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Feeding the world

Introduction

The world's population is set to grow considerably over the coming decades, despite an expected slowdown in the pace of overall growth. Some of the countries and regions where population growth is expected to be higher – many in sub-Saharan Africa – will likely undergo major shifts in dietary composition, involving increased consumption of livestock products, dietary fat and sugar. A similar pattern was observed over the last ten or twenty years in many emerging economies of the Middle East, North Africa, Latin America and East Asia. Per capita consumption in these regions has approached 3000 kcal per person per day. Sub-Saharan Africa and South Asia, by contrast, are still well below the 2500 kcal per person per day threshold. In South Asia, part of the reason may stem from cultural factors that lead to low meat consumption. At the other extreme, Latin America consumes high per capita amounts of meat, following the traditional wide availability of livestock commodities.

The expected evolution of consumption may make malnutrition more prominent than it is today, especially in developing countries. Diets are expected to include a higher intake of fats (especially of saturated fat), sugar and salt. At the same time, urbanization and the reduction of primary activities will likely be associated with more sedentary lifestyles. Underway in several emerging economies already, these two phenomena will likely combine to increase diet-related diseases and their associated social costs.

Yet, food is not available for all. Beyond per capita consumption, little less than a billion people in 2010 were estimated to be food-insecure. The highest number of undernourished was found in Asia, while the highest prevalence is in sub-Saharan Africa, where it was estimated at 28 percent.

Given the expected evolution of consumption, world food production will need to increase considerably over the coming decades. Recent FAO estimates indicate that in order to meet the projected demand of year 2050, global agricultural production must grow 60 percent above the level of 2005-07. But there are signs for optimism. Over the last five decades (between 1961-63 and 2007-09) production has increased by a massive 170 percent.

Most of the growth in world crop production over the past 50 years originated from increases in yield and higher cropping intensity. This pattern is expected to continue, given the limited opportunities for expanding agricultural land. At the global level, the rate of yield growth for most crops has been decelerating in the past few decades, while still increasing in absolute terms.

To a large extent, yield gains originate from improved cropping techniques, fertilization and irrigation. Much can be achieved by narrowing the gap between average farm yields and the yields obtained in experimental fields, and by reducing wastage and post-harvest losses. China's major rice-producing provinces, for instance, have reached a point where the average yield is about 80 percent of that obtained in experimental fields. Evidence suggests that a wide yield gap exists in maize cultivated in sub-Saharan Africa.

The intensification of production on land, however, is likely to carry significant negative externalities. This is seen in the case of the large increase in mineral fertilization. Substantial improvements in efficiency and productivity of land, water and input use in general are required. Technologies are also available to reduce the environmental pressure and carbon emissions from agriculture.

Developing and transferring technology alone will not close yield gaps and reduce wastage and post harvest losses. It requires an enabling and conducive investment environment. Farmers are likely to adopt technologies only if there are sound incentives to do so. In turn, this calls for well-functioning input and output markets, better infrastructure, as well as better finance and risk management tools. The same applies to the reduction of wastage and post-harvest losses, which require better-functioning supply chains.

Key Resources

The State of World Fisheries and Aquaculture (SOFIA)

SOFIA. The State of World Fisheries and Aquaculture (SOFIA) is the flagship publication of the FAO Fisheries and Aquaculture Department. This premier advocacy document is published every two years to provide policy-makers, civil society and those whose livelihoods depend on the sector a comprehensive, objective and global view of capture fisheries and aquaculture, including associated policy issues.

SOFIA 2010 reveals that the per-capita supply of fish as human food reached a new all-time high in 2008. It also highlights the growing need to focus on a variety of aspects of policy and governance, especially in relation to employment and poverty alleviation.

Publication cycle: Biennial

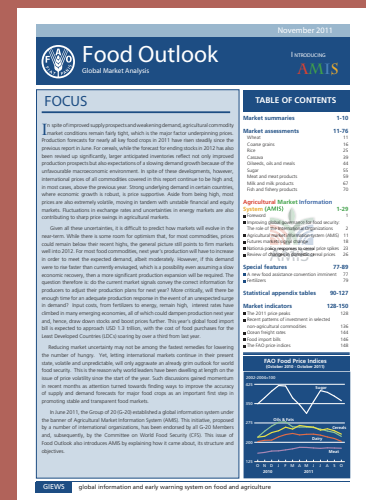
Webpage: <http://www.fao.org/docrep/013/i1820e/i1820e00.htm>

Food Outlook

Food Outlook is a biannual publication focusing on developments affecting global food and feed markets. The sub-title "Global Market Analysis" reflects this focus on developments in international markets, with comprehensive assessments and forecasts on a commodity by commodity basis. Food Outlook maintains a close synergy with another major GIEWS publication, Crop Prospects and Food Situation, especially with regard to the coverage of cereals. Food outlook is available in English, French, Spanish and Chinese.

Publication cycle: Twice a year (May/June and November/December)

Webpage: <http://www.fao.org/giews/english/fo/index.htm>



Aggregate agriculture

The growth of global agriculture's productive potential has so far been more than sufficient to exceed population growth, resulting in a steady, albeit slow, increase in average per capita food availability. For the world as a whole, per capita food availability has risen from about 2220 kcal/person/day in the early 1960s to 2790 kcal/person/day in 2006-08, while developing countries even recorded a leap from 1850 kcal/person/day to over 2640 kcal/person/day. This growth in food availability in conjunction with improved access to food helped reduce the percentage of chronically undernourished people in developing countries from 34 percent in the mid 1970s to just 15 percent three decades later.

More recently, the progress in the reduction in the prevalence, i.e. the percentage share of undernourished people has come to a halt. High and volatile food prices and a slowdown in global economic growth weighed on the ability of the poor to purchase enough food. Continuous, although slowing, population growth in developing countries and the lack of progress in reducing the prevalence even resulted in an increase in the absolute number of chronically hungry people. From the perspective of aggregate global food demand, this slowdown caused a further increase in the gap between potential and effective market demand. This gap is likely to remain a feature of global food and agriculture for the foreseeable future given the slow-down in global population growth and the growing saturation of food demand in developed and emerging countries. However, while growth in aggregate food demand is expected to slow, demand from other sources is likely to expand. In the last decade, the bio-based economy – in which the growth of biofuels has been prominent – has presented considerable scope for relaxing an environment constrained by the slow-down in food demand.

This additional demand presents new opportunities and new challenges at the same time. It offers considerable growth potential for global agriculture and, importantly, new options to raise farm incomes; but it also lifts prices for the poor and presents an additional burden on the world's natural resource base. Where growing conditions are difficult and the resource base is already limited, any additional demand from the non-food sector can become an outright threat to the resource base in general and local land, water and biodiversity reserves in particular.

Map 35:



Source: FAO, Statistics Division

Metalink: [P3.FEED.FAO.ESS.FD.QP, p. 272](#) 

- The world produced over 13 quadrillion calories in 2010
- ... or 5359 kcal on a per capita daily basis
- Much of Africa lags behind other regions in its present capacity to produce food

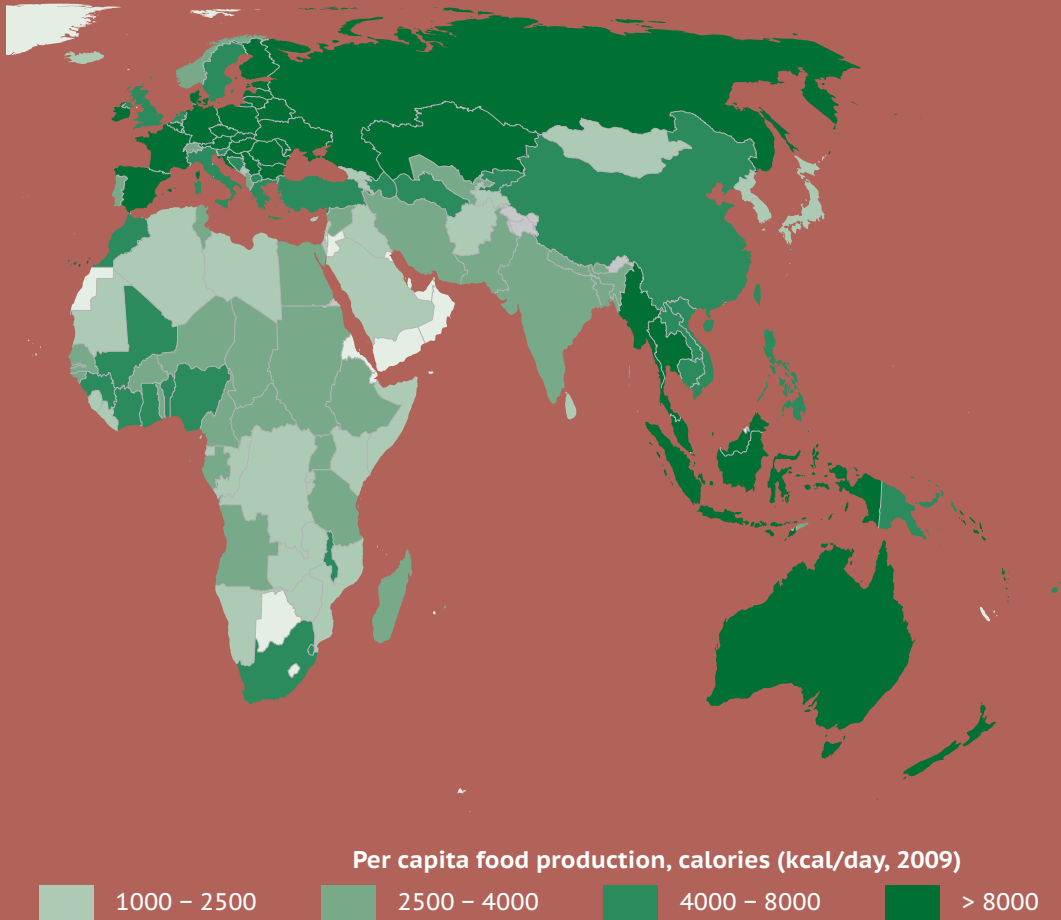
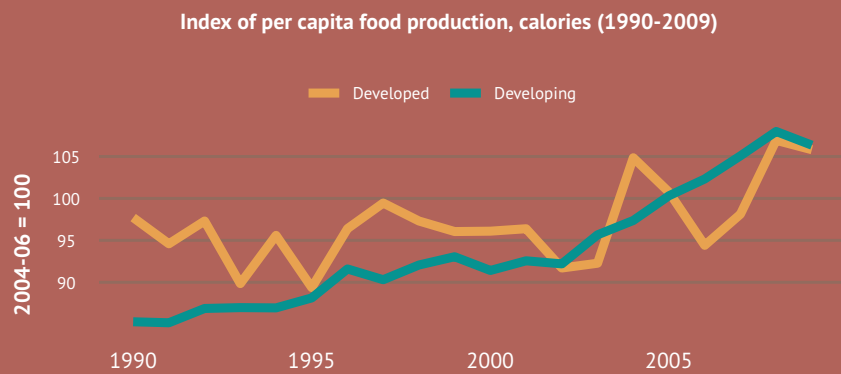


Chart 65: On a calorie basis, food productivity is fast increasing in developing countries



Source: FAO, Statistics Division

Metalink: [P3.FEED.FAO.ESS.FD.QP](#), p. 272 

The capacity for further growth in the **productive base** of agricultural is often contested. In drawing comparisons with the past, questions are often raised about whether slower growth will be sufficient to deliver the required additional output. There are indeed concerns. For instance, a large extent of the suitable land not yet in use is concentrated in several countries in Latin America and the Caribbean and sub-Saharan Africa, and not necessarily where it is most needed. Moreover, much of this land is suitable for growing only a few crops, not necessarily those for which there is highest demand. In addition, a great portion of the land not yet in use suffers from constraints (e.g. agro-ecological, climatic unsuitability and a lack of infrastructure) that cannot be overcome easily or economically.

The availability of **freshwater resources** shows a very similar picture to that of land availability. Sufficient resources are unevenly distributed at the global level, and an increasing number of countries or parts of countries are reaching alarming levels of water scarcity, especially in the Near East, North Africa and in South Asia. A mitigating factor could be increasing water use efficiency, such as providing the right incentives to use less water.

Fears that **yields** are reaching a plateau do not seem warranted. The potential to increase crop yields (even with existing technology) is considerable. Provided the appropriate socio-economic incentives are in place, there are still bridgeable yield gaps – the differences between agro-ecologically attainable and actual yields – to be exploited.

The required increases in yield, land and irrigation expansion will not come about spontaneously, such as through market forces, but will require considerable public intervention and investment, particularly in agricultural research and in preventing and mitigating environmental damage.

Further reading

- Bruinsma (2011)
- FAO Global Perspectives Unit (www.fao.org/economic/esa/esag/)

Map 36:



Source: FAO, Statistics Division (FAOSTAT)

Metalink: [P3.FEED.FAO.ESS.GPCPIN.FD.PCP](https://www.fao.org/data/metalink/P3.FEED.FAO.ESS.GPCPIN.FD.PCP), p. 272

- Over the past two decades world food production increased by 18 percent
- Encouragingly, some of the highest growth regions being food-insecure, required such growth
- Yet, many countries increasingly rely on food imports to satisfy their food needs

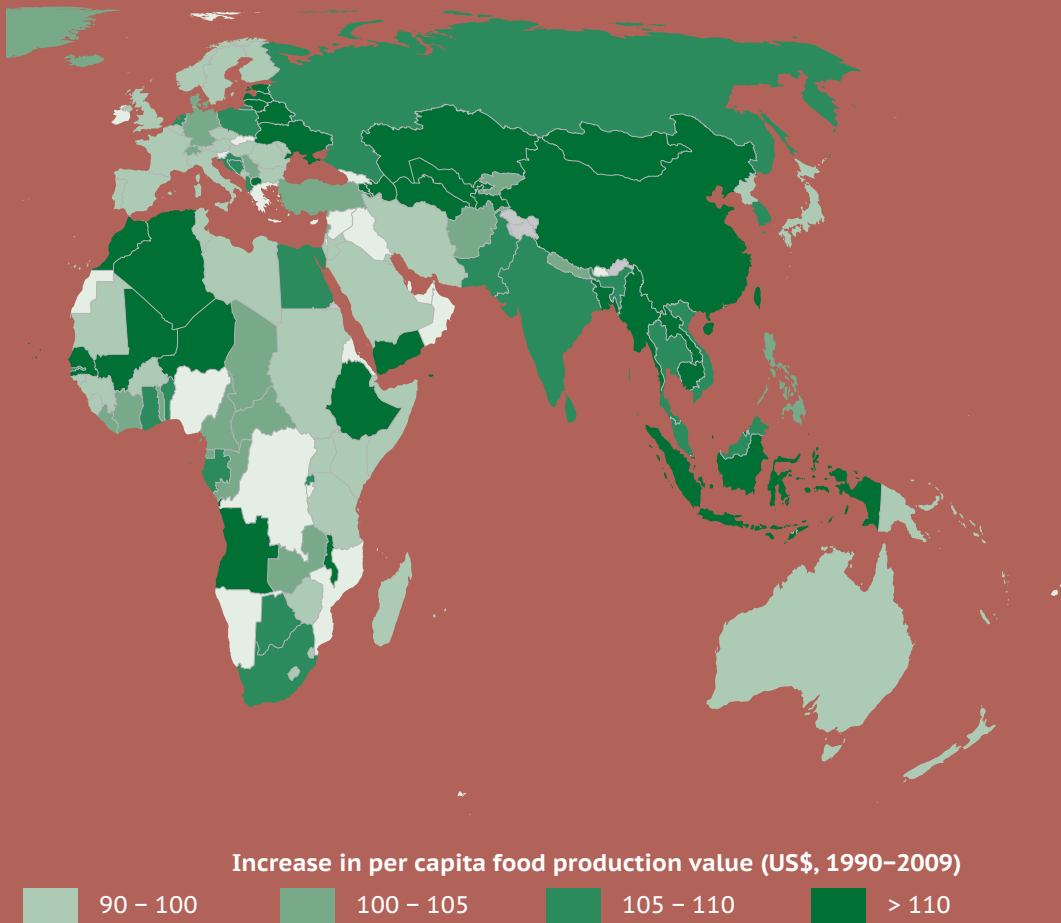
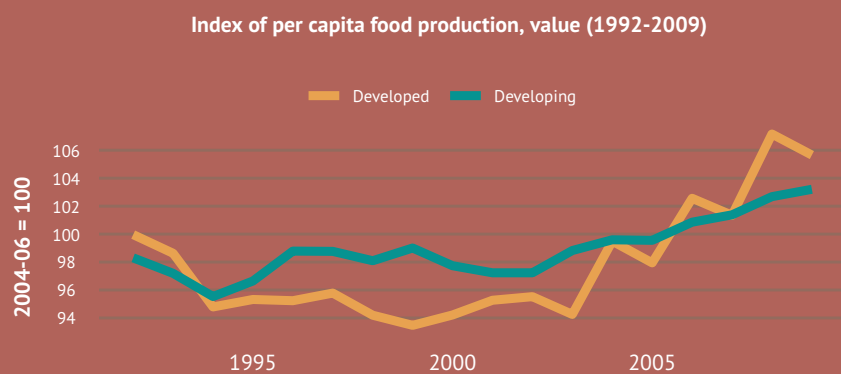


Chart 66: On a value basis, food productivity still on the rise in developing countries



Source: FAO, Statistics Division (FAOSTAT)

Metalink: [P3.FEED.FAO.ESS.GPIN.FD](#), p. 272 

Sources of growth in crop production

In the past 50 years or so, global crop production has expanded threefold. Crop production growth goes hand in hand with crop yield increase and/or expansion in the physical area (arable land) allocated to crops, which – together with increases in cropping intensities, such as higher multiple cropping and/or shortening of fallow periods – leads to an expansion in the area harvested.

Over the past five decades, global **arable land** increased by 67 million hectares, which is the result of two opposite trends: an increase of 107 million hectares in developing countries and a decline of 40 million hectares in developed countries. The arable land area in the latter group peaked in the mid-1980s and has been falling ever since at an accelerating rate. Hence, growth in yields and more intensive use of land accounts for all of the growth in crop output in developed countries.

In fact, much of the increase in world crop production over this period is attributable to **yield improvements**, followed by an expansion in arable land, while a small part is due to **cropping intensity**. These trends, however, are not uniform across regions. For instance, yield-led increases contributed to only one-third of the growth in sub-Saharan Africa crop production.

For cereals, which occupy over half of the harvested area in the world, the slowdown in yield growth has been pronounced: it is down from 3 percent per annum in the 1960s to just over half that amount in the 1990s, before rising to 1.8 percent in last decade. For other staples, such as pulses and root crops, growth in global yields has been much smaller – well under 1 percent per annum over the previous five decades. By contrast, yield growth in oil crops has been particularly dynamic, standing at around 3 percent per annum, which is the highest of all crops during that period.

By saving land, rising crop yields thus diminish pressure on the environment, especially deforestation. To take cereals as an example, if yield growth in the preceding 50 years did not materialize, an estimated one billion additional hectares would have been needed to meet current demand.

The major forces shaping longer-term location and extent of crop production include land scarcity, access to technology and the combination of agro-ecological conditions with availability of irrigation that permits commercially viable production. On the one hand, for instance, the bulk of growth in wheat and rice production in developing countries in the land-scarce regions of Asia and the Near East/North Africa is being met by gains in yield. On the other hand, expansion of harvested land is behind production growth of maize in sub-Saharan Africa and in Latin America and the Caribbean.

Map 37:



Source: FAO, Statistics Division (FAOSTAT)

Metalink: [P3.FEED.FAO.ESS.GPIN.CRPS, p. 272](https://www.fao.org/ess/crps/p3-feed-fao-ess-gpin-crps-p-272) 

- World crop production has grown at average annual rate of 1 percent over the last 20 years
- Sources of growth include yield improvements, increased cropping intensity and an expansion of arable land
- The pace of growth in crop production is diverse, but the Americas and Southeast Asia have experienced higher rates

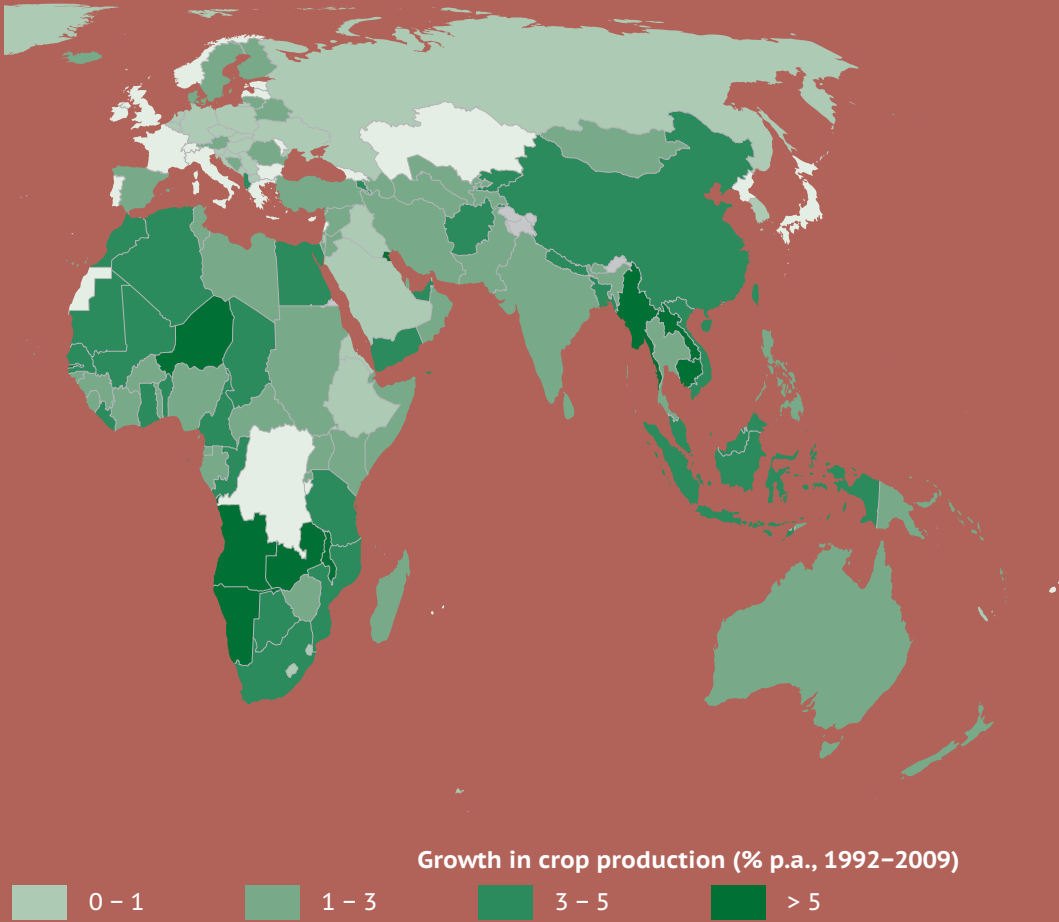
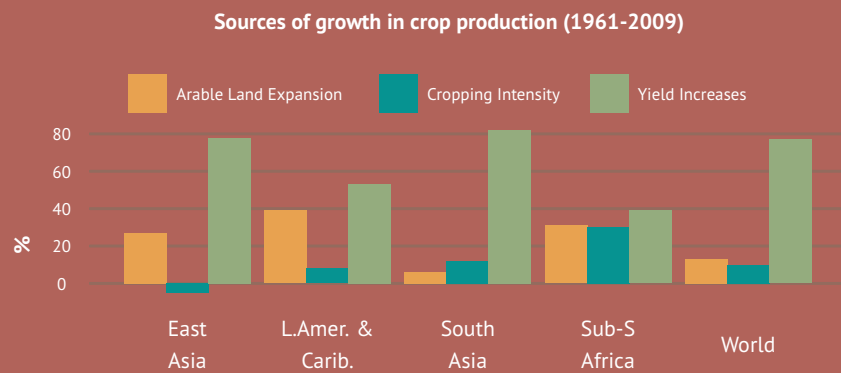


Chart 67: Yield increases have been instrumental in raising crop production



Source: FAO, Statistics Division

Metalink: P3.FEED.FAO.ESS.CRPS.GSRCE, p. 271

Generally, **agricultural land expansion** can be observed in countries that combine growing needs for food and employment with limited access to technology that could increase intensification of cultivation on land already in agricultural use, such as in many parts of sub-Saharan Africa. Land expansion also occurs in countries with both ample land resources and potential for crops facing fast demand growth, particularly for exports and/or for non-food uses, e.g. sugar cane and soybeans in South America and oil-palm in South-East Asia. Indeed, oilcrops have been responsible for a good part of the increases in total cultivated land in the developing countries and the world as a whole, albeit at the expense of forest area.

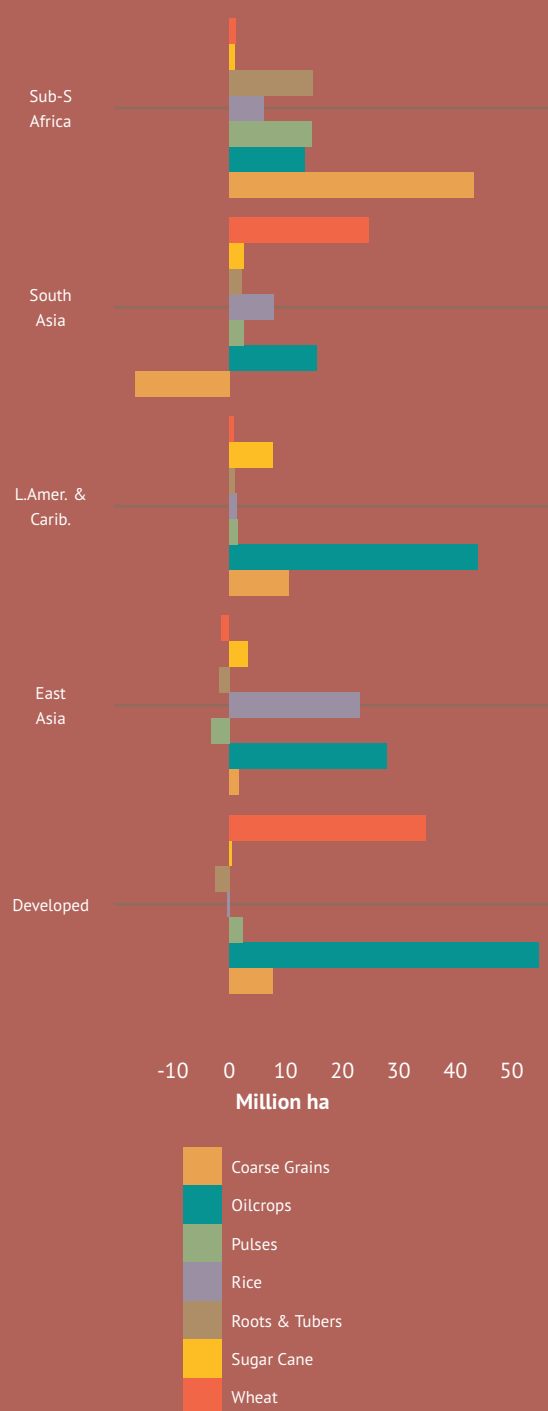
The broad lesson of experience shows that if scarcities develop and prices rise, as has been the case in the past few years, farmers respond quickly by adopting technology and increasing production, as long as they live in an environment of not-too-difficult access to improved technology, transport infrastructure and supportive policies. In countries with land expansion possibilities, the quickest response comes from increasing land under cultivation, including shifting land among crops towards the most profitable ones. However, even if there is sufficient scope in regional agriculture to support further increases in production, this is small consolation to food-insecure people who depend on what they themselves produce for nutrition. Such people often live in semi-arid agricultural environments where the scope for increasing production can be very limited or non-existent. The fact that the world as a whole may have ample potential to produce more food is of little help to them.

Further reading

- FAO World agriculture: towards 2030/2050 Interim report: Prospects for food, nutrition, agriculture and major commodity groups (www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf)
- FAO Food Outlook www.fao.org/giews/english/fo/index.htm)

Chart 68: Cropland in sub-Saharan Africa has undergone significant expansion compensating for low yields

Expansion of area cultivated by crop by region (1961-2010)



Source: FAO, Statistics Division

Metalink: [P3.FEED.FAO.ESS.WT.AH](https://www.fao.org/3/a/P3.FEED.FAO.ESS.WT.AH.pdf), p. 278

