Ensuring Food and Nutrition Security in a Green Economy

Shenggen Fan, Claudia Ringler, Ephraim Nkonya, and Alexander J. Stein

IFPRI Policy Brief 21 • June 2012

As the population continues to grow and natural resources become scarcer, the need to shift toward an environmentally responsible, socially accountable, more equitable, and "greener" economy has become increasingly apparent. Despite differing perspectives and definitions among stakeholders, the "green economy" is often seen as an economy that pursues growth while also promoting sustainable development through more efficient use of resources. Thus aligned with concepts of sustainability, the objective of a green economy is to simultaneously work toward economic development, environmental protection, and greater social welfare, in particular by reducing reliance on fossil fuels and nonrenewable resources.[1]

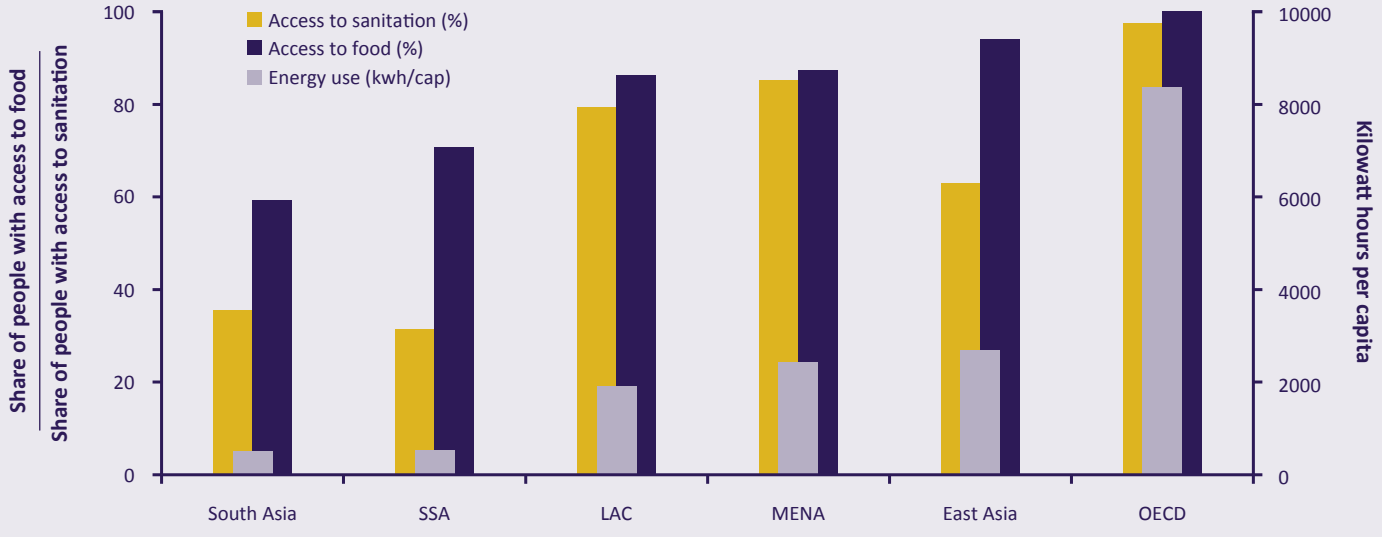
At the same time food and nutrition security remains under stress. For the 900 million undernourished people in the world and the more than 2 billion people suffering from micronutrient deficiency, the poor management and increasing scarcity of natural resources like water, arable land, and energy make the production of and access to adequate, nutritious food difficult. Moreover, food insecurity is closely linked to limited access to sanitation and clean water as well as low use of energy, all of which is particularly apparent in South Asia and Sub-Saharan Africa (Figure 1).

This raises some important questions: What are the implications of a green economy for the poor and hungry? How can the poor benefit from and thrive under a green economy? What role can agriculture play? What are the possible trade-offs and synergies between different policy objectives, and how can each be measured?

Food and Nutrition Security: Facing Complex, Interlinked Challenges

In 2011, the world's population reached 7 billion people, and it is projected to grow to more than 9 billion by 2050.[2] Much of this growth will be concentrated in low-income countries, which already face serious challenges satisfying basic needs, such as the provision of food, water, housing, and energy (Figure 1).[3] Population and income growth will drive food demand in the coming decades; nearly 80 percent more meat, almost 60 percent more cereals, and one-third as many roots and tubers are projected to be produced by 2050, at significantly higher food prices and with adverse consequences for the world's poor and vulnerable populations.[4]

FIGURE 1 Access to sanitation, food, and energy by regions, 2011



Source: World Bank, *World Development Indicators* (Washington, DC: World Bank, 2011), http://data.worldbank.org/data-catalog/world-development-indicators/wdi-2011; M. W. Rosegrant, C. Ringler, S. Msangi, T. B. Sulser, T. Zhu, C. Tingju, and S. A. Cline, *International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): Model Description* (Washington, DC: International Food Policy Research Institute, 2008), www.ifpri.org/ourwork/program/impact-model.

Notes: Share of people with access to food is approximated from share of children not malnourished. SSA = Sub-Saharan Africa; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; OECD = Organisation for Economic Co-operation and Development

With higher incomes, emerging middle classes in developing countries can afford to consume more fruits and vegetables and, in particular, more meat, which requires much more water and land to produce.[5] In addition, as people demand more perishable and processed foods, food safety risks along the supply chain increase. These risks may also increase with more intensive crop and livestock farming through contamination with chemicals or pathogens.[6]

Intensifying food production can boost the food security of millions of poor people and help save pristine forests and virgin soil from conversion to agriculture, as seen during the Green Revolution. However, increasing food production can also contribute to problems such as land degradation, water pollution, depletion of water resources, and new pest problems. These unintended consequences highlight the need for adequate agricultural extension, effective regulation, careful pricing policies, the correction of inappropriate incentives, and policy responses that make intensive agriculture compatible with sustainable management of natural resources and the environment.[7]

Land degradation—whether in the form of desertification, deforestation, overgrazing, salinization, or soil erosion—poses a serious threat to long-term food security, especially since arable land is already scarce in Asia and cultivating land reserves in Latin America and Africa would come at high environmental and infrastructure costs.[8] In fact, most land degradation throughout the past 30 years occurred in developing countries, compromising future agricultural productivity growth in these areas (Figure 2). Worldwide some 1.3 billion people live on fragile lands with limited possibility of agricultural intensification, where they face low levels of agricultural productivity.[9]

Agriculture accounts for 70–80 percent of global freshwater consumption, and since other demands for water are expected to increase much faster, the amount available for irrigation will see only a minimal increase.[10] Projections suggest that by 2050 water scarcity could reduce cereal production potential by more than 10 percent, not taking into account other yield-reducing factors.[11] Keeping in mind that one-third of the world's people already live in water-scarce areas and nearly one-quarter of the world's gross domestic product is produced in those areas, the wider repercussions of an increase in water scarcity move well beyond the agriculture sector.[12]

It has been estimated that the agriculture sector is responsible for up to 30 percent of global greenhouse gas emissions, which directly contribute to climate change.[13] In turn, climate change represents a particularly important threat to food security as agricultural production is critically dependent on local temperatures and precipitation and, in many places, the availability of runoff for irrigation. While farmers are familiar with adapting to a changing environment, changes that go beyond the current range of weather conditions—such as more frequent and intense extreme weather events or higher temperatures caused by climate change—pose additional challenges and stretch farmers' capacity for adaptation, particularly in developing countries.[14] In many regions, the change in climate results in declining yields that may not be readily offset by technological progress or the positive effect of elevated levels of atmospheric carbon dioxide on plant growth (carbon-dioxide fertilization). Projections show that even with perfect mitigation of greenhouse gas emissions, food insecurity in low-income countries is bound to increase when economic development is slow and population growth is high.[15] The situation worsens considerably when the adverse consequences from climate change are taken into account.[16]

In addition to unsustainable natural-resource use, other human actions can cause environmental changes that threaten food security and the stability of the planet's environment. Apart from climate change these include chemical pollution or biodiversity loss. Some of these changes are argued to already compromise the safe operation of the earth's ecosystems and threaten human welfare and agricultural productivity.[17]

Agriculture: Playing a Central Role for Food Security and in a Green Economy

Agriculture in a green economy has immense potential to address the unsustainable use of natural resources for food production. And a strategy to develop a green economy can support poverty reduction as well as food and nutrition security if it is both pro-poor and pro-agriculture because, in low-income countries, the agriculture sector employs almost two-thirds of the labor force and generates about 30 percent of the gross domestic product.[18] Smallholders represent the bulk of the poor and half of the world's hungry; they also depend on natural resources and ecosystem services for their livelihoods, so sustainable management through a green economy is bound to directly benefit them.[19,20]

However, while the importance of the linkages between agriculture and nutrition are increasingly recognized, food and nutrition security cannot be achieved through increased agricultural production alone.[21] Social protection is a key facet to ensuring poor people's access to food, and social safety nets may become even more necessary during a transition toward a green economy if poor farmers' incomes and livelihoods are adversely affected in the short term. For example, to make resource use more efficient in a green economy, subsidies for fertilizer, irrigation, or electricity may be reduced, and smallholders may subsequently suffer from price increases. Similarly, if measures are taken to curb greenhouse gas emissions by reducing the production of the "worst offending" crops and livestock (such as rice and cattle), poor farmers will need support to adjust.[22]

Innovations in biological sciences, resource management, and agricultural processes will be essential to increase productivity and resource-use efficiency in a green economy.[23] For instance, breeding crops for higher content of essential vitamins and minerals, or "biofortification," is a promising new approach to help address micronutrient malnutrition.[24] The application of modern biotechnology in crop breeding has shown how life sciences can contribute to agriculture—and under which conditions smallholders can benefit.[25] This technology also holds potential to help address other challenges, such as improving nitrogen-use efficiency of crops.[26] Novel technologies also include nanotechnology, which has barely been explored for agricultural uses.[27] Likewise, innovative policies and investments will be needed to help agriculture adapt to and mitigate the effects of climate change, and policymakers will need more evidence on agricultural innovation systems to make more informed decisions.[28]

Further research is also needed on biofuels that do not divert food and contribute positively to mitigation of climate change and the environment as grain-based biofuel production competes with poor people's food and does not help to improve sustainability or reduce carbon emissions. IFPRI research indicates that 30 percent of the increase in food prices in 2000–2007 was the result of grain-based biofuel production alone and that biofuel production leads to higher levels of undernourishment in low-income countries. Thus, the environmental and social implications of switching to biological alternatives of nonrenewable fuel sources, and the policies that promote their sustainable use, need to be better understood before they are adopted.[29]

Policy Actions: Promoting Food Security in a Green Economy

The multiple goals of achieving food and nutrition security for a growing global population, increasing equality, and embarking on a path toward a green economy can be mutually reinforcing. Decisive action on a number of fronts is nevertheless required. In particular, the synergies among food and nutrition security, agriculture, natural resource management, and economic growth need to be understood and exploited at all levels. This will require a comprehensive global approach, and the political will to focus policies and investments on pro-poor, environmentally sustainable development.

Integrate food and nutrition security into sustainable development.

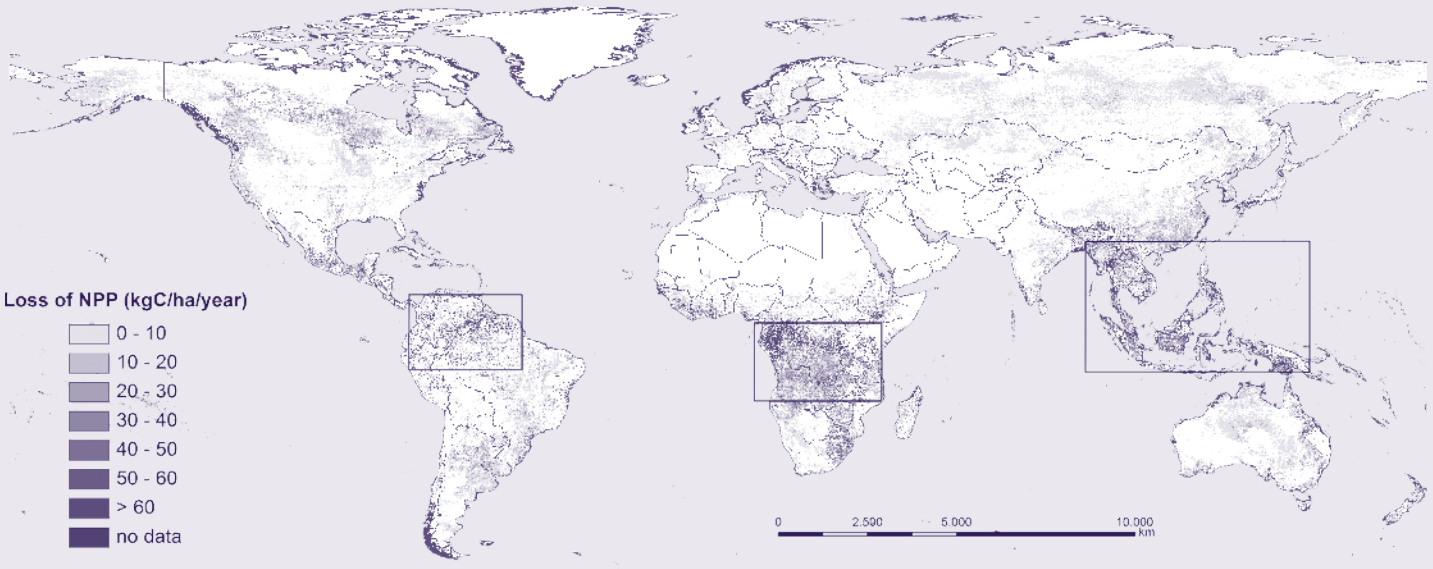
An integrated (or nexus) approach to economic development, sustainable use of natural resources, and food production will avoid solutions with adverse consequences for any one sector. In agriculture, such "triple-win" situations can be achieved through practices that reduce negative environmental effects while increasing productivity and smallholder incomes.[30] Important technologies include plant breeding and slow-release fertilizers that increase nutrient-use efficiency, integrated soil fertility management (particularly in Sub-Saharan Africa), precision agriculture, integrated pest management, and further expansion of alternative wet and dry irrigation for rice production (particularly in Asia). New research will help develop not only productivity and nutrition-enhancing technologies and processes but also policies and institutions to sustainably manage agriculture and food systems.

Factor in full costs and benefits of natural resources and ensure open trade.

To fully reflect the value of natural resources and set appropriate incentives, the full cost of environmental degradation as well as all benefits of ecosystem services should be taken into account by decisionmakers. The prices of food and natural resources must include social and environmental costs and benefits, such as impacts on climate change and health, which can be achieved through taxation, regulation, and improved economic incentives. Together with research, extension services, and awareness-building campaigns, higher costs will promote the adoption of resource-saving technologies and practices while encouraging all actors along the food value chain to reduce waste. Meanwhile social protection systems have a key role to play in protecting the poor in the short run, if food and natural resources become more expensive.

Moreover, ensuring open trade can increase the efficiency of natural-resource use because trade helps optimize resource allocation across countries in line with their comparative advan-

FIGURE 2 Loss of annual net primary production, 1981–2003



Source: E. Nkonya, N. Gerber, J. von Braun, and A. De Pinto, *Economics of Land Degradation: The Costs of Action versus Inaction,* IFPRI Issue Brief 68 (Washington, DC: International Food Policy Research Institute, 2011), www.ifpri.org/publication/economics-land-degradation; based on data from ISRIC–World Soil Information.

Note: The boxes on the map outline key areas of land degradation.

tages. For example, countries can import crops that were grown under rainfed conditions ("virtual water") instead of producing them using irrigation.[31] When climate change causes agricultural production to become more variable, trade can keep the food supply balanced through imports when shortfalls occur and exports when surpluses are generated.

Identify new indicators to evaluate cross-sectoral impacts.

New policy objectives require mechanisms and measures to track, monitor, and evaluate the impacts and implications of policies supporting a green economy, especially when they span interlinked sectors. In the case of food, agriculture, and natural resources, such new metrics are necessary to assess, for example, the nutrition and health implications of natural resource strategies as well as the effects food security strategies will have on natural resources. Once established, the best approaches can be developed into monitoring systems to generate evidence for sound policies.

Establish needed capacities at the country level.

Many developing countries lack the capacity to design strategies for agricultural development and food and nutrition security that also protect natural resources. Greater technical and financial support should be allocated toward establishing institutions for the design, implementation, monitoring, and evaluation of policies related to food and nutrition security. For example, initiatives like IFPRI's country-specific strategy support programs and the Regional Strategic Analysis and Knowledge Support System, which support country-led development strategies, can be scaled up and expanded to help promote the transition toward a green economy.[32]

Engage multiple stakeholders.

Smallholders have a central role in food production and processing; they are key partners in all efforts to ensure sustainable, climate-smart development, as are larger operators in the farm and food sector. While the public sector has many important roles to play—especially in addressing market failures—the private sector has taken on new roles in agriculture throughout developing countries. With the right incentives, the private sector can provide effective and sustainable investment, relevant expertise, and innovation to help enhance food and nutrition security. Therefore, by combining the strengths of both sectors, public-private partnerships can play an important role in achieving a green economy that is more inclusive of food and nutrition security.

Conclusion

The transition to a green economy is an opportunity to reconcile economic needs with environmental concerns while promoting food and nutrition security for poor and vulnerable people in one coherent policy framework. This opportunity cannot be ignored. By giving agriculture a central role in the green economy and managing this transition effectively, the international community can get closer to achieving the long overdue goal of eradicating hunger and ensuring food and nutrition security for all.

For Further Reading

Hazell, P. B. R. 2009. "Transforming Agriculture: The Green Revolution in Asia." In *Millions Fed: Proven Successes in Agricultural Development,* edited by D. J. Spielman and R. Pandya-Lorch. Washington, DC: International Food Policy Research Institute. http://dx.doi.org/10.2499/9780896296619BK.

IFPRI (International Food Policy Research Institute). 2012. *2011 Global Food Policy Report.* Washington, DC. www.ifpri.org/gfpr/2011.

Nelson, G. C., M. W. Rosegrant, A. Palazzo, I. Gray, C. Ingersoll, R. Robertson, S. Tokgoz, et al. 2010. *Food Security, Farming, and Climate Change to* 2050. Washington, DC: International Food Policy Research Institute. http://dx.doi.org/10.2499/9780896291867.

Rosegrant, M. W., X. Cai, and S. A. Cline. 2002. *World Water and Food to 2025: Dealing with Scarcity.* Washington, DC: International Food Policy Research Institute. www.ifpri.org/publication/world-water-and-food-2025.

Smale, M., P. Zambrano, G. Gruère, J. Falck-Zepeda, I. Matuschke, D. Horna, L. Nagarajan, et al. 2009. *Measuring the Economic Impacts of Transgenic Crops in Developing Agriculture during the First Decade: Approaches, Findings, and Future Directions.* Washington, DC: International Food Policy Research Institute. http://dx.doi.org/10.2499/0896295117FPRev10.

NOTE: Due to space constraints, it is not possible to include the full list of endnotes in this brief. However, the full reference list is available online at www.ifpri.org/publication/ensuring-food-and-nutrition-security-green-economy.

Shenggen Fan *is director general of the International Food Policy Research Institute (IFPRI).* ***Claudia Ringler*** *is deputy division director of the Environment and Production Technology Division at IFPRI.* ***Ephraim Nkonya*** *is a senior research fellow in the Environment and Production Technology Division at IFPRI.* ***Alexander J. Stein*** *is a research coordinator in the Director General's Office at IFPRI.*

The authors thank Ana F. Ramirez for her excellent research support as well as Gerald Nelson, Mark Rosegrant, and two anonymous referees for their helpful comments.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K Street, NW, Washington, DC 20006-1002 USA • T. +1.202.862.5600 / Skype: IFPRIhomeoffice • F. +1.202.467.4439 • ifpri@cgiar.org • www.ifpri.org