



## A truly green agricultural revolution is needed

World food prices have more than doubled over the past decade, reaching record highs (figure). Higher food prices have made food less affordable to many. The number of people with insufficient access to food reached one billion in 2010.

The recent food price spikes have exposed deep structural flaws in the world food system. Although increased financial speculation in commodity futures and options markets seems to have amplified short-term price volatility, medium-term food price trends mainly reflect structural imbalances in food demand and supply. Demand for food has risen owing to continued rising demand (including for biofuels) and supply constraints.

Agricultural output has not kept pace with growing demand owing to competition for land, increased intensity of droughts and floods, reduced public funding for food and agricultural infrastructure, research and extension as well as price supports. In earlier decades as food prices declined, national food security policies had been increasingly abandoned in favour of greater reliance on global food markets.

Meanwhile, food production has been recognized as a major contributor to greenhouse gas emissions, water pollution and land degradation. Ensuring food security in a sustainable manner will require a major overhaul of farming practices and technologies.

### Towards a truly green revolution...

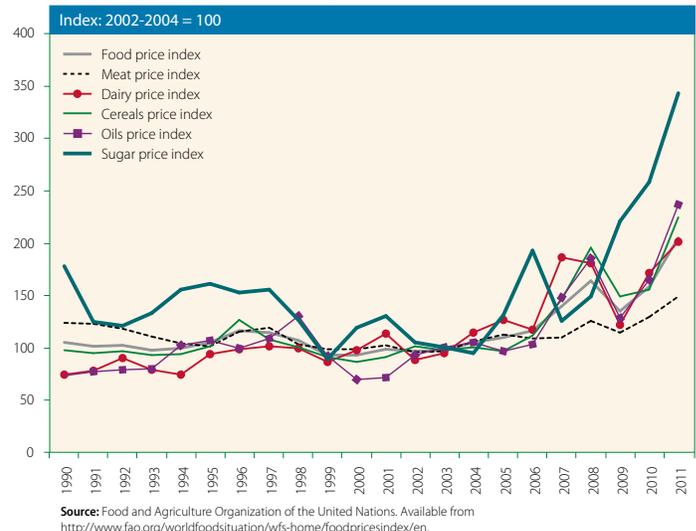
It will be necessary to increase food production by between 70 and 100 per cent by mid-century to feed a forecasted future population of 9 billion people. This will require nothing short of a technological revolution to greatly increase food production.

Valuable lessons can be learnt from the “Green Revolution” of the 1960s and 1970s in Asia and Latin America. That effort involved the adoption of a specific package of technologies—namely, higher-yielding varieties of wheat, rice and maize, chemical fertilizers, and irrigation—and brought about dramatic increases in productivity and production of some staple food crops.

However, the green revolution failed in two major ways. First, it failed to enhance the food security of many of the world’s poor, as it largely bypassed food crops consumed in Africa in particular, and did not respond to the agro-ecological conditions of a large number of farmers.

Second, the original green revolution, in most instances, led to excessive and inappropriate use of fertilizers, pollution of waterways due to greater siltation and the intensive use of chemicals, and biodiversity loss. Agriculture produces 14 per cent of global greenhouse gas emissions thus contributing greatly to climate change.

Figure  
Real food price indices, annual averages, 1990-2011



A truly green revolution is needed, to ensure food security using farming techniques that are more productive, socially inclusive and environmentally sustainable. As elaborated in the United Nations publication *World Economic and Social Survey 2011* (WESS 2011), there is an urgent need for rapid diffusion of sustainable agricultural technology and practices in both developed and developing countries.

In most developing countries, small-scale farming will have to be at the centre of the technological transformation. This transformation will involve consolidation of production activities to reach efficient scale appropriate to the crop and region. Small farmers are currently the mainstay of food production in most developing countries. Between 75 and 90 per cent of staple foods in developing countries are produced and consumed locally. Almost 90 per cent of all farmers in developing countries cultivate plots of two hectares or less.

Increasing farm productivity would not only directly enhance food security, but also contribute to poverty reduction by raising farm incomes, thus freeing labour resources for off-farm industry and services. Small-scale farming, with diversified crop cultivation, has several advantages over large-scale monoculture systems. There is strong evidence that for some crops, small scale production is more efficient than large scale and also less damaging for the environment.

However, these advantages can only be realized in full if smallholders have adequate access to rural infrastructure (like irrigation and roads), affordable credit and farm inputs (like quality seeds, fertilizers and pesticides), weather insurance, and

education. Such conditions are also required for successful adoption of sustainable farming techniques.

## What is to be done?

Governments have to facilitate the widespread dissemination, adaptation and adoption of technology and innovations to increase the productivity, profitability, resilience and climate change mitigation potential of rural production systems.

Successful localized productivity-enhancing innovations can be built upon. Such innovations were often responses to droughts or floods, and have resulted in improved pest and weed management, water efficiency and biodiversity.

The policy challenge is to identify and support the adaptation and scaling-up of such local instances of agricultural innovation, including in poor and food insecure countries and regions. Agro-ecological conditions vary widely across regions, implying that agricultural technologies and practices, including the appropriate farm size, need to be adapted to local conditions.

An extensive menu of technologies and sustainable practices in agriculture is available providing options for a radical shift towards sustainable food security. These include traditional knowledge and farming practices such as low-tillage farming, crop rotation and inter-planting, green manure utilization, water harvesting and water-efficient cropping.

Furthermore, new high-yielding and pest and disease-resistant varieties of food crops have and are being developed, which are efficient in water use and require little or no use of agro-chemicals as fertilizers or pesticides—unlike their predecessors developed in the 1960s and 1970s. More research is needed, however, to adapt these technologies to local conditions.

Finally, modern biotechnology and hydroponics provide complementary options to raise productivity with sustainable production methods. While much knowledge is already available, governments will have to provide more incentives and support to make them and new knowledge accessible, adaptable and affordable to farmers.

## National responses

The transformation of agriculture to achieve sustainable food security requires long-term support by governments and other actors through: (i) substantially increased funds for agricultural research and development (R&D); (ii) enhanced capacity development among farmers; (iii) better rural infrastructure; (iv) improved market access; and (v) redistributive land and agrarian reforms.

Resources for agricultural research remain low, especially in Africa, East and South-East Asia and the Middle East. The intensification of research efforts to breed new crops, and the development and adaptation of the new technology to increase sustainable food production require significant long-term public and private funding of agricultural R&D.

Effective agricultural research also demands closer collaboration among public research institutions, the private sector and small farmers through innovative partnerships, including patent buyouts, prizes, joint ventures, co-financing and advance-purchase agreements, comprehensive risk assessments and suitable regulatory schemes.

Increased awareness and the accelerated adoption of sustainable technology and crop management practices will also require wider dissemination of information and information & communications (ICT) technology among small-scale farmers through quality education in rural areas (including adult literacy and innovative peer-to-peer learning programmes) and adequate extension services.

Making sustainable food agriculture technologies available to small-scale farmers in diverse agro-climatic conditions requires further substantial investments in rural infrastructure, including roads, irrigation, electricity and storage facilities.

This should be complemented by measures to improve market access—including better access to credit, inputs and insurance—for small-scale farmers, as well as improved access to land for rent and secure property rights.

On the whole, a strategic attention to agriculture as part of national development strategies would improve policy coordination and give greater coherence to the actions of the many actors who are part of national food systems.

## International action

The international community has much to contribute to a global agenda for food security and environmental sustainability. Delivering on the financial pledges made in the aftermath of the food crisis of 2007–2008 would constitute an important down payment on eradicating hunger.

International action is also needed to reform agricultural subsidies in OECD countries, which undermine the ability of farmers in developing countries to compete. This includes rethinking subsidies to biofuels, and support for new biofuels to reduce the diversion of food production for such ends. Reconstituting global, regional and national capacities for agricultural R&D with international financial support can rapidly improve agricultural productivity. ■

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