

Rome 12-13 October 2009



## Global agriculture towards 2050

### THE CHALLENGE

Agriculture in the 21st century faces multiple challenges: it has to produce more food and fibre to feed a growing population, more feedstocks for a potentially huge bioenergy market, contribute to overall development in the many agriculture-dependent developing countries, adopt more sustainable production methods and adapt to climate change.

### FOOD DEMAND AND PRODUCTION

World population is expected to grow by over a third (or 2.3 billion people) between 2009 and 2050. This is much slower rate of growth than seen in the past four decades during which it grew by 3.3 billion people (or more than 90 percent). Nearly all of this growth is forecast to take place in the developing countries. Among the latter, sub-Saharan Africa's population would grow the fastest (+114 percent) and East and Southeast Asia's the slowest (+13 percent). Urbanization is foreseen to continue at an accelerating pace to account for 70 percent of world population in 2050 (up from 49 percent at present) with rural population, after peaking sometime in the next decade, actually declining.

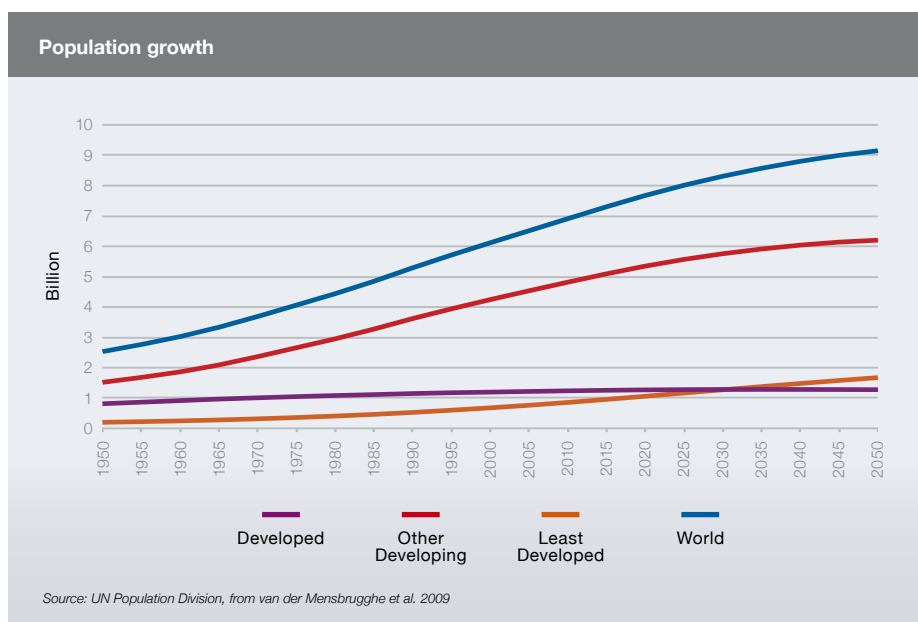
At the same time, per capita incomes in 2050 are projected to be a multiple of today's. There is a consensus among analysts that recent trends whereby the developing countries have been growing significantly faster than the developed

ones is likely to be sustained in the future. Relative inequality in incomes per capita would be reduced considerably by 2050. However, absolute differences would remain pronounced and even increase further, given the current very large gap in absolute per capita incomes. Moreover, inter-country and interregional inequalities within the present-day developing world would tend to become more pronounced.

Global economic growth of about 2.9 percent annually would lead to significant reduction or even near elimination of absolute poverty in the developing countries (persons living on less than US\$1.25/day in 2005 prices). Nevertheless, even in 2050 the world will be far from having solved the problem of

economic deprivation of significant parts of the population: the US\$1.25/day poverty line is simply too low. On less stringent criteria, deprivation will remain widespread, though significantly less than today.

These trends mean that demand for food (as expressed in the market) is expected to continue to grow. Demand for cereals (both for food and animal feed use) is projected to reach some 3 billion tonnes by 2050, up from the about 2.1 billion today. The advent of biofuels has the potential to change some of the projected trends and cause world demand to be higher, depending on energy prices and government policies. The demand for other food products with the capacity to respond to higher incomes in the developing countries (such as livestock



products, vegetable oils) will grow much faster than that for cereals.

This means that feeding a world population of 9.1 billion people in 2050 would require raising overall food production by some 70 percent over the period from 2005/07 to 2050 (nearly 100 percent in the developing countries). This translates into significant increases in the production of several key commodities. Annual cereal production for instance will have to grow by almost a billion tonnes, meat production by over 200 million tonnes to reach a total of 470 million tonnes in 2050, 72 percent of which in the developing countries, up from the 58 percent today.

## TRADE

Trade in agricultural commodities is also expected to expand considerably. For example, net cereal imports into the developing countries would increase almost three-fold to reach nearly 300 million tonnes by 2050, and by then would account for some 14 percent of their cereal consumption, up from 9.2 percent in 2006/08. Cereals self-sufficiency would continue to be low in the region most dependent on food imports (i.e. in the Near East/North Africa) falling further from 59 percent in 2006/08 to 54 percent in 2050. At the other extreme, Latin America

and the Caribbean, now a net cereals deficit area, may become fully self-sufficient reflecting the surplus production potential of major countries in the region. The other regions may see some decline in self-sufficiency, but they will remain in the 80 to 95 percent range compared with 83 to 100 percent at present. Concerning other major commodities, developing countries' net exports of oilseeds and vegetable oils would more than triple by 2050 to some 25 million tonnes (in oil equivalent) and net exports of sugar double to some 20 million tonnes by 2050. Again, the advent of biofuels has the potential of altering these prospects as all three commodity groups are used for feedstocks in biofuel production.

## RESOURCES

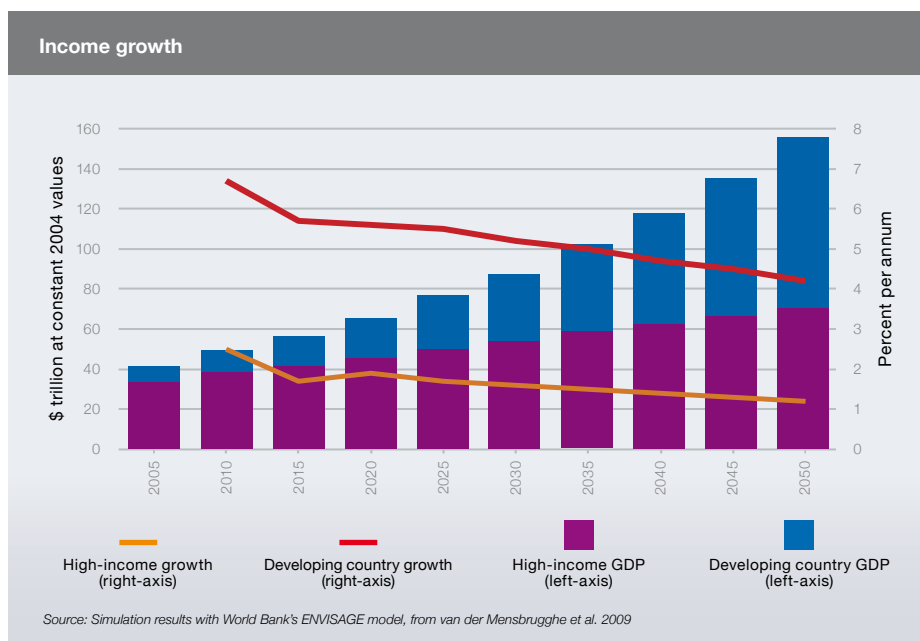
Ninety percent (80 percent in developing countries) of the growth in crop production is expected to result from higher yields and increased cropping intensity, with the remainder coming from land expansion. Arable land would expand by some 70 million ha (or less than 5 percent), the expansion of land in developing countries by about 120 million ha (or 12 percent) being offset by a decline of some 50 million ha (or 8 percent) in the developed countries. Almost all of the land expansion in developing countries would take place in sub-Saharan Africa and Latin America.

Land equipped for irrigation would expand by some 32 million ha (11 percent) while harvested irrigated land would expand by 17 percent. All of this increase would be in the developing countries. Due to a slowly improving efficiency in water use and a decline in the area under rice (which is relatively intensive in water use), water withdrawals for irrigation would grow at a slower pace but still increase by almost 11 percent (or some 286 cubic km) by 2050. The pressure on renewable water resources from irrigation would remain severe and even increase slightly in several countries in the Near East/North Africa and South Asia.

Crop yields would continue to grow but at a slower rate than in the past. This process of decelerating growth has already been under way for some time. On average, annual growth over the projection period would be about half (0.8 percent) of its historical growth rate (1.7 percent; 0.9 and 2.1 percent for the developing countries). Cereal yield growth would slow down to 0.7 percent per annum (0.8 percent in developing countries), and average cereal yield would by 2050 reach some 4.3 tonne/ha, up from 3.2 tonne/ha at present.

## ARE THE PROJECTED INCREASES IN LAND, WATER USE AND YIELDS FEASIBLE?

The Global Agro-Ecological Zone study shows that there are still ample land resources with potential for crop production available, but this result needs to be heavily qualified. Much of the suitable land not yet in use is concentrated in a few countries in Latin America and sub-Saharan Africa, but many countries with growing rural populations in these regions are extremely land-scarce, and much of the potential land is suitable for growing only a few crops, and not necessarily the crops for which there is the highest demand. Also much of the land not yet in use suffers from constraints (chemical, physical, endemic diseases, lack of infrastructure, etc.) which cannot easily be overcome (or it is economically not viable to do so). Part of the land is forested,



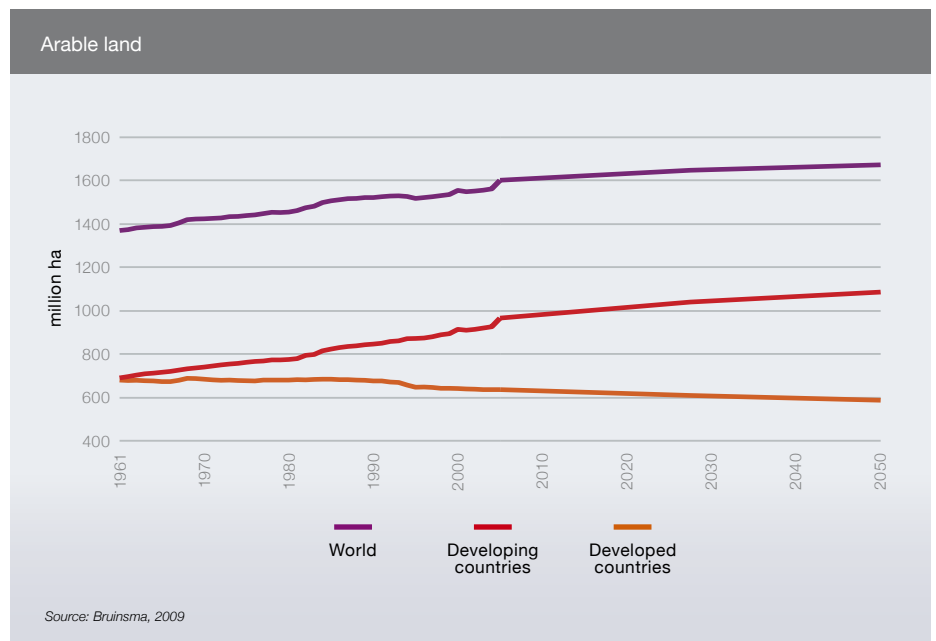
protected or subject to expanding urban settlements. Overall, however, it is fair to say that although there are a number of countries (in particular in the Near East/North Africa and South Asia) that have reached or are about to reach the limits of land available, on a global scale there are still sufficient land resources to feed the world population for the foreseeable future, provided the investments required to develop these resources are made and the neglect of recent decades in the agricultural research and development effort is reversed.

The availability of fresh water resources shows a similar picture as land availability, i.e. globally more than sufficient but very unevenly distributed with an increasing number of countries or regions within countries reaching alarming levels of water scarcity. This is often the case in the same countries in the Near East/North Africa and South Asia that have no land resources left. A mitigating factor could be that there are still ample opportunities to increase the water use efficiency (e.g. through providing the right incentives to use less water).

The potential to raise crop yields (even with existing technology) seems considerable. Provided the appropriate socio-economic incentives are in place, there are still ample 'bridgeable' gaps in yield (i.e. the difference between agro-ecologically attainable and actual yields) that could be exploited. Fears that yields (e.g. for rice) are reaching a plateau do not seem warranted (except in a few very special instances).

## ACCESS

Current projections suggest that average daily energy availability could reach 3050 kcal per person by 2050 (2970 kcal in the developing countries), up from 2770 kcal in 2003/05. However, the same projections suggest that production increases alone would not be sufficient to ensure food security for everyone: unless governments make sure access to food is significantly improved, while the prevalence of chronic undernourishment in developing countries



could fall from 16.3 percent (823 million) in 2003/05 to 4.8 percent in 2050, this would still mean that some 370 million persons would be undernourished in 2050. Of the three developing regions with the highest numbers currently undernourished, declines would be most pronounced in Asia (both East and South Asia), but less so in sub-Saharan Africa. On these prospects, the World Food Summit target of halving the numbers undernourished by 2015 (from the 813 million of 1990/92) may not be reached until well into the 2040s. These calculations underline the importance of putting in place effective poverty reduction strategies, safety nets, and rural development programmes

While progress towards raising average food consumption is a welcome development, such rises are not always an unmixed blessing: 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). 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 present these countries with novel challenges and strains in their health systems that must be addressed in policies to improve food welfare.

## HUNGER AND POVERTY REDUCTION AS ECONOMIES TRANSFORM

Experience of countries that have succeeded in reducing hunger and malnutrition shows that economic growth and poverty reduction policies as such do not automatically ensure success: the source of growth matters too. Cross-country analysis shows that overall GDP growth originating in agriculture is, on average, at least twice as effective in benefiting the poorest half of a country's population as growth generated in non-agricultural sectors. This is not surprising as 75 percent of the poor in developing countries live in rural areas and derive significant parts of their livelihoods from agriculture or activities dependent on it. For agriculture-dependent countries in particular agricultural growth is essential for overall development and poverty reduction.



- ▶ Should the focus of government intervention be primarily on increasing food production, or should it lean more towards increasing access to food and stimulating rural development in general?
- ▶ What will happen to countries and regions that remain in food deficit in 2050 – how can their food security be assured?
- ▶ To what extent will countries be able to tackle water problems by encouraging improved efficiency in water use, or by developing innovative systems for trading water rights?
- ▶ How can agricultural land, including land already under cultivation as well as land newly converted for agricultural production, be used more productively and sustainably?

A vibrant agricultural sector has been the basis for a successful economic transformation in many of today's developed countries. It was the precursor to the industrial revolutions in Europe and the USA and more recently to those in China, Taiwan Province of China, Korea, Thailand, Viet Nam and other rapidly growing Asian economies. During these transformations, investment in agriculture created agricultural surpluses, kept real food prices low, and helped stimulate overall economic growth. At the same time, overall economic development created new employment opportunities that helped absorb the rural labour surplus that emerged from the transformation of agriculture. In ideal conditions, the result is a transition from many, small subsistence producers to fewer and larger commercial farmers and a new equilibrium with fewer farmers, more non-farm employment and larger farm operations overall.

The outlook to 2050 suggests that many developing countries are on the pathway to such transformation. Higher agricultural productivity and a growing saturation of food demand will ultimately limit the overall income potential of agriculture and circumscribe the number of livelihoods that can be sustained by the sector. At the same time, integration of primary

production agriculture in the agro-industrial system will favour capital and knowledge intensive agriculture and larger holdings. This means that while some farmers will be able to expand their operations, others will be severely challenged in their efforts to compete in the sector and meet the stringent food quality and safety standards required by processors and retailers. Policy-makers can accompany this transition by providing incentive structures that allow successful farmers to remain in the sector and help others commercialize and grow, or exit from agriculture. Timing, pacing and sequencing of the measures facilitating this transition remains a particular challenge for policy-makers in all countries.

While the role of agriculture as a driver of overall growth will diminish over time along with its share in GDP, the experience of today's middle income countries suggests that its role in poverty and hunger reduction will still be significant. Agriculture's contribution to hunger reduction consists not just in producing food where needs are most pronounced but also in generating income and supporting rural livelihoods. Poverty reduction requires investments in a number of different areas. These include: first, investments in sectors strongly linked to agricultural productivity growth, such as rural infrastructure (roads, ports, power,

storage and irrigation systems); second, investments in institutions and the broader enabling environment for farmers (research and extension services, land titles and rights, risk management, veterinary and food safety control systems); and third, non-agricultural investment to bring about positive impacts on human well-being, including food safety nets and cash transfers to the most needy.

For further information



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