Sharpening the focus of research on sustainable food systems

In the face of renewed food price inflation and volatility during recent years, governments and international organizations have placed food security near the top of the development agenda once again. What key decision makers may not fully recognize, however, is that the issue is a moving target – subject to shifting food chain dynamics whose future implications are far from clear.

This is the message of a widely publicized recent study by CIAT researchers and partners (see page 4), which documents far-reaching changes in global food supplies over the last half century. Appearing in the *Proceedings of the National Academy of Sciences (PNAS) of the USA*, the article describes how diets have become steadily more homogeneous, especially in developing countries.

Driven by rising incomes, urbanization, and globalization, this dietary shift involves rising consumption of major cereals and oil crops – increasingly in the form of processed foods – together with higher intake of livestock products, and a diminishing role for regionally important cereals and root crops. Taken as a whole, these changes have both positive and negative implications for human health and nutrition as well as for the sustainability of food systems.

Add to this picture widespread food waste in developing countries, which is mainly the result of inefficient postharvest handling. It then becomes obvious why achieving food security is not just a matter of intensifying agricultural production – based on essentially the same policies and technologies that account for the present state of global diets – but rather requires nuanced interventions that reflect a clear understanding of food chain dynamics.

In a novel effort to guide food systems toward an equitable and sustainable future, the International Center for Tropical Agriculture (CIAT) has embarked on a strategic initiative called FoodLens. Through research on changing patterns in food delivery and consumption, the initiative will deliver new knowledge and interventions that better enable developing countries to provide all urban and rural consumers with ready access to healthy food.
Food system facts

The prevailing trends in food production and consumption have imposed on developing countries a triple nutritional burden: (1) many consumers are chronically hungry and malnourished; (2) many more suffer from a lack of micronutrients in their diets, and (3) growing numbers, ironically, suffer from diseases related to overeating. Those consumers and society as a whole also pay a high price for rampant food waste. Consider these big facts:

- About 1 billion people suffer from chronic hunger, and twice that many are affected by micronutrient deficiencies.
- More than 2 billion adults are overweight, and of these, more than half a billion are obese.
- Numbering 3.9 billion, city dwellers currently account for 54% of the world’s total population, and this share is expected to reach 66% by 2050.
- About one-quarter of the food produced in developing countries goes to waste, largely as a result of inefficient storage, handling, and distribution.

Sources:
- WHO www.who.int/mediacentre/factsheets/fs311/en/
- FAO www.fao.org/docrep/014/mb060e/mb060e.pdf
Pioneering perspectives

CIAT scientists have a solid record of finding novel food solutions, based on innovative research in crop production as well as a good grasp of crop use for food and other purposes. This experience, illustrated by the cases summarized below and reinforced with new expertise, provides a firm basis for the Center’s FoodLens initiative.

Seeing the potential of a versatile root

Though little known in the industrialized countries, cassava (a root crop of tropical American origin) is among the principal sources of dietary energy across much of the tropics. Especially important for poor consumers, it’s prepared and eaten in a wide variety of forms. Large-scale marketing of cassava is limited, however, by the fact that its roots are bulky and perishable.

In a concerted effort to overcome this limitation, researchers at CIAT and in many partner organizations as well as the private sector have developed and promoted a wide variety of cassava processing methods over the last 4 decades. As a result, the crop has finally begun to realize its potential as a source of fresh and processed food as well as livestock feed and starch for a wide variety of industrial uses. CIAT researchers are further aiding this process by developing cultivars with special starch qualities and other traits that diversify the use of cassava and strengthen its market appeal. Given the crop’s versatility and its resilience in the face of climate change, it can only grow in importance as a mainstay of developing-country food systems.

Biofortified foods to combat hidden hunger

In response to the widespread scourge of micronutrient malnutrition, CIAT and other CGIAR Centers embarked 10 years ago on an innovative initiative called HarvestPlus. Jointly coordinated by CIAT and the International Food Policy Research Institute (IFPRI), it develops a wide variety of nutrition-rich – or “biofortified” – crops as well as improved systems for making these crops readily available to farmers, particularly in Africa, Latin America and the Caribbean, and South Asia.

In 2013, HarvestPlus surpassed its commitment, a year ahead of schedule, to deliver biofortified crops to more than 500,000 rural households. Now, the initiative is gearing up for a new phase focused on getting these vitamin- and mineral-rich foods into the diets of 40 million people by 2018. CIAT’s research is focused on developing cassava that is high in beta-carotene (the precursor of vitamin A), rice that is high in zinc, and beans that are high in iron and zinc.
An overview of global food supplies

The good news about increasingly homogeneous diets in developing countries (a trend documented in the aforementioned PNAS study1) is that this has allowed more people to consume increased amounts of calories, protein, and fat, thus strengthening food security. But there’s also bad news, and it comes in two installments. First, overconsumption of macronutrients has contributed to a global surge in diet-related diseases. And second, more similar food supplies have come from more uniform agricultural systems, in which reduced biodiversity leads to heightened genetic vulnerability to diseases and insect pests as well as physical stresses, like drought, making these systems less resilient in the face of climate change.

Against this background, agricultural research must pave the way for future food and nutrition security by giving high priority to four critical actions:

1. safeguarding the genetic diversity of major staple crops and using this strategic natural resource more effectively for crop improvement, with emphasis on nutritional quality;
2. addressing the dietary and environmental challenges associated with increased global production of oil crops;
3. promoting the conservation, development, and marketing of more nutritious and resilient alternative crops; and
4. developing more nutritionally diverse and ecologically sound food systems through holistic research approaches.

Research that looks forward – and back

Over the last 4 decades or so, CGIAR research has proven its worth time and again as an effective means to enhance the livelihoods of poor farmers and consumers. However, there is a risk that international research may miss the moving target of future food and nutrition security, unless it makes adjustments over the next few years in response to rather dramatic shifts, particularly at the consumer end, in the food systems of an increasingly urbanized world. CIAT and its partners will strive to reduce this risk through new research projects focused on the five issues listed as follows.

1. Putting the spotlight on consumer demand

While CGIAR research has traditionally dealt mostly with crop production, this work has expanded over the last 15 years or so to encompass farmers’ links with markets. To remain relevant and effective, it must also address questions about food consumption in developing countries. How have consumer demands and preferences changed in urban versus rural areas, taking into account gender, income, and other factors? Moreover, how is the nutritional quality of human diets evolving and with what effects on human and ecological health?
2. Defining the foods of the future

Recent decades have seen dramatic changes in human diets. This process will, of course, continue but preferably with guidance from research that opens the way to healthier and more convenient products for all. What characteristics should these future foods possess, and what are the implications for plant, livestock, and fish breeding? Also, how must production, processing, distribution, and marketing systems change to provide urban and rural consumers with equitable access to new products?

3. Food policies that favor the poor

The positive influence of new technologies on food and nutrition security will greatly depend on national and local food policies. How can governments frame these policies so as to offer the poor equitable access to nutritious food in rural and urban areas? And what kinds of knowledge products can best enable policy makers to achieve this end?

4. Turning waste into added value

Curbing food waste would seem to be a low-hanging fruit in developing countries, as they struggle to achieve food and nutrition security. But this is far easier said than done, as long as so little is known about the exact causes of crop loss and food waste at different points in food systems. A major opportunity for research is to identify multiple sources of food waste that can be transformed into value-added product lines – as with the use of cassava peels to produce ethanol.

5. Reducing environmental footprints

Inefficiency in food systems results not only in wasted food but in the mishandling of vulnerable natural resources involved in its production, processing, and delivery. Life cycle analysis can trace the carbon dioxide and water "footprints" of food systems, and help identify opportunities to reduce greenhouse gas emissions and recycle water productively.
Food for thought

The considerable interest generated by the PNAS study described earlier suggests that audiences around the world – from researchers to the general public – have a ravenous appetite for more information about changes in global diets and about the consequences for human health and the environment.

Working in collaboration with partners in Europe, USA, and selected countries across the tropics, CIAT’s FoodLens initiative tries to satisfy this hunger for knowledge through forward-looking projects that point the way to more sustainable food systems by responding equitably to changing consumer demands and by influencing demand. These projects complement the agendas of several CGIAR research programs and also contribute to CIAT’s strategy for building an eco-efficient future by seeking to increase biomass recycling, improve the nutritional quality of food, lower crop losses, and reduce greenhouse gas emissions in food systems.

About CIAT

The International Center for Tropical Agriculture (CIAT) – a member of the CGIAR Consortium – develops technologies, tools, and new knowledge that better enable farmers, especially smallholders, to make agriculture eco-efficient – that is, competitive and profitable as well as sustainable and resilient. With headquarters near Cali, Colombia, CIAT conducts research for development in tropical regions of Latin America, Africa, and Asia.

www.ciat.cgiar.org

CGIAR is a global research partnership for a food-secure future. Its science is carried out by the 15 research centers who are members of the CGIAR Consortium in collaboration with hundreds of partner organizations.

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CIAT Strategic Initiatives

FoodLens is one of three global initiatives created under CIAT’s new strategy for the period 2014–2020. The aim of these forward-looking, collaborative endeavors is to open wider avenues for enhancing the development impact of CGIAR research.

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