

World Agriculture Towards 2030/2050: The 2012 revision

Current UN projections indicate that world population could increase by more than two billion people from today's levels, reaching 9.15 billion by 2050. Incomes will grow even faster. To meet increased demand, FAO projects that global agricultural production in 2050 will be 60 percent higher than in 2005/07 (see box). This is a smaller increase than the agriculture sector has achieved over the past half century, but still raises concerns about how it can be achieved sustainably.

This report is the latest in the series by the Global Perspective Studies unit within FAO, which aims to provide insights into how food and agriculture may develop between now and 2050, making note of key assumptions and uncertainties and incorporating the wide range of technical expertise found throughout FAO on likely paths of development and constraints. Given increasing complexity and uncertainty, future outlooks will also draw on new tools to explicitly assess different scenarios and assumptions.

Expected developments in food and feed demand are subject to less uncertainty than other factors – particularly demand arising from novel uses of agricultural products such as biofuels and the underlying constraints relating to land and water resources – but all play a role in the outlook presented in this paper.

The main drivers: population and income

The expected slowing of world population growth over the next 40 years means that agricultural production and consumption are also expected to grow less rapidly. The growth rate varies considerably across countries, however, and those countries whose populations continue to increase rapidly are precisely those that currently exhibit high levels of undernourishment. Many of these are in sub-Saharan Africa, which is expected to account for around 20 percent of the world's population by 2050.

Global GDP is projected to grow 2.5-fold by 2050 with per capita income growing 1.8-fold, resulting in a world that is richer and characterized by less-pronounced income gaps between developed and developing countries. But aggregate income growth alone is not expected to eliminate poverty and undernourishment. Of the 45 developing countries with a per capita GDP below US\$1 000 today, 15 will remain in this classification – with its associated levels of per capita food consumption and undernourishment – in 2050.

Structural change in diets: towards satiety and beyond

While population and income growth will spur demand, significant parts of the world will approach saturation of per capita consumption levels. The result is a halving of annual demand growth to 1.1 percent per annum – a combination of developed countries having completed the transition to livestock-based diets and some large developing regions progressing more rapidly towards higher consumption levels (Figure 1). Convergence towards developed countries' consumption patterns is not inevitable for all countries, however, if only for cultural reasons.

Demand will increase in both developed and developing countries, even where current levels appear adequate and additional growth may cause health concerns. This may happen even in countries where undernourishment remains significant. As a result, by 2050, some 52 percent of the world's population may live in countries where average calorie intake is more than 3 000 kcal/person/day, while the number of people living in countries with an average below 2 500 kcal may fall from 2.3 billion to 240 million.



Undernourishment, however, remains a challenge

The 1996 World Food Summit adopted a target of halving the number of undernourished people in developing countries, which stood at 810 million in 1990–92, by 2015. FAO's latest estimate indicates there were 827 million undernourished in 2005/07. Although the proportion of population who are undernourished fell, absolute numbers increased slightly with the rise in population. The proportion of people who are undernourished is expected to fall by about 4 percentage points by 2015 (Figure 2), although the absolute target may not be achieved before the 2040s. Progress is expected to be slow because countries with low food consumption and high prevalence of undernourishment in 2005/07 are also those where population growth is likely to be highest.

Production growth slows, but absolute increases are expected to be significant

Projected growth rates in production may be smaller than those of the past, but in absolute terms production is expected to rise significantly for the main product groups (Figure 3). Achieving such increases will be more difficult than in the past. Land and water resources are increasingly stressed and are becoming more scarce and diminished in quality due to resource degradation and competition from uses other than for food production.

How will production respond? Contributions to growth

In aggregate, most of the increase in production (more than 85 percent) over the next 40 years is expected to derive from improved yields (Figure 4). Some gains will also come from higher cropping intensity, predominantly in developed countries.

Yield growth has been the mainstay of historic production increases and will continue to play this role into the future. Average cereal yields have been growing in a nearly linear fashion for the past

five decades (Figure 5), implying a falling growth rate. Some regions, notably sub-Saharan Africa and Latin America, may grow faster than the linear trend, provided that economic and institutional conditions are conducive. Local constraints to increasing yields remain a significant concern in many countries, threatening improvements in local food supplies in countries where they are most needed. After accounting for differences among countries, global cereals yields are projected to increase from 3.3 tonnes/ha in the base year to 4.30 tonnes/ha in 2050 (Figure 5). World average yields for other major crops follow similar patterns.

Land availability. Globally, around 7.2 billion ha of land has potential for rainfed production. After discounting areas already in production, under forest cover or put to other uses and land that is only marginal suitable, some 1.4 billion ha of prime land remains that could be brought into cultivation. Much of this, however, would come at the expense of pastures, and would require considerable investment.

Spare land is often not readily accessible due to lack of infrastructure; it may be distant from markets, or characterized by high incidence of disease. Such factors can make production uneconomical. Globally, land under crops is projected to increase by some 70 million ha by 2050. As much of the spare land is concentrated in a small number of countries, constraints may be very pronounced in other countries and regions. Where

Figure 1: Per capita food consumption (kcal/person/day)

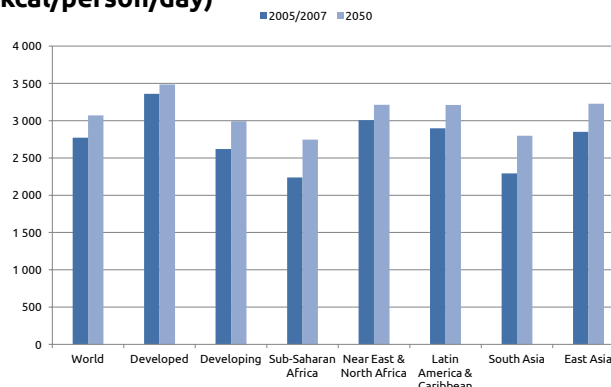


Figure 2: Undernourishment in developing countries

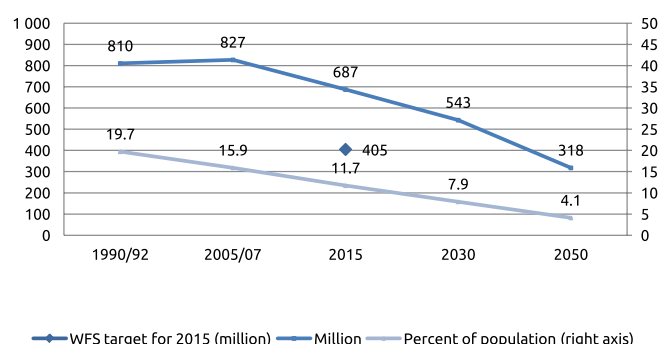
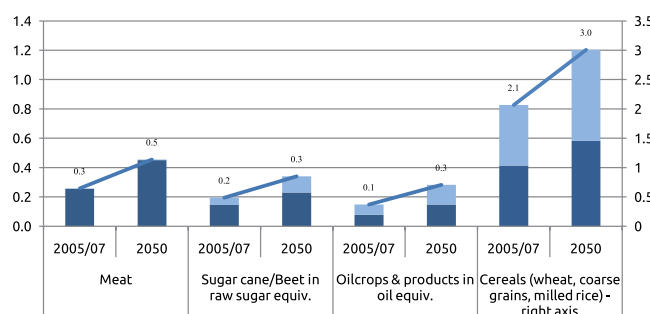


Figure 3: World production and use, major products (billion tonnes)



60 percent or 70 percent – which is it?

FAO's latest projections indicate that global food production will increase by 60 percent between 2005/07 and 2050 under its baseline scenario. This represents a downward revision, based on updated data and information, from the 70 percent increase projected for the same period in 2009.

The starting point for the projections is production and consumption data for 2005/07 (the base year) from FAOSTAT. The 2050 estimates for production and consumption are based on projections for population and income (GDP), complemented with assumptions on changing demand patterns, yield growth and land availability. The FAO baseline scenario is regularly updated to integrate new historical data, revised parameter estimates, and new external projections of population and income. The latest revision includes updated consumption and production data for 2005/07 contained in FAOSTAT as of 2011. In addition, new population and GDP growth projections from the UN Population Division and the World Bank are incorporated in the projections.

Of these changes, the revision to the base year production data had the greatest impact: the revised data show that production in 2005/07 was actually significantly higher than previously estimated, particularly in developing countries. By contrast, projected 2050 levels remain essentially unchanged.

these constraints are coupled with fast population growth and inadequate income opportunities, land scarcity can lead to more poverty and migration. Thus, local resource scarcities are likely to remain a significant constraint in the quest for achieving food security for all.

Water is another critical resource, and irrigation has played a strong role in contributing to past yield and production growth. World area equipped for irrigation has doubled since the 1960s to 300 million ha, but the potential for further expansion is limited. While water resources are globally abundant, they are extremely scarce in the Near East and North Africa, and in northern China, where they are most needed.

Most of the world's irrigated agriculture currently occurs in developing countries (almost half of this in China and India), where it accounts for some 60 percent of cereal production. A net increase of 20 million ha is expected by 2050. By contrast, in developed countries, irrigated area is expected to remain constant. It should be noted, however, that gross investment in irrigation to 2050 will need to be a multiple of that implied by the small net expansion to take into account the depreciation of existing infrastructure.

Global resources are sufficient, but the outlook is uneven

Evidence cautiously suggests that, at the global level, agricultural production can be increased enough to satisfy the additional demand projected to 2050. Agricultural output as a whole is projected to rise to approximately 60 percent above 2005/07 levels, considering both food and non-food uses. However, resource availability, income and population growth are unequally distributed. Food security will remain a challenge at local and household and individual levels, and some countries will need to increase effective food demand more quickly than in the past through broad-based economic growth if they are to achieve it. Such countries are typically those characterized by persistent poverty and high population growth.

Figure 4: Sources of production growth from 2005/07 to 2050

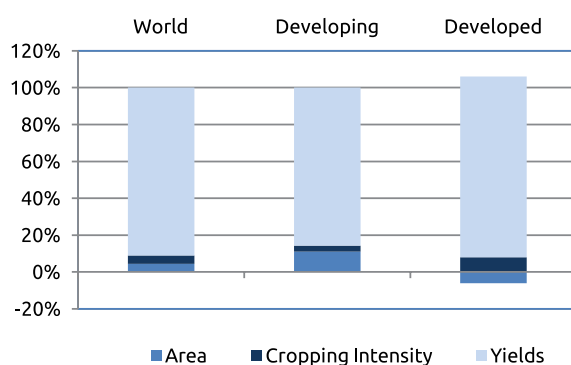
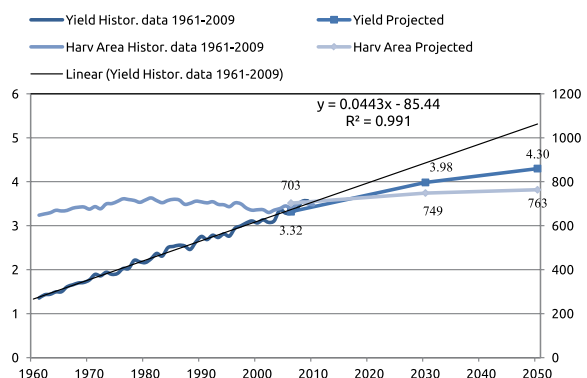


Figure 5: World cereals, average yield and harvested area



Risks and uncertainties remain

While these projections represent the result of our best analysis and assumptions on factors affecting global agricultural supply and demand, there remain many risks to our projections. The projections assume sufficient investment and policy support in the agriculture sector, and even then areas of undernourishment will persist. Continued strengthening of the linkages between agriculture and energy present both an opportunity and a risk to food security. Significant changes in energy prices would potentially divert commodities and land to renewable energy production, increasing the demands on the agriculture sector. Moreover, the projections are set in a future where the impact of climate change is not yet fully understood.

Each of these assumptions is a source of uncertainty that could alter the ability of the agriculture and food sectors to meet demand and reduce undernourishment. Testing of these assumptions through scenario analysis will add significantly to the value of the outlook process to planning and prioritizing within FAO and externally, and will be an important feature of future work of the Global Perspective Studies team.

Global Perspective Studies at FAO

In the wake of the First World Food Congress (Washington, 1963) FAO took on the task of creating the Indicative World Plan for Agricultural Development, which was published in 1970. The aim was to offer governments an international framework for drafting their national plans and policies as well as to orient FAO's own work. Numerous Country Perspective Studies followed in the 1970s.

The Global Perspective Studies Unit was created in 1978, to lead such analysis – drawing on the diverse technical expertise housed in FAO. Similar reports continued to be produced at regular intervals, taking in updated information and data, to provide a consistent examination of the long-run prospects for food and agriculture. The current paper updates earlier projections of the possible evolution and challenges to 2050.

Reports to date have brought together the best single assessment of factors influencing food and agriculture markets. The strengthening linkages between commodity markets, increased demands on finite natural resources and the potential effects of climate change present growing uncertainties. Hence the need to better understand the risks surrounding the outlook. The Global Perspective Studies team is updating its projection toolbox, to make it able to evaluate alternative paths of development of the primary drivers in food and agriculture and assess risks surrounding possible outcomes on food security and sustainable agriculture. A set of economic equilibrium modelling tools, incorporating linkages within agriculture as well as with the larger economy and climate, while continuing to draw on FAO's 'in-house' expertise, will form the basis of future reports.

The information provided in this brief introduces and summarizes a more detailed analysis newly published by FAO's Global Perspective Studies team and available online.

For more information:

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ESA E Working Paper No. 12-03

<http://www.fao.org/economic/esa/esag/en/>

Agricultural Development Economics Division

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Nikos Alexandratos and Jelle Bruinsma
Global Perspective Studies Team

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