

Long-Term Prospects for Agriculture, Hunger and Poverty

Schmidhuber, Josef*

ABSTRACT

The benefits of modern agriculture have been immense. Global food production has doubled over the past 30 years, the proportion of undernourished is down by more than half. Production growth has mainly come from higher productivity, with yield growth accounting for more than 70 percent of incremental output over the past 30 years. The astounding productivity growth was the result of far-sighted public investment in agricultural research, extension, and intensification. As production growth outstripped growth in demand, prices for food and agricultural products have declined by more than 60 percent over the past 40 years in real terms.

The outlook to 2030 suggests that the world is not likely to run into constraints on a global scale on the production side that would threaten global food security. While growth of world agriculture will be lower than in the past, this is mainly a reflection of lower population growth and a gradual move towards mid-high levels of per capita food consumption in a growing number of countries, including some of the most populous ones. Despite the slowdown in growth, the projected increase in consumption translates into considerable increases in absolute terms. By 2030, this means the need for another billion tonnes of cereals, another 160 million tonnes of meat, etc. per annum. Almost the entire increase in demand will come from the developing countries, and the developing countries will be able to meet the lion's share of their additional needs from domestic production.

All in all, the progress towards a better-fed world will continue. Global food production is expected to continue to outstrip population growth, providing more food for the world as a whole. By 2015, almost 3000 kcal will be available per person measured at the global average. The number of chronically undernourished in the developing countries will decline in tandem, from about 800 million in 1999/01 to 610 million in 2015. By 2030, the number of undernourished should be down to 443 million. However, the rate of decline will remain disappointingly low and fall short of meeting the target set at the World Food Summit in 1996, i.e., halving the number of undernourished by no later than 2015. In fact, the outlook suggests that the goal will not even be reached by 2030.

The rest of this paper is organized as follows. This paper will start with a brief overview of past developments and then sketch out the main results of the outlook to 2015 and 2030. It will focus on hunger, malnutrition and poverty problems. The presentation of malnutrition issues will range from hunger and micronutrient deficiencies to obesity and related non-communicable diseases (NCDs).

* Senior Economist, Global Perspectives Studies Group (ESDG), Food and Agriculture Organization of the United Nations (FAO), Rome

TAKING STOCK OF PAST ACHIEVEMENTS

The benefits of modern agriculture have been immense. Globally, *gross* agricultural output has doubled over the past 30 years and modern agriculture now provides more and better food to more people than ever before. Food production outpaced population growth by more than 15 percent; developing countries recorded even bigger gains with food production per person up by about 50 percent (Fig.1). At the same time, the number of chronically undernourished has declined from 960 million people in the early 1970s to 800 million people today, (proportional declined from 37 percent to 17 percent). The proportion of people in developing countries with average food intakes below 2200 kcal per day fell from 57 percent in the mid 1960s to just 10 percent in the late 1990s.

The nutritional quality of food intake has improved in parallel. Diets have become more diverse, with shifts away from cereals and roots and tubers towards more meat; milk, fruits and vegetables, sugar, and vegetable oils. In general, diets have become more balanced and healthier, as well as richer in protein, minerals and vitamins (Fig. 2a).

While quantities and quality of food improved, prices continued to decline. Between 1960 and 2000, the real prices of rice, wheat and maize, the world's major staple foods, fell by around 60 percent (Fig. 2b). This decline in real food prices has had a marked impact on the level and the composition of food consumption. Most importantly, it has enabled consumers to purchase more at relatively low levels of disposable incomes and move faster towards medium to high levels of higher value food items, like meat and other livestock products.

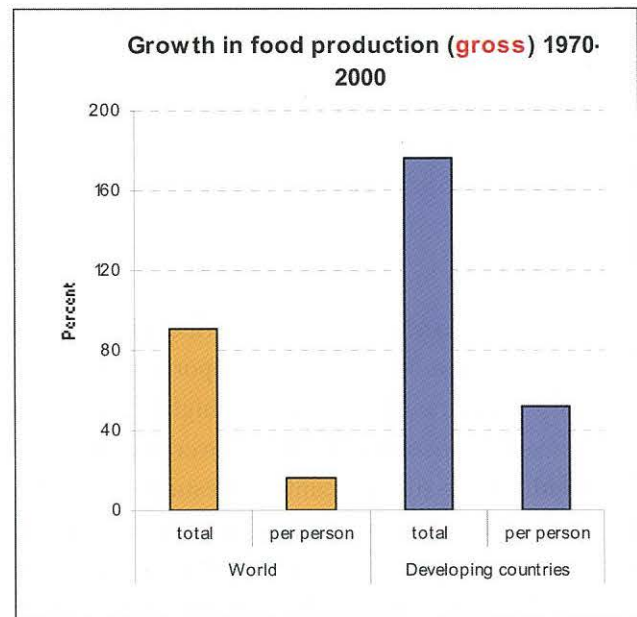


Fig. 1. Growth in food production

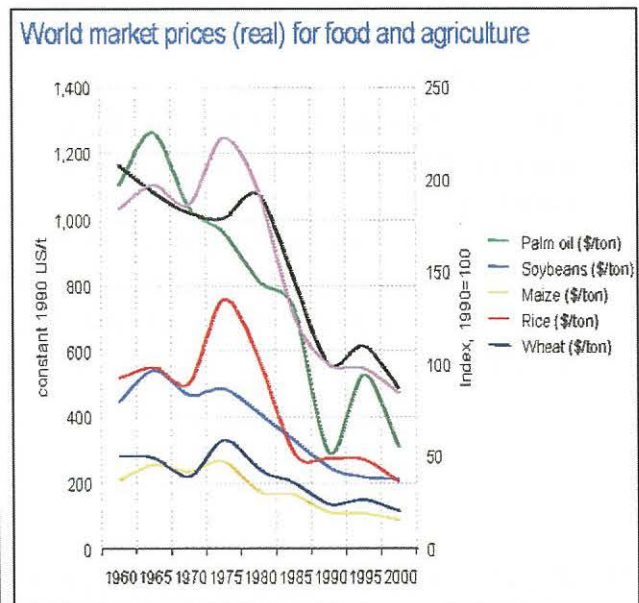
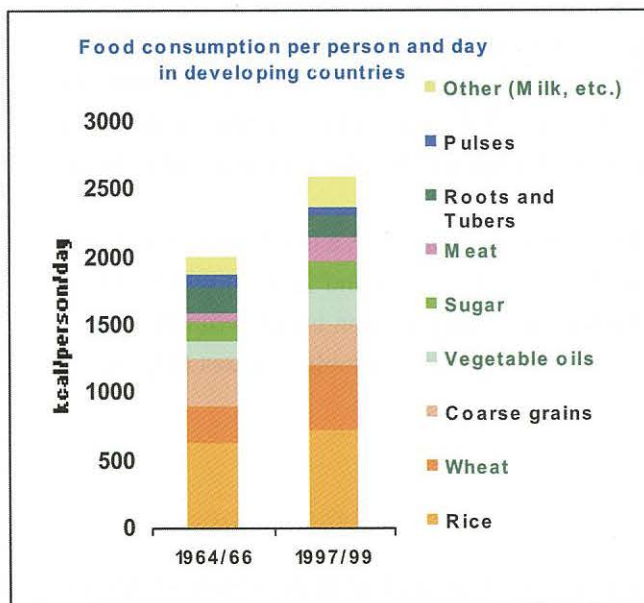


Fig. 2a and 2b. Food consumption patterns and prices

THE OUTLOOK TO 2030

Future developments in global agriculture are critically affected by growth in population and incomes, as well as by other factors like urbanization or changes in dietary preferences.

Population growth

The 2000 assessment of the population projections by the United Nations (UN, 2001) shows a continuing slowdown in the growth of the world's population. In the medium UN projection, the 6.1 billion people of 2000 will grow to 7.2 billion in 2015 and 8.3 billion in 2030, heading towards 9.3 billion in 2050 (Fig. 3). World population growth will further slow after 2050 and is expected to come to a gradual halt between 2050 and 2070 (Lutz, et al. 2003). This means that the perceptions of a continuing population explosion are unfounded. In fact it is more than 30 years since the world passed its peak population growth rate, of 2.04 percent a year, in the late 1960s. Since then the growth rate has fallen to 1.35 percent. This is expected to fall further to 1.1 percent in the period 2010 to 2015 and to 0.8 percent in 2025 to 2030.

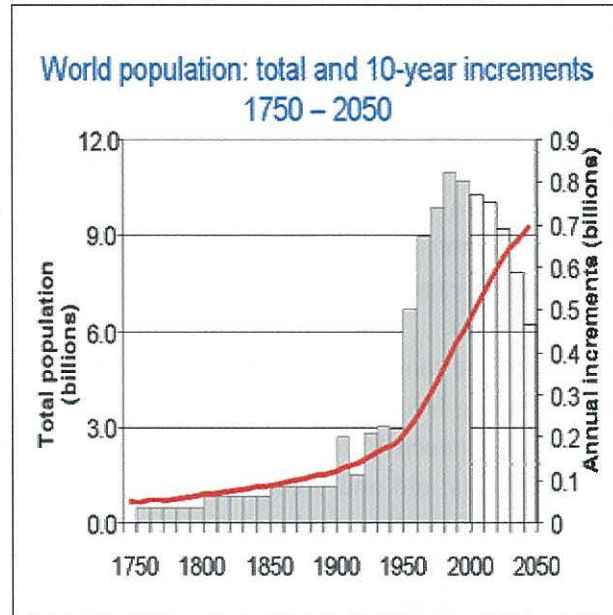


Fig. 3. World population: 1750-2050

The absolute numbers added each year are also past their peak of 86 million a year, reached in the late 1980s. Even so, current annual additions of around 77 million still amount to almost a new Germany each year. The yearly increments will taper off only slowly during the study period: even by the period 2025 to 2030 they will still be running at 67 million a year. It is only by the middle of the century that these increments will have fallen significantly, to 43 million per year in 2045 to 2050 (Fig. 4a).

Almost all of these increases will be in the developing countries' and within the group of developing

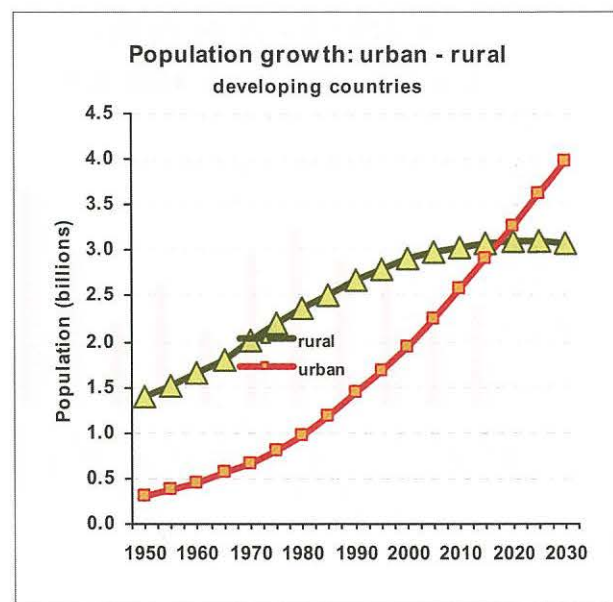
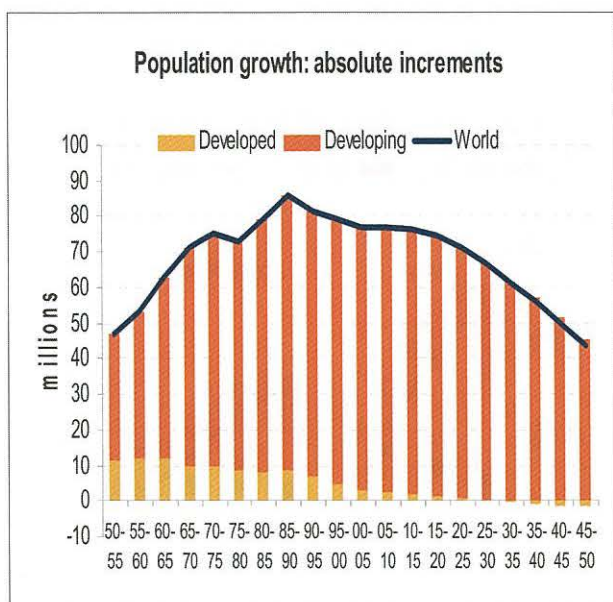


Fig. 4a and 4b. Urbanization and the distribution of population growth

countries, the growth rates will differ considerably. While East Asia’s population will be growing at “only” 0.4 percent a year, that of sub-Saharan Africa will still be growing at 2.1 percent.

By 2030, every third person added to the world’s population will be a sub-Saharan African. By 2050, this will rise to every second person. Another important development is the projected rural/urban shift in population growth. Over the next 30 years, almost the entire population growth in developing countries will take place in urban areas, while population of rural areas will essentially stagnate at its current level (Fig.4b).

Income growth and poverty

The second major factor determining growth in food demand is growth in incomes. The 2002 World Bank assessment of future economic growth is less optimistic than its predecessors, but it still projects a rise of 1.9 percent a year in per capita incomes between 2000 and 2015, higher than the 1.2 percent seen in the 1990s. All regions are expected to exceed their past GDP growth rates on a per capita basis, except for East Asia which is expected to stagnate at a very high level of more than 5 percent growth in average incomes (Fig. 5a and 5b).

One of the main reasons for the high income growth expectations lies in the structure of population growth. Falling fertility rates in developing countries (from 6 in the late 1960s to 2.9 today) mean that the age bracket between 15 to 60 years will grow, with the bulk of the population at working age. There will be few dependents, old and young, receiving pensions or absorbing education expenses. These changes are expected to bring about higher production levels per capita incomes providing developing countries a so-called demographic dividend.

What will happen to economic growth and the incidence of poverty is of great importance to food security because poverty and hunger are closely associated. The World Bank has estimated the implications of its economic growth projections for poverty reduction by the year 2015 (World Bank, 2001). They are that:

- It is possible to achieve the goal of halving the proportion of people living in absolute poverty – defined as an income below US\$1 per day – by 2015, over the 1990 level.
- Much of the decline will be due to development in East and South Asia. Indeed, about half of the decline of 400 million projected for East Asia has already occurred (Fig. 6).

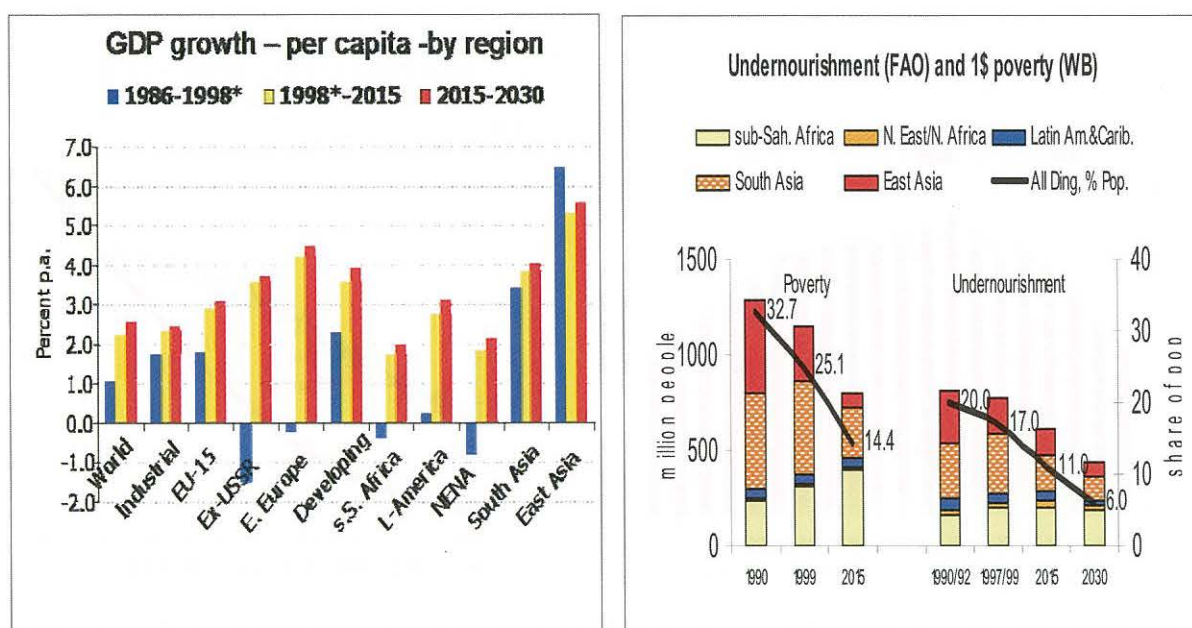


Fig. 5a and 5b. GDP growth rates by region/ Poverty and hunger estimates

Only in sub-Saharan Africa, where incomes are expected to grow very slowly, are the numbers living in poverty expected to rise, from 240 million in 1990 to 345 million in 2015. By then, two out of five people in the region will be living in poverty.

Prospects for food consumption, hunger, malnutrition and obesity

Looking back on past developments

The 1960s. At the most general level, dietary changes can be described through the evolution of per capita energy supplies. The comparison of today's per capita energy availability with the one forty years ago reveals an almost universal trend towards higher DES levels. At the beginning of the 1960s, the entire developing world – with the exception of Argentina, Uruguay and a handful of small countries in the Middle East and the south Pacific – was suffering from substantive calorie deficits, chronic under-nourishment and in some cases outright famine. Particularly Asia's population was frequently hit by periodic famines affecting large parts of its population giants, India and China. China's great famine from 1958-1962, for instance, caused an estimated 30 million deaths (Smil, 1999). The severe food shortages that prevailed in India for much of the 1960s took a heavy toll on its economy, as well as on health and life expectancy of her people. The entire African continent was heavily undersupplied, without exhibiting the today's differences between a well-supplied North African region and the grossly undersupplied sub-Saharan Africa (Figs. 6a, 6b and 6c). All in all, nearly 40% of the population in developing countries was chronically undernourished, while over-

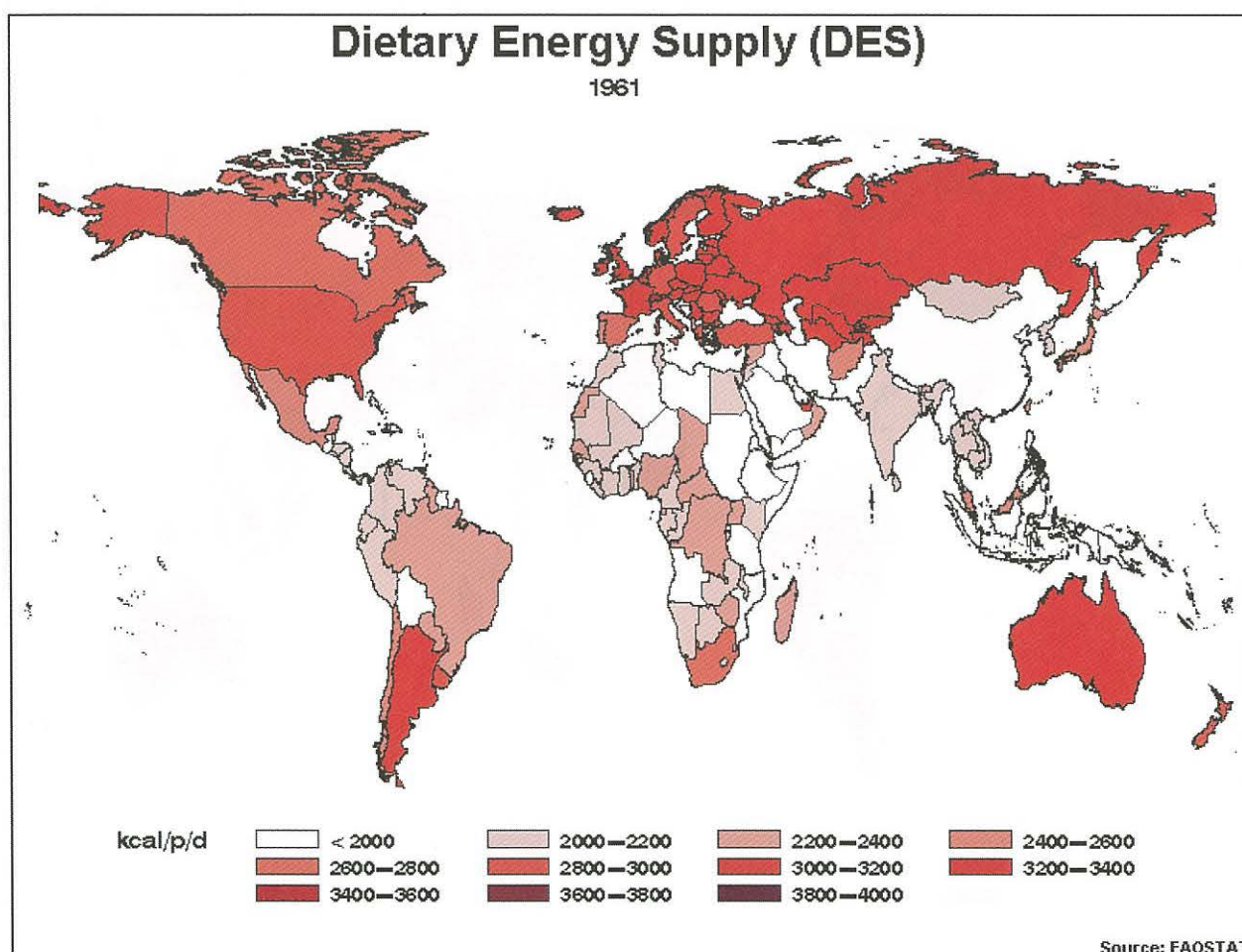


Fig. 6a. Dietary Energy Supply (DES) in the early 1960s

nutrition and obesity were marginal and geographically narrowly defined problems.

Many developed countries by contrast were already approaching or even exceeding energy supply levels of around 3000 kcal/person/day. But even amongst the rich countries, large differences remained. While the most advanced industrialized countries (US, Canada, Germany, etc.) already attained DES levels of 3300 calories and more, DES levels in the less advanced industrial countries like Greece, Portugal or Spain remained at or below the 2500 kcal mark. The diets of the latter group resembled then those of advanced developing countries today (Mexico, Brazil, China). But it was also the group of low-income industrial countries that experienced the fastest nutrition transition, catching up rapidly to the group of the richest countries, both in terms of energy supplies and food components. The nutrition transition in many of these countries could be a harbinger for dietary changes in many developing countries over the next 15 years and for most developing countries over the next 30 years.

From 1970 to 2000: the nutrition transition gathers momentum. The next three decades (1970s to 1990s) brought about a radical change in the nutritional situation for many developing countries. Energy supply improved swiftly throughout much of East Asia, Latin America and the Near-East/North African region. There are numerous reasons behind these improvements; probably the most important contributors were the success of the “Green Revolution” and the shifts towards a more market-oriented agricultural sector in China (“The household responsibility system” and other subsequent policy reforms). By the end of the 1990s, the rather homogeneous picture of undersupplies and hunger of the 1960 had changed completely. The prevalence of undernourishment had fallen in all regions except for sub-Saharan Africa and a few

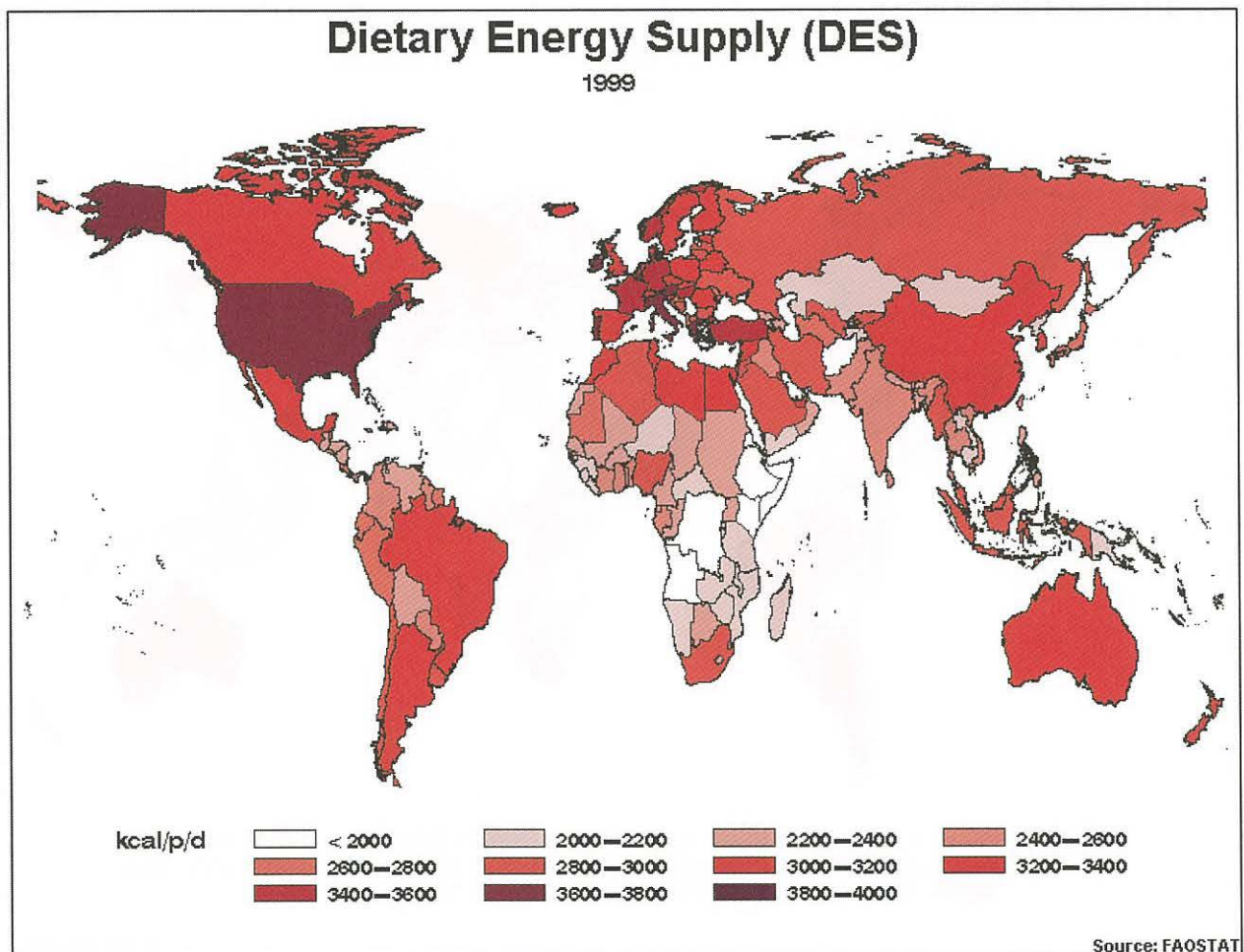


Fig. 6b. Dietary Energy Supply (DES) of the late 1999s

countries in south Asia to levels below 10%. Outside these areas, energy supplies have surged to levels that are giving rise to new concerns. Particularly the more rapidly developing countries begin to suffer from oversupply of food energy and a growing rate of obesity. And where incomes are unequally distributed, hunger and obesity now often co-exist in the same country or region.

The rapid shift towards higher DES and animal food consumption has attracted considerable public attention. It was associated with a rapidly rising prevalence of obesity and non-communicable diseases in these previously low-income developed countries and is likely to be associated with the same problems in developing countries. The pace of change for developing countries may even be faster. As already noted, falling real prices and rising purchasing power allow consumers in developing countries today to adapt a diet that was reserved for consumers in developed countries at much higher per capita income levels.

The rapid nutrition transition also means that these countries need to design and implement policy responses that help avoid or at least mitigate the health problems that most developed countries are grappling with today. What is more, the hardships associated with obesity and NCDs may be felt more intensely in developing countries. Even if cheaper calories mean that many in developing countries will no longer be "food-poor" (more specifically food-energy poor) they remain poor otherwise. Large parts of the population will not be able to afford the benefits of an elaborate health care system that make NCDs in developed countries expensive but manageable problems. In the absence of an appropriate health care system, too high energy supplies will become as heavy a burden as the deficient supply levels of the past.

Probably the most unexpected development was the steady further increase in energy supplies in many developed countries. Even in countries that had high DES levels in the early 1960s (e.g., 3300 in the US), food energy supplies reached levels of 3800 kcal/person/day and more by 2000/01. Presumably, the largest share of food supplies above 3000 calories per day is wasted; nonetheless, quantitative analysis for the US (Kantor et al., 1997) suggests that actual energy intakes, albeit at levels of 1000 kcal below energy availability, continued to increase. Many other developed countries followed the US path, reaching DES levels of 3500 kcal and more. The result of such a development is more predictable than the development itself, particularly if it is combined with a shift towards a more sedentary lifestyle and lower calorie expenditures: The prevalence of obese and overweight persons soared, in the US exceeding 30% and 60%, respectively. Alongside the epidemic increase in obesity was a massive increase in the prevalence of NCDs, notably of NIDDM (Non-Insulin-Dependent Diabetes Mellitus) and CHD (Coronary Heart Diseases), and the symptoms that are subsumed under the label "Syndrome X". NCD related health costs increased in tandem, and are estimated at about US\$ 120 billion in the US (Wolf, 1997), €15 billion in Germany, €3 billion in the UK. Australia, New Zealand, and Canada are facing similar problems.

Many of the factors that caused the rapid increase in obesity in developed countries are expected to determine the health and nutritional outcomes in many developing countries, particularly those that are expected to enjoy high growth rates in GDP and experience rapid urbanization, mechanization and improvements in transportation infrastructure.

The Outlook to 2030

The double burden of hunger and obesity. Even only a cursory inspection of the DES map for the year 2030 reveals that the largest part of the developing world will have accomplished energy supply levels of 2700 kcal and more. On average, consumers in developing countries will have nearly 3000 kcal per day at their disposal (Bruinsma, 2003). Most countries will have reached the very high calorie supply brackets of developed countries today. On average, only 6% of the developing countries' population will be chronically undernourished. In fact, the hunger problem should be largely limited to sub-Saharan Africa, but even there the prevalence of undernourishment is projected to be down to 15%, less than half of current levels.

At these high levels of average dietary energy supply, overnutrition is likely to become a growing problem. Where the income disparities remain high, undernourishment and overnutrition are likely to co-

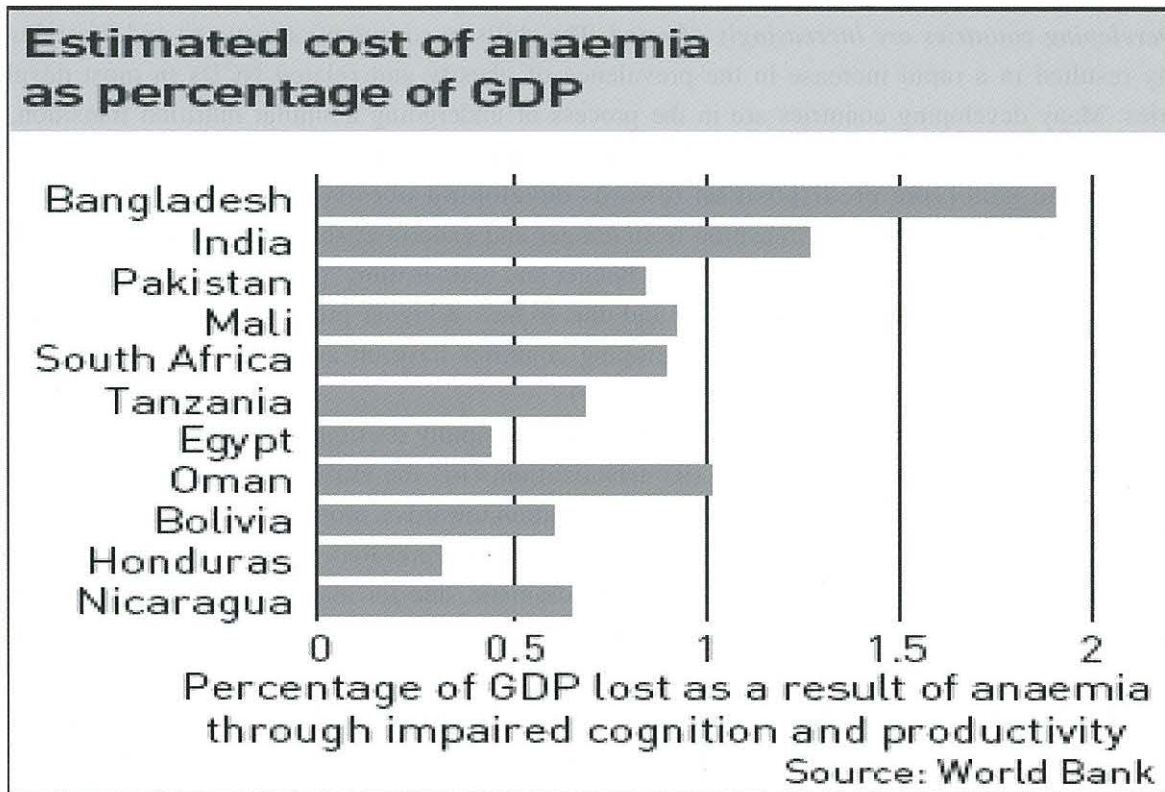


Fig. 7. Estimated costs of anaemia

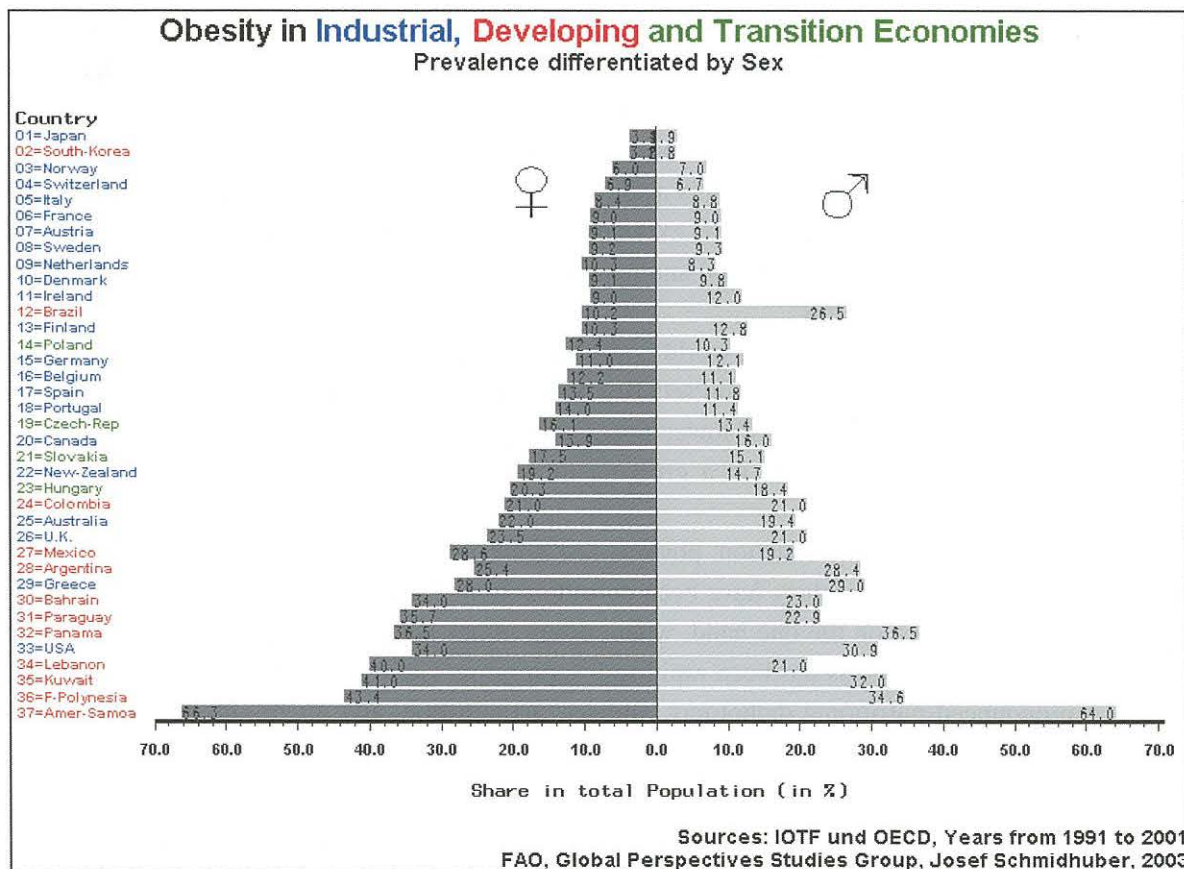


Fig. 8. The prevalence of obesity by sex and country

current extent of the global obesity epidemic.

Developing countries are increasingly affected. The shifts in consumption patterns and lifestyles have already resulted in a rapid increase in the prevalence of obesity and related NCDs in most developed countries. Many developing countries are in the process of undergoing a similar nutrition transition, with probably even more adverse health impacts. The main compounding factor of these nutritional changes is a phenotypic and genotypic predisposition towards developing obesity and NCDs. The phenotypic predisposition is the result of rapid transition from hunger and undernourishment towards overnutrition and affluence[†]. There is ample empirical evidence that hunger and malnutrition “programme” the next generation to develop a more efficient energy metabolism and thus to have a higher propensity to develop obesity and related NCDs. In addition, populations of developing countries have on average a genetic predisposition towards developing obesity and NCDs (thrifty *genotype*).

The combination of (i) the rapid nutrition transition with rapidly declining share of expenditure on food as a percent of total expenditure/income, (ii) urbanization, (iii) the shift in diet towards more animal products, and (iv) the phenotypic and genotypic predisposition towards a more efficient metabolism and non-communicable diseases (NCDs) could spark a rapid increase in the prevalence of obesity and NCDs over the next 30 years. The human and economic toll could be dramatic, and for many the exit out of food-poverty may be associated with a straight entry into health-poverty. This means that, while fewer people will suffer from hunger and chronic undernourishment, more will have health problems related to obesity and NCDs. The impacts will be felt more severely than in developed countries as fewer consumers in developing countries will be able to afford the needed medical treatment even if they can afford more food. Many NCDs can have a lethal impact if left untreated.

SUMMARY AND CONCLUSIONS

The benefits of modern agriculture have been immense. Global food production has doubled over the past 30 years, and the proportion of undernourished is down by more than half. Production growth has mainly come from productivity growth, with yield growth accounting for more than 70 percent of incremental output over the past 30 years. This astounding productivity growth was the result of far-sighted public investment in agricultural research, extension, and intensification. As production growth has outstripped growth in demand, prices for food and agricultural products have declined: over the past 40 years by more than 60 percent in real terms.

The outlook to 2030 suggests that the world is not likely to run into constraints on a global scale on the production side that will threaten global food security. While growth of world agriculture will be lower than in the past, this is mainly a reflection of lower population growth and a gradual move towards mid-high levels of per capita food consumption in a growing number of countries, including some of the most populous ones.

Though the changes in food production, poverty, and hunger have been relatively positive for the world as a whole over the past 30 years, there have been considerable regional differences, notably between South Asia and Sub-Saharan Africa on the one hand, where progress has been relatively small, and the rest of the world on the other, where progress has been rapid and impressive. These diverging developments could also translate in a pronounced nutritional dichotomy. Hunger, malnutrition, and micro-nutrient deficiencies will

[†] According to the Barker hypothesis proposed in the 1990s, children who are born in times of scarcity or in regions where undernourishment is a big problem quite often grow up to develop obesity and health problems related with obesity later in life, particularly when they find themselves in more affluent environments. This explains why obesity is now becoming a growing problem for developing countries.

persist in much of Sub-Saharan Africa and parts of South Asia, while in other countries there will be an increasing problem of obesity and related non-communicable diseases—most importantly diabetes, coronary heart diseases, and other symptoms included in the so-called “Syndrome X”.

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