capita in relation to income per capita: three country typologies**




Sources: Calories, Faostat FBSheets as of Aug. 04; Household Consumption Expenditure (HHCE in 1995$), World Bank (2004)

relevant Household Consumption Expenditure (HHCE) per capita, grew much faster than before (3.3 percent p.a. in 1992-02, up from 2 percent in the preceding decade and 1.6 percent in the decade before). On the other hand, the data for Nigeria, if correct, would seem to suggest evolution of food consumption in the opposite direction, i.e. fast growth in food consumption per capita in the decade to the early 1990s, precisely when per capita incomes and HHCE were on a path of fast decline. Gains in cassava productivity are often cited as a major factor explaining the gains in food consumption in Nigeria (FAO, 2000; Nweke, 2004). The "paradoxes" for these two countries are shown in Figure 2.2 together with the case of Korea, Rep. which provides a benchmark of what constitutes a more "normal" evolutionary path, i.e. food consumption growing fast with economic growth and subsequently slowing down, and eventually leveling off, as high levels of around 3000 kcal/person/day were achieved. A closer look at the "paradox" of Nigeria was attempted in Bruinsma (2003: 37) and is attempted here for India (Box 2.1).

An alternative way of looking at changes over the historical period is to observe the distribution of the population of the developing world who live in countries having given levels of kcal/person/day. This is a rough and far from perfect approximation to depicting a distribution pattern of world food consumption, using the country averages as the unit of observation in the absence of comprehensive within-country distribution data. The relevant data are shown in Table 2.2. The stark changes that took place in the relatively short period of 30 years are vividly depicted: thirty years ago, some 2 billion, or 75 percent of the 2.6 billion population of the developing countries lived in 47 countries, including both China and India, with under 2200 kcal/person/day, more than one half of them in countries with under 2000 kcal, China among them. Only six developing countries accounting for a mere 100 million population had over 2700 kcal, a level that is roughly near a threshold for not having significant prevalence of undernutrition.

Thirty years on the situation had changed dramatically: "only" some 600 million (12 percent) of the greatly increased population (4.7 billion) of the developing countries lived in the under 2200 kcal category, while a substantial 2.4 billion (51 percent) had shifted into the over 2700 kcal category. The gains made by some of

**Table 2.2 Population living in developing countries with given per capita food consumption (million)**[1]

| kcal/person/day | | 1969/71 | 1999/01 | 2030 | 2050 |
|---|---|---|---|---|---|
| Under 2200 | Population (m.) | 1962 | 584 | 29 | |
| Under 2200 | Average kcal | 1992 | 2001 | 2060 | |
| Under 2200 | No countries | 47 | 32 | 2 | |
| 2200-2500 | Population (m.) | 438 | 1537 | 785 | 128 |
| 2200-2500 | Average kcal | 2321 | 2403 | 2380 | 2460 |
| 2200-2500 | No countries | 40 | 26 | 17 | 3 |
| 2500-2700 | Population (m.) | 103 | 201 | 510 | 618 |
| 2500-2700 | Average kcal | 2624 | 2547 | 2605 | 2625 |
| 2500-2700 | No countries | 8 | 14 | 23 | 12 |
| 2700-3000 | Population (m.) | 40 | 1925 | 2336 | 1622 |
| 2700-3000 | Average kcal | 2800 | 2933 | 2835 | 2870 |
| 2700-3000 | No countries | 4 | 16 | 31 | 42 |
| Over 3000 | Population (m.) | 60 | 484 | 3049 | 5140 |
| Over 3000 | Average kcal | 3117 | 3174 | 3280 | 3200 |
| Over 3000 | No countries | 2 | 14 | 29 | 45 |
| All Developing | Population (m.) | 2604 | 4731 | 6709 | 7509 |
| All Developing | Average kcal | 2111 | 2654 | 2960 | 3070 |
| All Developing | No countries | 101 | 102 | 102 | 102 |

[1] Only countries with Food Balance Sheets

## Box 2.1 Indian paradox: Near stagnant average food consumption in midst of rapid economic growth

As discussed later (section 2.3 and Chapter 3), much of the slowdown in global cereals consumption has been the result of developments in per capita food consumption of cereals in China and India, which between themselves account for 38 percent of world population. A major issue for the global projections is the extent to which recent developments in these two large countries are indicative of things to come or if these trends may change in the future. To address this issue we first note the significant differences existing in the historical developments in the two countries.

In China, the leveling off and subsequent decline in per capita cereals consumption occurred when the country had reached nearly 220 kg/person/year and consumption of all foods was providing 2600+ kcal/person/day. In parallel with the declines in cereals, the consumption of other foods was increasing leading to the present nearly 3000 kg/person/day (more on China's cereals in Chapter 3, Box 3.2.). In contrast India's per capita cereals consumption started stagnating/declining when it was still relatively low at around 170 kg and when consumption of all food was also low at around 2400 kcal/person/day (or 2150 kcal rural and 2070-2160 urban according to the national consumer expenditure surveys of 1993-94 and 1999-2000 – (Dev et al., 2004: tables 8-9). Somewhat higher levels are indicated by nutrition surveys proper, though these are measured in terms of consumption units rather than per capita, Shetty, 2002: tables 5-6). Moreover, the stagnation and/or decline in per capita cereals consumption was not accompanied by any significant increases in the consumption of total food calories, so that the national average is still in the area of 2450 kcal/person/day. The reduction of calories from cereals, and to a smaller extent pulses, was made up mainly by increases in the consumption of vegetable oils, milk, sugar and fruit and vegetables.

These developments are assumed to reflect both the influence of standard economic factors (e.g. inadequate growth of incomes of those that would consume more cereals if they could afford them, and prices) but also what goes by the name of "change in tastes and preferences". Several authors emphasize the role of such shifts in tastes, e.g. Dev et al. (2004), Rao (2000), Sen (2005). However, we are still short of explanations why such widespread shifts, that would normally occur when national averages are at levels consonant with significantly reduced undernutrition, seem to occur in India at the very early stages of such nutritional transition when the prevalence of undernutrition is still high. The latter is estimated at 21 percent of the population or 220 million (FAO, 2004a). These estimates are not different from those circulating among national experts, e.g. Paroda (2001): "India still has the world's largest number of poor people (around 250 million) who do not get two square meals a day".

To judge from survey data of food intakes, the situation has been getting worse rather than improving, at least in terms of per capita calories consumed (Shariff and Malik, 1999), and this phenomenon is fairly widespread affecting all classes, rural and urban and those below and above the poverty threshold (Sen, 2005: table 5). Some authors (e.g. Saha, 2000) consider that the decline of cereals consumption is a sign of distress rather than of improving welfare favouring diet diversification, indicating that things are getting worse in the rural areas as people have to pay more than before for things like fuel and other basic necessities of life. Of course, this is saying that rural incomes have not improved at anything near the rates implied by the high overall economic growth rates, if at all. In which case, the near stagnant levels of national average food consumption may not be much of a paradox.

Overall, however, one should be careful in taking at face value the calorie data coming from the surveys (similar reservations apply, of course, to the FAO estimates of apparent food consumption based on the food balance sheets). Such surveys seem to consistently show significant underconsumption of the population groups at the bottom of the income distribution scale. For example, in ten of India's 16 States the poorest (by expenditure) 20 percent of the population had in 1999-2000 calories in the range in the range 1300-1600. Worse, in 1983 the poorest 20 percent are shown as having had calories in the range 850-1360 in 3 States (Tamil Nadu, Kerala, Karnataka - Meenakshi and Vishwanathan, 2003, Table 6). Nutritionists would say these levels are hardly sufficient for survival and minimal activity if persons are permanently subjected to them even after accounting for differences among States in population characteristics (age/sex structures, body weight). Apparently this result reflects, inter alia, exclusion of the food consumed by employees in their employers' households. In India's National Sample Surveys such food is counted as part of the latters' food consumption (Minhas, 1991). In conclusion, we should evaluate carefully the reliability of the survey data before drawing conclusions about developments in India's food consumption levels.

National income data can help us examine the issue in an international context. India's per capita GDP in the year 2000 was 2220 PPP$ of 1995[2] (World Bank, 2004) when per capita apparent food consumption was 2410 kcal/person day. This relationship is not at all "abnormal" in a cross-country comparison: there are 11 developing countries[3] with GDP in the neighbourhood of that of India (PPP$ 2200 plus/minus $500) and they all have kcal/person/day in the range 2000-2600, with India being right in the middle of the range. Going by analogy, in the future India should be somewhere near the middle of the range of countries with incomes in the neighbourhood of what India will have at that time. Assuming the growth rate of per capita GDP of the last 10 years (4.1 percent p.a.) were to apply also to the period to 2030, India's per capita GDP should rise by 2030 to PPP$ 7400 of 1995. Countries that currently have incomes in range PPP$ 7400 plus/minus $1000[4], have kcal/person/day in the range 2700-3150. Therefore, India's average national food consumption rising to around 2800 kcal by 2030 would not be out of place in the projections. Were this to happen, it would imply a significant reduction in undernutrition for the country and the world. To judge from survey data, Indians do move up the calorie scale as incomes increase: in six of India's 16 States the richest (by expenditure) 20 percent of the population had over 3000 kcal/person/day while the bottom 20 percent had calories in the range 1713-2228 (Meenakshi and Vishwanathan, 2003, Table 6). As incomes rise and poverty is reduced[5], those in the less well off segments of the population can be expected to behave vis-à-vis food more like those in the better-off groups currently.

2 PPP= Purchasing Power Parity (definition in: http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0,,contentMDK:20118237~menuPK:62002075~pagePK:60002244~piPK:62002388~theSitePK:270065,00.html)
3 Cameroon, Pakistan, Angola, Ghana, Guinea, Vietnam, Lesotho, Bolivia, Nicaragua and Honduras (Zimbabwe is not included because it was in the middle of a severe food crisis).
4 Brazil, Uruguay, Costa Rica, Mexico, Malaysia, Trinidad and Tobago and Chile (Botswana, with income in this range but only 2160 calories, is not included in the sample as being atypical and a clear outlier, probably because of the large weight of the diamond sector in total GDP).
5 See the World Bank's projections of reductions in South Asia's poverty (Table 2.6).

the very populous developing countries mentioned above were largely responsible for this massive upgrading of the food situation of the developing countries.

### 2.1.2 Failures

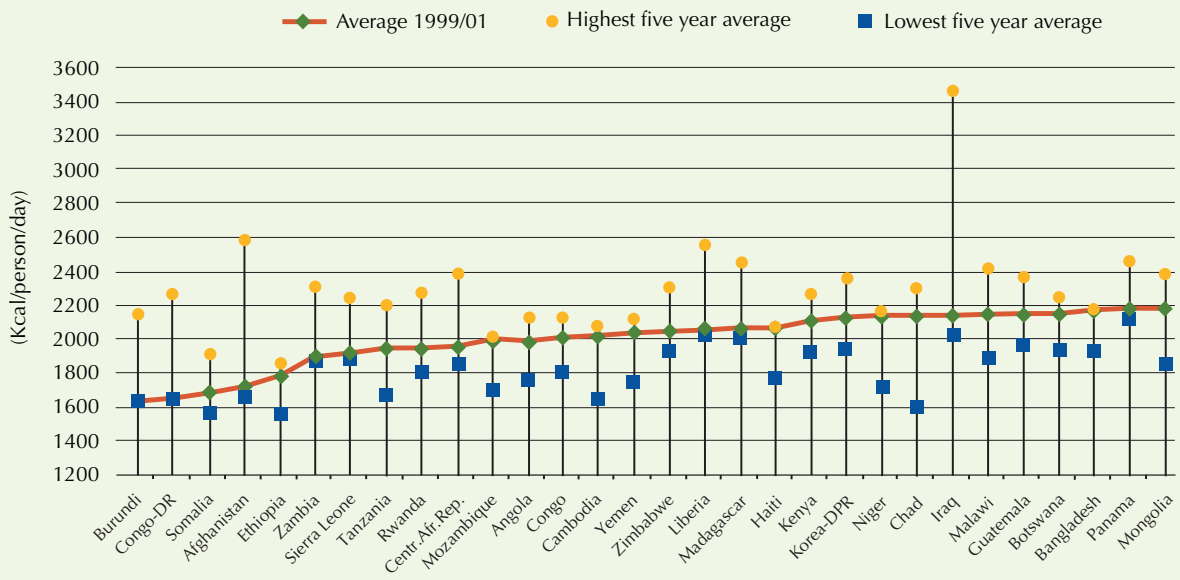
A significant number of countries failed to participate in this general thrust towards increasing average food consumption levels. There are currently 32 developing countries where food consumption is under 2200 kcal/person/day (Table 2.2). Figure 2.3 summarizes their historical experience: present (average 1999/01) levels are compared with the highest and lowest ones recorded in any 5-year average (5-year averages are used to smooth out distortions from yearly fluctuations) in the period 1961-2002. The following comments may be made about these 32 countries:

- Several among them (e.g. Iraq, Afghanistan, the Central African Republic, Panama, Madagascar, Malawi) had achieved middling levels (over 2400 kcal) or even high ones (Iraq) in at least one 5-year average in the past. They were in the under-2200 kcal class in 1999/01 because they suffered declines, some particularly deep ones, Iraq, Afghanistan, Congo DR, Burundi and Liberia. The impact of war or war-like conditions is evident.
- For most other countries in Figure 2.3, the highest level ever achieved was totally inadequate to start with, yet they suffered further declines, some very sharp ones, e.g. Somalia, Burundi, Congo DR, Rwanda, Kenya, Ethiopia-cum-Eritrea[6].
- Finally, a few countries did not suffer declines but have always had very low per capita food consumption. That is, they have never had levels that were significantly above the very low ones they have currently. Here belong Bangladesh, Niger, Haiti and Mozambique.

Looking at the regional picture, sub-Saharan Africa stands out as the only region which failed to make any significant progress in raising per capita food consumption, a stagnation even more pronounced if we exclude Nigeria from the regional averages (Table 2.1). Not all countries of the region are in this dire food security situation. Besides Nigeria, a number of other countries made significant progress to over 2400 kcal/person/day (Mauritius, Mauritania, Ghana, Gabon, Benin, Burkina Faso and Lesotho) but their weight in the region 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 population of over 15 million, six have per capita food consumption

6 The data used in Figure 2.3 refer to the aggregate Ethiopia and Eritrea, because there are no separate data before 1993 for making historical comparisons for the two countries separately.

**Figure 2.3 Developing countries with under 2200 kcal in 1999/01. Highest and lowest 5-year average kcal recorded during 1961-2001**




levels which are lower than what they attained in the past - some of them much lower, e.g. Congo DR, Madagascar and Tanzania. Only Nigeria and Ghana among these larger countries have shown persistent gains in per capita food consumption, apparently in both countries due to jumps in production of roots and tubers, as discussed later in this Chapter.

### 2.1.3 The prevalence of undernourishment– past and present

The latest FAO assessment, *The State of Food Insecurity in the World 2004* (FAO, 2004a), estimates the total prevalence of undernourishment in the developing countries at 813 million persons in 2000/02 (17 percent of their population - Table 2.3)[7], when average food consumption reached 2650 kcal/person/day. This estimate is not significantly different from that of ten years earlier, the 3-year average 1990/92 (823 million), although then it represented a higher proportion of their total population (20 percent). The 3-year average 1990/92 was the base used by the 1996 World Food Summit (WFS) in setting the target of halving the numbers undernourished in the developing countries by 2015 at the latest.

This slight decline represents virtually no progress in the first ten years of the 25-year period set by the WFS for attaining the target. In practice, declines achieved in East Asia were compensated by increases in the other two regions with the highest concentrations - sub-Saharan Africa and South Asia. If these trends continue, the halving target will certainly not be achieved and whatever reductions take place will further accentuate the divide between countries making progress and those falling behind.

Changes in the prevalence of undernourishment are close correlates of changes in food consumption levels (kcal/person/day), as explained in Box 2.2. The historical data in Table 2.1 show that food consumption levels have improved greatly for most regions over the last three decades. Such improvement must have been accompanied by a lowering of the prevalence of undernourishment also in the years before 1990/92. By implication, undernourishment must have been much higher in the past, e.g. in 1969/71 when there were only 2110 kcal/person/day on the average in the developing countries. Estimates for that period indicate 960 million which was 37 percent of the population[8].

7 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, 1999: 6).

8 Estimates in http://www.fao.org/faostat/foodsecurity/index_en.htm.

## Table 2.3 Prevalence of undernourishment, developing countries

| | 1990/92 | 2000/02 | 1999/01 | 2015 | 2030 | 2050 |
|---|---|---|---|---|---|---|
| | Percent of population | | | | | |
| | SOFI 04 | | | | | |
| Developing countries | 20.3 | 17.0 | 17.2 | 10.1 | 6.9 | 3.9 |
| sub-Saharan Africa | 35.7 | 32.7 | 33.3 | 21.1 | 12.4 | 5.8 |
| *excl. Nigeria* | *40.8* | *38.3* | *39.0* | *25.2* | *14.7* | *6.8* |
| Near East / North Africa | 7.6 | 10.1 | 10.2 | 7.0 | 5.7 | 3.7 |
| Latin America and Caribbean | 13.4 | 10.2 | 10.7 | 6.6 | 3.9 | 2.6 |
| South Asia | 25.9 | 22.1 | 22.3 | 12.1 | 8.4 | 4.1 |
| East Asia | 16.5 | 11.5 | 11.6 | 5.8 | 3.9 | 2.9 |
| | Million | | | | | |
| Developing countries | 823 | 813 | 811 | 582 | 458 | 290 |
| sub-Saharan Africa | 170 | 203 | 201 | 179 | 140 | 88 |
| *excl. Nigeria* | *159* | *192* | *191* | *173* | *135* | *84* |
| Near East / North Africa | 24 | 40 | 39 | 36 | 36 | 29 |
| Latin America and Caribbean | 60 | 53 | 55 | 41 | 27 | 20 |
| South Asia | 291 | 301 | 299 | 203 | 166 | 90 |
| East Asia | 277 | 217 | 216 | 123 | 88 | 64 |

*The absolute numbers differ slightly from those published in FAO (2004a) because the latter include estimates for some small countries.
SOFI 04 = *State of World Food Insecurity in the World 2004 (FAO, 2004a)*

### Box 2.2 Measuring the prevalence of undernourishment: the key role of the estimates of food available for direct human consumption[9]

The key data used for estimating the prevalence 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 – explanations in http://faostat.fao.org/faostat/agricult/cbcp-e-e.htm). The latter are constructed on the basis of countries' reports on their production and trade of food commodities. The part used as food is derived after deduction of estimates and/or allowances for non-food uses and for losses (excluding losses at the household or individual level[10]. Such losses can be considerable – see estimates for the USA in Kantor, 1998). The population data are used to express these food availabilities into per capita terms (kg/person/year, then converted to kcal/person/day). The resulting numbers are taken as proxies for actual national average food consumption. For many countries the thus estimated per capita food consumption of the different commodities are totally inadequate for good nutrition, hence the relatively high estimates of the prevalence of undernourishment reported for them.

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[11], though 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 at rest (breathe, pump blood, etc.) even without allowing for movement or activity. This is the Basal or Resting Metabolic Rate (BMR or RMR). It is in the general range 1300-1700 kcal/day for adults in different physiological conditions (age, sex, height, bodyweight). Taking the age/sex structure and body-weights of the adult populations of the different countries, their national average BMRs for adults are estimated. 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 and inactivity. For children, in addition to the BMR, an additional allowance needs to be made for the requirements for adequate growth and in the case of pregnant and lactating (nursing) mothers for the proper growth of the foetus and for the lactation needs of the growing infant.

9 Reproduced with amendments from FAO (1996a).
10 Work is currently underway to generate estimates for such losses.
11 See discussion in FAO (2004b).

When an allowance for light activity is added, estimated to be about 54 percent of the BMR, there results a range of between 1720 kcal and 1965 kcal person/day for the different developing countries given their population structures in 2000 (average: 1840). This will rise to 1820-1980 kcal by 2050 (average: 1913) when the demographic structure will be different, with a higher proportion of adults. It follows that population groups in which an average individual has habitually an intake below this level (the threshold) are undernourished because they do not eat enough to maintain health, body weight and to engage in light activity. The result is physical and mental impairment. Characteristics for the former are evidenced in nutritional anthropometric surveys. Estimating the prevalence 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 (2001:12) considers that the thresholds used in the FAO measurement of undernourishment for the tropical countries are too high leading to overestimates of undernourishment[12].

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 have high household waste or simply overeat) and other people less than their requirement (usually because they cannot 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 national 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 1800 kcal and CV=0.20, must have a national average of 2700 kcal/person/day if the proportion undernourished is to be only 2.5 percent, or 2900 if it is to be 1 percent. Naturally, if inequality were more pronounced, these requirements would be higher.

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 prevalence of undernourishment as explained elsewhere (FAO, 1996b; more technical discussion in Naiken, 2003)[13]. 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 prevalence of undernourishment, the inevitable conclusion for these countries is that it must be significant, ranging from moderate to high or very high, 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 which 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 which 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, social policies, etc. 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.

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, mainly, the primary data on production and trade supplied by the countries, as well as the estimates made for non-food uses and losses of food commodities and the population data used to express them in per capita terms[14]. It is these data and estimates 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.

12 Work is currently underway to revise the thresholds used in the estimation of undernourishment.

13 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.

14 In some cases the population data themselves are a prime source of errors in the estimates of food consumption per capita (for the case of Nigeria, see Bruinsma, 2003, Box 2.2).

## 2.2 The outlook for food and nutrition to 2015, 2030 and 2050

### 2.2.1 Demographics

The population data and projections used here are those of the United Nations *World Population Prospects-the 2002 Revision* (UN, 2003). The projections indicate that a rather drastic slowdown in world demographic growth is in prospect. The data and projections are shown in Table 2.4. The world population of 6071 billion of 2000 is projected to grow to 8130 million in 2030 and to 8920 million 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 0.7 percent in 2025-30 and to 0.33 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 world population every year in the second half of the 1990s and the number will remain at over 50 million p.a. until the mid-2030s. More rapid declines after 2035 should bring the annual increment down to 26 million by 2050. Practically all these increases will be in the developing countries. Within the developing countries themselves, there will be increasing differentiation. East Asia will have shifted to negative demographic growth (-0.2 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 1.2 percent p.a. in the same period 2045-50, despite the drastic downward revision made in recent years in the region's population projections. By 2050, 18 million of the 26 million added annually to world population will be in sub-Saharan Africa. Some countries, mostly in Africa, have demographic projections suggesting that their populations in 2050 would be rather sizeable multiples of their current ones. This prospect raises the serious issue whether significant improvements in food consumption and nutrition could be achieved in the foreseeable future (see discussion in Box 2.3). In conclusion, rapid population growth could continue to be an important impediment to achieving improvements in food security in some countries, even when world population ceases growing.

### 2.1.2 Overall economy and poverty

The latest World Bank assessment of global economic prospects published in late 2005 contains economic growth (GDP per capita) projections for the period 2001-15 (World Bank, 2006: Table 1.2). These medium-term projections of the World Bank are shown in Figure 2.4. Higher growth rates in per capita GDP than in the 1990s are foreseen for all regions and country groups with the exception of East Asia, which however remains the region with the highest rate of over 5.0 percent p.a. in per capita terms. To note in particular: (a) the reversal of declines and robust growth in the low/middle-income Europe and Central Asia (comprising in the World Bank's classification the transition economies plus Turkey), and (b) the great contrast in the prospects of the two

**Table 2.4 Population data and projections**

| | Population (million) | | | | | growth rates, percent per annum | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 2000 | 2015 | 2030 | 2050 | 1970-2000 | 2000-2030 | 2030-2050 | 2000-2050 |
| World (UN) | 3692 | 6071 | 7197 | 8130 | 8919 | | | | |
| World (countries with FBS) | 3682 | 6048 | 7166 | 8091 | 8871 | 1.7 | 1.0 | 0.5 | 0.8 |
| Developing countries | 2603 | 4731 | 5802 | 6709 | 7509 | 2.0 | 1.2 | 0.6 | 0.9 |
| sub-Saharan Africa | 262 | 607 | 853 | 1134 | 1509 | 2.9 | 2.1 | 1.4 | 1.8 |
| Near East/North Africa | 183 | 392 | 521 | 643 | 774 | 2.6 | 1.7 | 0.9 | 1.4 |
| Latin America and Caribbean | 281 | 515 | 623 | 705 | 762 | 2.0 | 1.1 | 0.4 | 0.8 |
| South Asia | 708 | 1340 | 1685 | 1972 | 2208 | 2.2 | 1.3 | 0.6 | 1.0 |
| East Asia | 1169 | 1877 | 2119 | 2256 | 2256 | 1.5 | 0.6 | 0.0 | 0.4 |
| Industrial Countries | 727 | 905 | 965 | 1003 | 1019 | 0.7 | 0.3 | 0.1 | 0.2 |
| Transition Countries | 351 | 411 | 399 | 380 | 343 | 0.5 | -0.3 | -0.5 | -0.4 |

## Table 2.5 Income growth assumptions

| | World Bank Region* | GNI per Capita $ | | growth rates, percent per annum | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | WB Atlas 2002 | PPP 2002 | Total GDP at market prices | | Per capita GDP at market prices | | | |
| | | | | 2000 -2030 | 2030 -2050 | 1980 -1990 | 1990 -2000 | 2000 -2030 | 2030 -2050 |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| World | World total | 5121 | 7848 | 3.1 | 3.2 | 1.3 | 1.2 | 2.1 | 2.7 |
| Developing countries | | 1077 | 3755 | 4.8 | 4.6 | | | 3.6 | 4.0 |
| Sub-Saharan Africa | Sub Saharan Africa | 450 | 1700 | 3.8 | 4.3 | -1.1 | -0.5 | 1.6 | 2.8 |
| Near East/North Africa | Middle East and North Africa | 2240 | 5670 | 4.1 | 4.1 | -1.1 | 1.0 | 2.4 | 3.1 |
| Latin America and the Caribbean | Latin America and the Caribbean | 3280 | 6950 | 3.4 | 3.5 | -0.9 | 1.6 | 2.3 | 3.1 |
| South Asia | South Asia | 460 | 2460 | 6.0 | 5.5 | 3.3 | 3.2 | 4.7 | 4.9 |
| East Asia | East Asia and Pacific | 960 | 4280 | 6.0 | 5.0 | 5.8 | 6.3 | 5.3 | 5.0 |
| Industrial countries | High income countries | 26490 | 28480 | 2.5 | 2.5 | 2.5 | 1.8 | 2.2 | 2.4 |
| Transition countries | Europe and Central Asia | 2160 | 6900 | 4.3 | 3.8 | 0.9 | -1.8 | 4.5 | 4.3 |

Notes: Cols 1, 2, from World Bank (2004). GNI=Gross National Income, formerly named Gross National Product (GNP); Col. 3, based largely on World Bank projections to 2030 for World Bank (2005); Col. 4, Own assumptions. Cols 5-6 from World Bank (2006): Table 1.2; Cols 7-8, computed from Cols 1, 3, 4 and population projections in Table 2.4

*The country coverage of the World Bank groups is similar, though not identical to that in this study, e.g. Turkey is included in the group (low and middle income) Europe and Central Asia, South Africa in sub-Saharan Africa, while Korea Rep., Hong Kong and Taiwan (Province of China) are in the High-Income Countries (World Bank classification from World Bank, 2005: Table A.51).

### Box 2.3 Countries with high population growth for 50 years and limited agricultural resources: An untenable combination?[15]

A key characteristic of the demographic outlook, which is not so evident in medium term projections but leaps to the eye in projections of 50 years ahead, is the prospect that a number of countries could have in 2050 populations which are large multiples of present ones. As shown in Table 2.4 world population is projected to be in 2050 47 percent above that of 2000 and that of the developing countries 59 percent. In contrast, the population of Niger (the country with the highest total fertility rate in the world of 8 children per woman at present and projected to still hold this record with 3.85 children in 2050) is projected to grow from 10.7 million in 2000 to 53 million in 2050, an almost 5-fold increase. In like manner, Yemen's population would grow from 18 million to 84 million, Ethiopia's from 65 to 170 million, Uganda's from 23.5 to 103 million, and so on for a number of other countries. Almost all of these countries have been in nearly perennial food insecurity for several decades. The issue is therefore raised if and to what extent significant progress in development and food security can be achieved under the rapidly mounting population pressure implied by the demographic projections.

The issue is of paramount importance for those countries with large and growing rural populations and heavy dependence of their economies on their own agriculture for income, employment, food supplies and for providing the basis for their overall development. Countries falling in this category which also have agricultural resources that are limited in quantity and/or quality (e.g. predominantly semi-arid, little irrigation potential) and are not endowed with other resources (e.g. oil, mining) will find it much more difficult than other low-income countries to reduce poverty and make adequate progress in food security. The food and agriculture projections cannot avoid recognizing this prospect and highlight the possibility that food insecurity could continue to be a dominant characteristic in a number of countries for several decades to come. More generally, the demographic projections themselves (i.e. the underlying assumptions about fertility, mortality and migration) may have to be revisited and re-assessed in the light of prima facie incompatibilities between population growth and agricultural potentials in countries where the latter are of crucial importance for development. The just released (in early 2005) 2004 revision of the UN demographic projections (UN, 2005a) did modify the projections of the 2002 revision (used here) for some of these countries, but not always in the direction of making them more compatible with agricultural potentials. For example, Yemen's 2050 population is now projected to be 59 million rather 84 million, but for Uganda the revision is in the opposite direction: 127 million in 2050, up from the 103 million of the 2002 projection; and Niger's projection remains almost unchanged at 50 million in 2050.

15 A more complete discussion of the issues in this Box can be found in Alexandratos (2005).

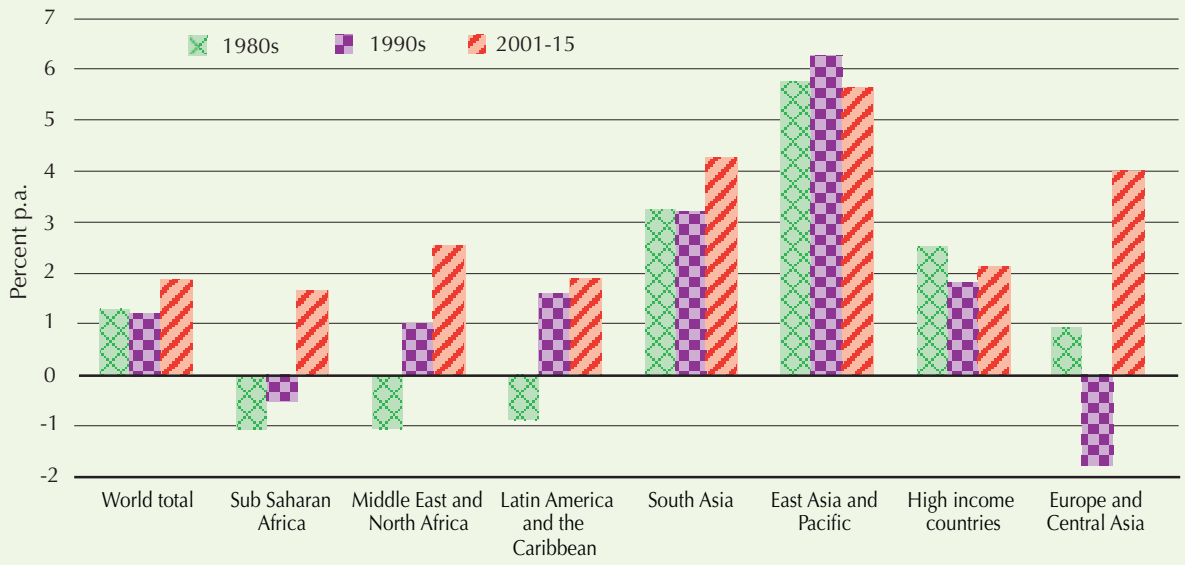
regions with high relative concentrations of poverty and food insecurity, South Asia and sub-Saharan Africa. In the former, a further acceleration of the relatively high growth rates of the past holds promise of positive impact on poverty alleviation (see below). However, progress may be very limited in sub-Saharan Africa, with per capita incomes growing at only 1.7 percent p.a. in the period to 2015. This is certainly much better than 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 in the medium term future.

These World Bank projections and extensions to 2030 have provided the basis for defining the GDP projections used as exogenous assumptions in the present study. Projections for the period 2030-50 were formulated by the authors of this study, largely on the assumption of continuation of the growth of the period to 2030, but with some important exceptions. They are shown in Table 2.5. The exogenous economic growth assumptions used here, together with the growth of population, are the major determinants of projected food consumption, though by no means are they the only ones. Many other factors besides population and average GDP growth influence the apparent levels and commodity composition of food consumption and have to be taken into account in the process of all phases of analytical and evaluation work concerning consumption, production and trade (see methodological notes in Bruinsma, 2003, Appendix 2). As noted (Figure 2.2), there are several countries where the evolution of average per capita income (as recorded in the national accounts data) seems to bear little relationship to the evolution of the average apparent food consumption as revealed in the Food Balance Sheets. For some countries, particularly those with severe food insecurity problems, it is often the evolution of local food production that dominates developments in food consumption (Bruinsma, 2003: 45-47).

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 we use as exogenous assumptions are compatible with poverty reduction. We have no way of exploring poverty implications for the long term horizon we use in this study. However, the empirical evidence that economic growth is correlated with reduction of poverty (defined as numbers of people, or population proportions, living on e.g. US$ 1 or US$ 2 a day or less) suggests that the positive growth rates assumed here (Table 2.5) do imply poverty reductions, though we cannot say by how much. Some idea of the magnitudes involved in this relationship between economic growth and poverty reduction can be had from the World Bank's projections of poverty associated with those of the per capita GDPs to 2015 in Figure 2.4.

Their poverty estimates are shown in Table 2.6. They refer to what is commonly known as US$ 1/day poverty,

**Figure 2.4 Growth rates of per capita GDP, 1980s, 1990s and 2001-15**




Source, World Bank (2006), Table 1.2 (see note in Table 2.5 for country coverage)

i.e. number of persons living in households with per capita expenditure under US$ 1/day, with US$ defined in units of Purchasing Power Parity - PPP. These poverty projections imply that:

- The Target set by the Millennium Development Goals 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 31 percent in 1990 to 12.3 percent in 2015);
- The absolute numbers in poverty may also be halved. They are projected to decline from 1216 million in 1990 to 614 million in 2015;
- Much of the decline is due to prospective developments in East Asia, where the halving of poverty (from 1990 levels) had already being achieved by 2002. Further declines would practically eliminate poverty (of the US$1/day definition) in the region by 2015;
- South Asia is also projected to make great strides in reducing significantly (though by no means eliminating) poverty by 2015. Indeed these two regions of Asia will account for the totality of further reductions in poverty between 2002 and 2015 (200 million each);
- 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, though not as fast as in the past. The trend for the percentage of population in poverty in this region to also increase may be reversed, but at 38 percent this percentage will still be very high in 2015.

There is a parallel between these foreseen developments in the prevalence of poverty and those projected here for the prevalence 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, 2001: 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 we use to track developments in food security - per capita food consumption as defined above - will have grown significantly. The world average will be approaching 3000 kcal/person/day in 2015, will be just over 3000 by 2030 and higher in 2050 (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 the present 2650 kcal to over 3000 kcal in 2050. More and more people will be living in countries with medium to high levels of per capita food consumption. For example, by 2050 some 90 percent of the increased population of the developing countries will be living in countries with values of this variable exceeding 2700 kcal/person/day, up from 51 percent at present and the only 4 percent three decades ago. Indeed, some 5 billion could be in countries exceeding 3000 kcal (Table 2.2).

**Table 2.6 Estimates and projections US$1 poverty, World Bank, baseline scenario**

| | Million | | | Percent of population | | |
|---|---|---|---|---|---|---|
| | 1990 | 2002 | 2015 | 1990 | 2002 | 2015 |
| Developing countries | 1216 | 1001 | 614 | 31.0 | 24.2 | 12.3 |
| sub-Saharan Africa | 227 | 303 | 336 | 44.6 | 46.4 | 38.4 |
| Middle East and North Africa | 6 | 5 | 3 | 2.3 | 2.4 | 0.9 |
| Latin America and Caribbean | 49 | 42 | 29 | 11.3 | 9.5 | 6.9 |
| South Asia | 462 | 437 | 232 | 41.3 | 31.3 | 12.8 |
| East Asia and Pacific | 472 | 214 | 14 | 29.6 | 14.9 | 0.9 |
| Memo Items | | | | | | |
| East Asia and Pacific, excl. China | 97 | 34 | 2 | 21.1 | 10.8 | 0.4 |
| Developing countries, excl. China | 841 | 821 | 603 | 30.2 | 26.9 | 14.8 |

Source: Adapted from World Bank (2006), Table 1.3. See Table 2.5 for country coverage

These rises are not always an unmixed blessing as the diet transitions experienced by many countries imply changes in diets towards energy-dense ones high in fat, particularly saturated fat, sugar and salt and low in unrefined carbohydrates. In combination with lifestyle changes, largely associated with rapid urbanization, such transitions, while beneficent in many countries with still inadequate diets, are often accompanied by a corresponding increase in diet-related chronic Non-Communicable Diseases (NCDs – WHO, 2003; Schmidhuber and Shetty, 2005; Alexandratos, 2006). In many countries undergoing this transition, obesity-related NCDs appear when health problems related to undernutrition of significant parts of their populations are still widely prevalent. The two problems co-exist and these countries are confronted with a "double burden of malnutrition" resulting in novel challenges and strains in their health systems.

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 2030 12 percent of the developing country population (810 million people) will still be living in countries with low levels of food consumption (under 2500 kcal), and the number will still be 130 million in 2050. As noted (Box 2.2), at these levels of national average consumption the prevalence of undernourishment is bound to be significant.

At the regional level, in 2030 sub-Saharan Africa will still have only 2600 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 (Table 2.1). Of the 19 countries still remaining in 2030 in the under 2500 kcal category (Table 2.2), 14 will be in sub-Saharan Africa.

### *Modest reductions in the numbers undernourished*

The relatively high average consumption levels that the developing countries may attain in the future (Table 2.1) could lead one to expect that the problem of undernourishment will be solved or be 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 would be rather modest: the 810 million of 1999/01 (17.2 percent of the population) may become 580 million in 2015 (10.1 percent), 460 million in 2030 (6.9 percent) and 290 million (3.9 percent) by 2050. For the developing countries as a whole, we may have to wait until after 2030 before the numbers of undernourished are reduced to the target set for 2015 by the WFS, i.e. one half of the 823 million estimated for the base period of 1990/92. It is noted that the UN Millennium Development Target refers not to halving the numbers undernourished but rather to "halve, between 1990 and 2015, the *proportion* of people who suffer from hunger" (UN, 2005b). In this sense, the Target may be achieved in 2015, as the proportion falls from the 20.3 percent in 1990/92 to the projected 10.1 percent in 2015.

These findings indicate that achieving significant declines in the prevalence 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 4.7 billion in 2000 to 5.8 billion in 2015 and 7.5 billion in 2050 (Table 2.4).

The numbers of undernourished are expected to decrease little by 2015 in sub-Saharan Africa and they will still be above those of the WFS base in 1990/92. A small decline is no doubt an improvement over the historical trend of nearly stagnant food consumption per capita in the region and rising numbers of undernourished. It is, however, far from what is needed to meet the World Food Summit target of reducing the numbers by half by no later than 2015. In contrast, rather significant reductions are expected for East Asia and to a smaller extent for South Asia, the two regions that contain the bulk of the world's undernourished population. East Asia is expected to have more than halved undernourishment by 2015 from base 1990/92 (it had already reduced it by 22 percent in the period 1990/92-2000/02) and South Asia could achieve this target shortly after 2030.

In order to appreciate why these prospects emerge, let us recall briefly that future estimates are generated by applying the same method FAO uses 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 2.2), 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 2.2. It was noted that due to the changing demographic structures (growing share of adults in total population) the levels will be higher in the projection years than at present[16]. Therefore, this factor would tend to raise the prevalence of undernourishment, *ceteris paribus*;
- The coefficient of inequality, as described in Box 2.2. 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 current undernourishment estimates, we would be ignoring the prospect that declining poverty and rising national averages of food consumption are normally associated with more equal access to food. The World Bank projections of declines in the prevalence of poverty (Table 2.6) 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 the reduced poverty projected by the Bank and the rising national averages of food consumption projected here would be accompanied by reduced inequality in food consumption as measured by the coefficient of variation (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[17]. The net effect of these assumptions is that the coefficients of variation (CV) of the different developing countries which are currently in the range 0.21-0.36 would be in the range 0.20-0.295 in 2050. The estimates of future undernourishment presented in Table 2.3 are based on such assumptions about changes in inequality.

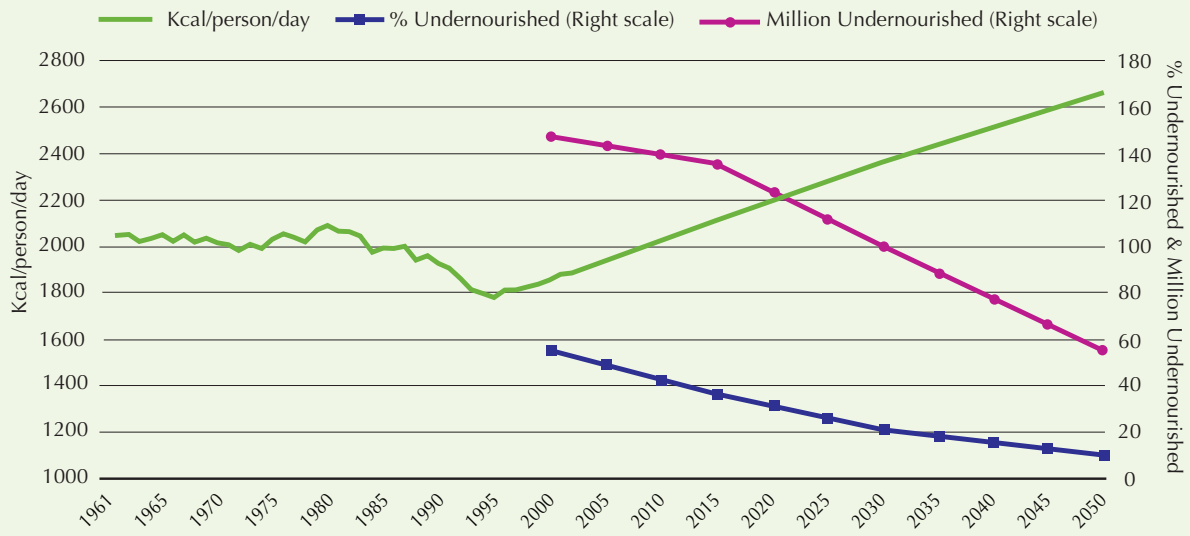
One factor making for the slow decline in the numbers of undernourished is the gradual rise in the threshold for classifying a person as undernourished. As noted, this rise is due to the growing share of adults in the population. The (simple arithmetic) average threshold of the developing countries rises from 1840 kcal in 2000 to 1875 kcal in 2030 and to 1913 kcal in 2050. This rise has important implications for the future prevalence of undernourishment in countries with low average food consumption. It implies that consumption must rise by an equal proportion just to prevent the prevalence of undernourishment (in percent of the population) from increasing, and by more if absolute numbers are not to rise. If this change in the age structure of the population and the associated rise in threshold requirements had not intervened, the numbers undernourished estimated for 2030 would be 15 percent lower than shown in Table 2.3 – 390 million rather than 460 million.

A second factor is to be found in the very adverse initial conditions several countries start with. For example, 17 developing countries start with estimated base year undernourishment of over 40 percent[18]. The group's average per capita food consumption is 1835 kcal and undernourishment is 54 percent of the population or 146 million. The food consumption projections imply (according to the method used here) that the *proportion* of the population affected will fall to 35 percent by 2015. This is a significant decline. However, the *absolute numbers* affected will fall little – to 134 million in 2015, because of the relatively high growth rate of the group's population, 2.4 percent p.a. in 2000-2015. The undernourished may still be some 100 million (19 percent of the population) in 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 1760-2070 kcal in the past four decades. In the projections, it grows from the 1835 kcal

16 As noted (Box 2.2) work is currently under way to revise the thresholds.
17 Future CV = (present CV) times (present kcal/future kcal), subject to future CV=> 0.20
18 They are (in descending order of percent undernourished): Eritrea, Congo DR, Burundi, Somalia, Afghanistan, Sierra Leone, Zambia, Ethiopia, Mozambique, Haiti, Tanzania, Rwanda, Central African Republic, Angola, Congo, Liberia and Zimbabwe.

**Figure 2.5 Countries with undernourished over 40 percent in 1999/01**




in 1999/01 to 2100 kcal in 2015 to 2350 kcal in 2030 and to 2650 kcal in 2050. If achieved, undernourishment may fall to tolerable levels by the final year of the projections, to 7.5 percent. Taking into account population growth, aggregate demand for food (expressed in calories) is projected to grow at 3.3 percent p.a. in the 15 years to 2015. This contrasts with the experience of the past four decades when the highest growth rate achieved in any 15-year period (1961-76, 1962-77, …, 1986-01, 1987-02) was 2.9 percent p.a. (and the lowest 1.6 percent). Overall, therefore, the projections of food consumption and of production, far from being pessimistic, embody a degree of optimism. This projected acceleration is clearly seen in Figure 2.5 which shows the history and projections for this group of countries. The projected improvement is partly justified by the prospect of recovery of agriculture following eventual cessation of war or warlike conditions that are, or were recently, present in several countries in this group. Empirical evidence suggests that in such situations better performance of agriculture is a key factor in making possible rapid increases in food consumption (Bruinsma, 2003: 45-47). Similar considerations apply, *mutatis mutandis*, to other countries which start from low or very low per capita food consumption and high undernourishment and also have fairly high population growth rates.

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 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 of undernourished will be a slow process. Moreover, in several countries with high population growth rates the absolute numbers of undernourished are projected to increase rather than decline by 2015. As noted (Box 2.3), the countries which, in addition to high demographic growth, also have limited agricultural resources and high dependence on agriculture, will find it most difficult to achieve significant improvements.

## 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, eggs), vegetable oils and, to a smaller extent, sugar, as sources of food calories. These three food groups together now provide 29 percent of total food consumption of the developing countries (in

terms of calories), up from 20 percent three decades ago. Their share is projected to rise further to 35 percent in 2030 and to 37 percent in 2050 (in the industrial countries the share has been around 48 percent for several decades now). However, structural change was not universal and wide inter-country diversity remains in the share of different commodity groups in total food consumption. The major changes, past and projected, are briefly reviewed below. Further discussion of developments in the main commodity sectors is presented in Chapter 3.

*Cereals* continue to be by far the most important source of total food consumption in the developing countries (their direct food consumption provides 54 percent of total calories) and the world as a whole (50 percent). There is, however, very wide inter-country diversity: direct food consumption of cereals provides only 15-30 percent of total calories in several countries ranging from those with diets based predominantly on roots and tubers (e.g. Rwanda, Burundi, the two Congos, Uganda, Ghana, etc.) to several high income countries with predominantly livestock-based diets (these latter countries consume, of course, large quantities of cereals indirectly in the form of animal feed for the production of the livestock products they consume as food). At the other extreme, countries with rice-based diets like Bangladesh, or those with diets based on coarse grains (e.g. Lesotho, Burkina Faso) continue to derive 70-80 percent of total food calories from cereals.

Per capita *food* use of cereals[19] seems to have peaked in the early 1990s, and this is true for the world as a whole (per capita apparent consumption fell from 171 kg/person/year in 1989/91 to 165 kg in 1999/01) as well as for the aggregate of the developing countries (from 174 kg to 166 kg). This of course raises the question why the average of the developing countries should be leveling off when so many of them are far from having reached adequate levels of food consumption. Addressing this question requires that we look in some more detail at the experiences of the individual countries. In practice, the peak and subsequent decline reflects primarily developments in China and India. Per capita food consumption of cereals declined in China in the last few years while it stagnated and declined somewhat in the 1990s in India. A commentary on India is provided in Box 2.1 and on China in Chapter 3 (Box 3.2)

These two large countries account for 38 percent of world population and for 48 percent of that of the developing countries. Therefore trends in their values influence decisively the global totals. Excluding these two large countries from the totals, the averages for both the world and the developing countries kept increasing in the 1990s, albeit very slowly. This very slow growth in the midst of still significant undernutrition is a composite of both positive and negative factors in operation. On the negative side, there are the experiences of the many countries whose declines in food cereals consumption is part of the broader picture of failures in the food security area discussed in the preceding section. Countries in this class include Iraq, Afghanistan, Rwanda, Burundi, Somalia and several others. On the positive side, there are the experiences of those countries whose declines in food cereals are broadly part and parcel of the well established pattern of diet diversification away from staples like cereals towards more preferred foods. Countries in this class include several of those in the middle and upper middle income classes, e.g. Taiwan (Province of China), Korea, Rep., Turkey, Tunisia, Syria, etc.

Concerning the future, the downward pressure from developments in China and India on the averages of the world and the developing countries will be attenuated and on balance the declines in these averages observed in the last few years may be halted at least in the first sub-period of the projections to 2030 before resuming a slow pace of decline in the two subsequent decades. This likely development will be the net effect of the contrasting trends of, on the one hand, diet diversification away from the direct consumption of cereals in those countries attaining medium-high levels of food consumption, and on the other hand, increases in per capita consumption in those countries remaining at low levels of food consumption and/or diversifying towards cereals and away from other staples, e.g. roots and tubers. The share of cereals in total calories will continue to decline, but very slowly, falling for the developing countries from 54 percent at present to 49 percent in 2030 and to 46 percent in 2050. Naturally, the per capita consumption of cereals for all uses (including food, feed and other non-food uses, e.g. for seed and the production of ethanol or starch) should keep growing again after the reversal of the sharp declines of the 1990s in the feed sector of the transition economies (Table 2.7 and Chapter 3).

Concerning the likely developments in the individual cereals (wheat, rice, coarse grains) much of the slowdown in per capita food consumption will continue

19 Food use of cereals includes the grain equivalent of all cereals-based food products, including products like beer produced from barley and sugar-substitute sweeteners produced from maize, e.g. corn syrups.

to originate in the declines in per capita consumption of rice, a well established trend in the major countries with predominantly rice-based diets, particularly those in the East Asia region. In contrast, *wheat* food consumption 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).

Food consumption of *coarse grains* has declined on average, but continues to be important mainly in sub-Saharan Africa (where it accounts for 70 percent of food consumption of cereals, with some countries depending overwhelmingly on maize – Zimbabwe, Zambia, etc. – and others mostly on millet and sorghum – mostly the countries in the Sudano-Sahelian zone) and to a smaller extent in Latin America (42 percent, mostly maize). 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. Developments in maize use for the production of sweeteners (which in our data appears as food demand for maize) have boosted the food consumption of coarse grains in the industrial countries, mainly in the USA, where HFCS has replaced a good part of sugar. Aggregate demand for coarse grains will be increasingly influenced by the demand for animal feed and, in some countries, for the production of biofuels. 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 inter-country differences in cereals food consumption will continue to persist. Several countries have per capita food consumption of cereals under 100 kg/year, some below 50 kg (Congo DR, Burundi, Rwanda). These persistently low levels reflect a combination of agroecological factors (favouring dependence of diets on roots and tubers, bananas and plantains, in countries mainly in the humid tropics) as well as prevalence of poverty and depressed levels of food consumption overall. It is worth noting that Africa includes countries at the two extremes of the cereals consumption spectrum: the countries with the highest food consumption of cereals are also in Africa, namely those in North Africa, but also Niger, Burkina Faso and Lesotho, with per capita levels in the range from 200 to 250 kg.

*Livestock products:* The diversification of diet in developing countries has been most visible in the shift towards meat, milk and eggs. Here again there is very wide diversity between 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, Uruguay), but also the occasional country with predominantly pastoral economy, e.g. Mongolia. However, developments in these countries are not what caused the structural change in the diets of the developing countries towards more meat. 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 like China[19] (including Taiwan Province and the Hong Kong SAR), Korea Rep., Malaysia, Chile, Brazil and several countries in the Near East/North Africa region. Indeed, as discussed in Chapter 3, the increase of meat consumption of the developing countries from 11 to 27 kg in the last four decades 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 16 kg[20] (Table 2.7). Given the uncertainties surrounding China's meat statistics, it is perhaps a bit exaggerated to speak of a "meat revolution" taking place in the developing countries and the world.

In the future we may witness a significant slowdown in the growth of demand for meat, notwithstanding the prospect that per capita consumption in the latter group of countries (developing minus China and Brazil) could grow somewhat faster than in the past, rising from the present 16 kg to 26 by 2030 and to 32 kg by 2050 (Table 2.7). However the large weight in the world

19 The reliability of the meat sector data in China has been questioned (Ma et al., 2004). 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 in the past, and could be more important in the future, than suggested here.

20 These data for meat consumption refer only to the traditional meats constituting the great bulk of aggregate consumption, i.e. bovine, ovine, pigmeat and poultry. Other meats (horse, camel, rabbit and game) are not included in the estimates given here. They add to the world average of 37.4 kg another 0.8 kg. However, these other meats are significant food sources in a number of countries, e.g. they add 24 kg to the per capita meat consumption in Mongolia, an important 5-10 kg in some African countries which significantly increases the meat consumption from the more traditional animals. For sub-Saharan Africa, this other meat increases the regional average from the 9.5 kg shown in Table 2.8 to 11.1 kg. Several European countries have also significant consumption, e.g. Italy and France (5-6 kg), and an EU15 average of 3.5 kg added to the traditional average of 88 kg.

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

| kg / person / year | 1969/71 | 1979/81 | 1989/91 | 1999/01 | 2030 | 2050 |
|---|---|---|---|---|---|---|
| | | | **World** | | | |
| Cereals, food | 148.7 | 160.1 | 171.0 | 165.4 | 165 | 162 |
| *Cereals, all uses* | *302.8* | *325.0* | *329.3* | *308.7* | *331* | *339* |
| Roots and tubers | 83.7 | 73.4 | 64.5 | 69.4 | 75 | 75 |
| Sugar (raw sugar equiv.) | 22.4 | 23.4 | 23.3 | 23.6 | 26 | 27 |
| Pulses, dry | 7.6 | 6.5 | 6.2 | 5.9 | 6 | 6 |
| Vegetable oils, oilseeds and products (oil eq.) | 6.8 | 8.3 | 10.3 | 12.0 | 16 | 17 |
| Meat (carcass weight) | 26.1 | 29.5 | 33.0 | 37.4 | 47 | 52 |
| Milk and dairy, excl. butter (fresh milk eq.) | 75.3 | 76.5 | 76.9 | 78.3 | 92 | 100 |
| Other food (kcal/person/day) | 216 | 224 | 241 | 289 | 325 | 340 |
| **Total food (kcal/person/day)** | **2411** | **2549** | **2704** | **2789** | **3040** | **3130** |
| | | | **Developing countries** | | | |
| Cereals, food | 146.3 | 161.7 | 173.7 | 165.7 | 166 | 163 |
| *Cereals, all uses* | *191.8* | *219.1* | *238.6* | *238.0* | *268* | *279* |
| Roots and tubers | 78.8 | 69.6 | 60.1 | 67.0 | 75 | *77* |
| *(Developing minus China)* | *61.8* | *59.0* | *58.4* | *62.8* | *76* | *80* |
| Sugar (raw sugar eq.) | 14.7 | 17.5 | 19.2 | 20.7 | 25 | 26 |
| Pulses, dry | 9.2 | 7.8 | 7.3 | 6.7 | *7* | *7* |
| Vegetable oils, oilseeds and products (oil eq.) | 4.9 | 6.5 | 8.6 | 10.4 | 14 | 16 |
| Meat (carcass weight) | 10.7 | 13.7 | 18.2 | 26.7 | 38 | 44 |
| *(Developing minus China & Brazil)* | *10.7* | *12.5* | *13.6* | *15.9* | *26* | *32* |
| Milk and dairy, excl. butter (fresh milk eq.) | 28.6 | 34.0 | 38.1 | 45.2 | 67 | 78 |
| Other food (kcal/person/day) | 123 | 140 | 171 | 242 | 285 | 300 |
| **Total food (kcal/person/day)** | **2111** | **2308** | **2520** | **2654** | **2960** | **3070** |
| | | | **Industrial countries** | | | |
| Cereals, food | 132.3 | 139.4 | 154.4 | 162.4 | 159 | 156 |
| *Cereals, all uses* | *531.1* | *542.0* | *543.7* | *591.8* | *641* | *665* |
| Roots and tubers | 74.2 | 67.1 | 69.4 | 66.7 | 61 | 57 |
| Sugar (raw sugar eq.) | 40.5 | 36.7 | 32.6 | 33.1 | 32 | 32 |
| Pulses, dry | 3.4 | 2.8 | 3.2 | 3.6 | 4 | 4 |
| Vegetable oils, oilseeds and products (oil eq.) | 13.2 | 15.7 | 18.5 | 21.5 | 24 | 24 |
| Meat (carcass weight) | 69.7 | 78.5 | 84.3 | 90.2 | 99 | 103 |
| Milk and dairy, excl. butter (fresh milk eq.) | 189.1 | 201.0 | 211.2 | 214.0 | 223 | 227 |
| Other food (kcal/person/day) | 486 | 500 | 521 | 525 | 565 | 580 |
| **Total food (kcal/person/day)** | **3046** | **3133** | **3292** | **3446** | **3520** | **3540** |
| | | | **Transition countries** | | | |
| Cereals, food | 200.5 | 189.2 | 179.1 | 168.7 | 164 | 158 |
| *Cereals, all uses* | *653.0* | *777.6* | *767.8* | *499.1* | *618* | *688* |
| Roots and tubers | 140.2 | 118.4 | 97.1 | 103.3 | 99 | 94 |
| Sugar (raw sugar eq.) | 41.9 | 45.9 | 43.4 | 36.5 | 39 | 41 |
| Pulses, dry | 4.1 | 3.1 | 2.3 | 1.6 | 2 | 2 |
| Vegetable oils, oilseeds and products (oil eq.) | 7.4 | 9.2 | 10.2 | 10.1 | 15 | 18 |
| Meat (carcass weight) | 49.5 | 62.9 | 70.7 | 44.4 | 59 | 68 |
| Milk and dairy, excl. butter (fresh milk eq.) | 185.7 | 181.3 | 177.2 | 160.2 | 179 | 193 |
| Other food (kcal/person/day) | 331 | 372 | 333 | 317 | 365 | 390 |
| **Total food (kcal/person/day)** | **3323** | **3389** | **3280** | **2900** | **3150** | **3270** |

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

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

| | 1969/71 | 1979/81 | 1989/91 | 1999/01 | 2030 | 2050 |
|---|---|---|---|---|---|---|
| | | | **sub-Saharan Africa** | | | |
| Cereals, food | 115.3 | 114.3 | 118.8 | 123.3 | 142 | 155 |
| Roots and tubers | 193.0 | 175.0 | 184.3 | 191.2 | 211 | 205 |
| *(sub-Sah. Afr. minus Nigeria and Ghana)* | *184.3* | *182.6* | *179.5* | *165.9* | *194* | *191* |
| Sugar (raw sugar eq.) | 7.8 | 9.8 | 8.6 | 10.0 | 12 | 15 |
| Pulses, dry | 11.0 | 9.7 | 8.9 | 9.8 | 12 | 14 |
| Vegetable oils, oilseeds and products (oil eq.) | 8.0 | 8.4 | 8.5 | 8.9 | 12 | 13 |
| Meat (carcass weight) | 10.2 | 10.5 | 9.8 | 9.5 | 14 | 18 |
| Milk and dairy, excl. butter (fresh milk eq.) | 29.6 | 33.7 | 29.8 | 28.3 | 34 | 38 |
| Other food (kcal/person/day) | 139 | 141 | 130 | 128 | 170 | 185 |
| **Total food (kcal/person/day)** | 2100 | 2078 | 2106 | 2194 | 2600 | 2830 |
| | | | **Near East / North Africa** | | | |
| Cereals, food | 179.3 | 199.7 | 211.8 | 203.5 | 199 | 193 |
| Roots and tubers | 16.6 | 26.5 | 31.8 | 33.7 | 33 | 33 |
| Sugar (raw sugar eq.) | 20.4 | 28.0 | 28.2 | 27.7 | 29 | 30 |
| Pulses, dry | 6.2 | 6.3 | 8.0 | 6.6 | 7 | 7 |
| Vegetable oils, oilseeds and products (oil eq.) | 7.5 | 10.9 | 12.5 | 12.1 | 14 | 15 |
| Meat (carcass weight) | 12.6 | 17.3 | 19.6 | 21.7 | 35 | 43 |
| Milk and dairy, excl. butter (fresh milk eq.) | 68.1 | 84.1 | 75.0 | 73.2 | 90 | 101 |
| Other food (kcal/person/day) | 224 | 277 | 298 | 333 | 370 | 385 |
| **Total food (kcal/person/day)** | 2382 | 2834 | 3011 | 2974 | 3130 | 3190 |
| | | | **Latin America and Caribbean** | | | |
| Cereals, food | 118.7 | 130.1 | 130.1 | 132.6 | 140 | 139 |
| Roots and tubers | 94.1 | 74.3 | 63.9 | 63.3 | 62 | 58 |
| Sugar (raw sugar eq.) | 40.5 | 48.1 | 46.0 | 48.5 | 49 | 47 |
| Pulses, dry | 14.2 | 12.6 | 10.5 | 11.2 | 11 | 10 |
| Vegetable oils, oilseeds and products (oil eq.) | 6.8 | 10.1 | 12.1 | 11.8 | 15 | 16 |
| Meat (carcass weight) | 33.5 | 40.5 | 42.8 | 58.5 | 79 | 90 |
| Milk and dairy, excl. butter (fresh milk eq.) | 84.0 | 96.9 | 94.5 | 108.8 | 136 | 150 |
| Other food (kcal/person/day) | 240 | 246 | 258 | 272 | 310 | 330 |
| **Total food (kcal/person/day)** | 2465 | 2698 | 2689 | 2836 | 3120 | 3200 |
| | | | **South Asia** | | | |
| Cereals, food | 150.4 | 151.1 | 164.3 | 157.1 | 167 | 169 |
| Roots and tubers | 16.9 | 19.9 | 18.7 | 23.5 | 31 | 36 |
| Sugar (raw sugar eq.) | 20.3 | 20.6 | 23.7 | 25.6 | 30 | 32 |
| Pulses, dry | 14.5 | 11.3 | 12.3 | 10.1 | 8 | 7 |
| Vegetable oils, oilseeds and products (oil eq.) | 4.6 | 5.8 | 7.2 | 9.7 | 15 | 18 |
| Meat (carcass weight) | 3.9 | 4.1 | 5.0 | 5.5 | 12 | 18 |
| Milk and dairy, excl. butter (fresh milk eq.) | 37.0 | 41.6 | 55.1 | 67.6 | 106 | 129 |
| Other food (kcal/person/day) | 84 | 89 | 104 | 141 | 180 | 200 |
| **Total food (kcal/person/day)** | 2066 | 2084 | 2329 | 2392 | 2790 | 2980 |
| | | | **East Asia** | | | |
| Cereals, food | 152.2 | 181.4 | 199.5 | 186.7 | 176 | 162 |
| Roots and tubers | 96.6 | 80.8 | 57.1 | 65.8 | 61 | 53 |
| Sugar (raw sugar eq.) | 5.7 | 8.0 | 10.5 | 11.6 | 17 | 20 |
| Pulses, dry | 4.8 | 4.3 | 2.6 | 2.0 | 2 | 2 |
| Vegetable oils, oilseeds and products (oil eq.) | 3.5 | 4.7 | 7.8 | 10.6 | 15 | 17 |
| Meat (carcass weight) | 9.2 | 13.2 | 22.6 | 39.8 | 62 | 73 |
| Milk and dairy, excl. butter (fresh milk eq.) | 3.7 | 5.0 | 7.4 | 11.3 | 21 | 24 |
| Other food (kcal/person/day) | 98 | 121 | 179 | 322 | 405 | 440 |
| **Total food (kcal/person/day)** | **2012** | **2317** | **2625** | **2872** | **3190** | **3230** |

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

meat totals of the developed countries, as well as some major developing ones (e.g. China and Brazil and some others mid-high income countries with much less growth potential than the rest of the developing countries given the high or medium-high levels already achieved), together with the slower global population growth, means that aggregate world demand would grow at much lower rates than in the past. The prospects are slim that other large developing countries such as India will emerge as major meat consumers, due to 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 19) is unlikely to be replicated by other countries 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, though in somewhat attenuated form. These changes are the growing role of the poultry sector in total meat production, and the growing share of trade in world output and consumption (see Chapter 3).

The other major commodity group with very high consumption growth in the developing countries is that of *vegetable oils*. The rapid growth in consumption, in combination with the high calorie content of oils and other oilcrop products[21], have been instrumental in bringing about the increases in apparent food consumption (kcal/person/day) of the developing countries, that characterized the progress in food security achieved in the past. Three decades ago, consumption of oilcrop products (4.9 kg/person/year, in oil equivalent) supplied only 136 kcal/person/day, or 6.5 percent of the total availability of 2110 calories of the developing countries. By 1999/01 consumption per capita had grown to 10.4 kg contributing 272 kcal to total food supplies, or 10 percent of a total which itself had risen to 2650 kcal. In practice, one out of every four 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: 38 out of every 100 additional calories may come from these products in the period to 2050.

Some important structural changes of the historical period in the world oilcrops economy are likely to continue (see also Chapter 3). These are:

- the growing share of four oilcrops in the total oilcrops sector (oil palm, soybeans, rape, sunflower);
- the continued dominance of a few countries as major producers and exporters;
- the growing role of imports in meeting the food demand for vegetable oils of many developing countries.
- the growing role of soybeans as a source of high protein feeds for the livestock sector and associated growth in trade (see Chapter 3); and
- the prospect that the biofuels sector may open new avenues for growth of the oilcrops sector (Chapter 3).

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 these crops. Often this was the result of preference for increasing production and self-sufficiency in cereals. As Evenson (2004), referring mostly to Latin America, puts it "Because of limited genetic improvements, beans have effectively been "crowded out" of productive areas by crops with greater genetic improvement, especially corn and soybeans". 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 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:* This category of basic foods comprises a variety of products, the main ones being cassava, sweet potatoes, potatoes, yams, taro and plantains[22]. They have been traditionally 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

21 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.

22 Plantains are included along with the roots and tuber crops because "…Plantains and cooking bananas are grown and utilized as a starchy staple mainly in Africa…" (FAO, 1990).

population. In three of them, the dependence is over 50 percent (Congo DR, Rwanda, Ghana). Most have low overall per capita food consumption (13 of them have under 2200 calories of which six under 2000) and, consequently, high prevalence of undernourishment. Cereals, which in the developing countries as a whole provide 54 percent of total food calories, account in these countries for much smaller proportions, typically 20-45 percent, rising to just over 50 percent only in Tanzania (mostly maize) and Madagascar (rice). At the same time, the region contains countries at the other extreme of the spectrum with only minimal consumption of roots and tubers, e.g. Mali, Mauritania, Niger, Sudan, etc.

The Food Balance Sheets 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, other countries (Ghana, Benin, Malawi, Peru) also experienced significant increases in per capita food consumption which originated to a large extent in the increases of roots and tubers production. Despite these country examples, the evolution over time shows declining per capita food consumption of starchy foods for the developing countries and the world as a whole up to about the late 1980s, followed by some recovery in the 1990s (Table 2.7). These developments were due to two main factors:

- the rapid decline in food consumption of sweet potatoes in China (from a peak of some 100 kg three decades ago to the some 40 kg at present), the parallel rise in that of potatoes, in both China (from 14 kg to 36 kg) and the rest of the developing countries (from 9 kg to 16 kg), and
- the rapid rise of food consumption of all these products in a few countries, e.g. Nigeria, Ghana, Malawi, etc, with Nigeria having a major weight in shaping the aggregate for sub-Saharan Africa (Table 2.8).

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 the present 67 kg to 75 kg in 2030 and to 77 kg in 2050 (Table 2.8). Much of the decline in China's per capita food consumption of sweet potatoes has already occurred and in the future it will not have the depressing effect it had in the past on total roots consumption of the developing countries. Potatoes will continue to show relatively high income elasticity in most developing countries, and average food consumption is projected to increase. Another factor that could raise consumption is the potential for productivity increases in the other root crops (cassava, yams). It will be possible for more countries in sub-Saharan Africa to replicate the experiences of countries like Nigeria, Ghana, Benin, Malawi, and increase their food consumption based on rapid production improvements in these crops (Nweke, 2004; Babaleye, 2005).

*Sugar* shares many of the characteristics of vegetable oils as regards food consumption and trade of the developing countries: it is a fast-rising consumption item and a major export commodity of several countries (Brazil, Cuba, Thailand, etc.). In addition, several developing countries are becoming large and growing net importers (Egypt, Iran, Korea Rep.), 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 7 kg as it uses a lot of saccharine. About one 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 the average of the developing countries should keep increasing. 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 prevalence of undernourishment (percent 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.
- The number of undernourished in the developing countries is not likely to be halved by 2015 from the 823 million of 1990/92 (the 3-year average used as the basis for defining the World Food Summit target). However, the *proportion* of the population undernourished may be halved by 2015 and decline further in the rest of the projection period.
- The projected slow progress in reducing undernourishment will reflect the inadequate progress of many countries towards 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 unfavourable overall economic growth prospects. This prospect underlies the projection that the countries with long histories of stagnant food consumption levels and high undernourishment could make some progress in the future. Poor agricultural resources may represent a serious obstacle to such prospects, particularly in countries with high demographic growth.

- Despite this slow pace of progress in reducing the prevalence of undernourishment, the projections imply a considerable overall improvement. In the developing countries the numbers of well-fed (i.e. not classified as undernourished according to the criteria used here) could increase from 3.9 billion in 1999/01 (83 percent of their population) to 5.2 billion in 2015 (90 percent of the population), to 6.2 billion (93 percent) in 2030 and to 7.2 billion (96 percent) by 2050. That would be no mean achievement.
- In conclusion, in many countries, including some of the more populous ones, the relative prevalence of undernourishment (percent of the population) will decline significantly. Fewer countries than at present will have high levels 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.