



EDUARDO SOTERAS/AFP/GETTY

A woman feeds her malnourished child in the Democratic Republic of the Congo.

# A new global research agenda for food

Lawrence Haddad, Corinna Hawkes and colleagues propose ten ways to shift the focus from feeding people to nourishing them.

**A**round 57 of the 129 countries that have data on undernutrition and obesity are struggling with both<sup>1</sup>. Everywhere, the consumption of vegetables, legumes, fish, nuts, seeds and fruits is much below that recommended by the World Health Organization (WHO). Meanwhile, people are consuming too much fat, processed meat, salt and sugary drinks.

Global food systems are failing to keep us all fed, let alone healthy. How food is grown, distributed, processed, marketed and sold determines which foods are available, affordable and desirable. These factors have a crucial role in the quality of people's diets, and hence play a vital part in health.

Diet is the number one risk factor in the global burden of disease<sup>2</sup>. Poor diets are

responsible for more of the global burden of ill health than sex, drugs, alcohol and tobacco combined. In the next few decades, food systems will be under further stresses from population and income growth, urbanization, globalization, climate change and increasingly scarce natural resources.

Although 795 million people are undernourished and lack essential vitamins and minerals<sup>3</sup>, obesity is behind many of the chronic diseases that are sweeping the globe, from type 2 diabetes to heart disease. One in three people is malnourished. Almost one-quarter of children under five have stunted growth, with diminished physical and cognitive capacities. Across Africa and Asia, the impact of undernutrition on gross domestic product is 11% annually<sup>1</sup>. At the same time,

2 billion adults worldwide — more than 1 in 4 — are overweight or obese.

This is not a problem that countries can overcome through growth or development. As economies expand, many social factors improve, but the quality of diets does not. Hunger and famine have fallen substantially, thanks to rapid poverty reduction and rising agricultural productivity. But progress remains too slow in many respects. Moreover, middle- and low-income countries are now following the well-worn, highly damaging path from undernutrition to obesity.

The efforts required from the international community are equivalent to those marshalled to tackle HIV/AIDS, malaria and smoking. In particular, urgent interdisciplinary research is needed to support concerted

policy action. That is our conclusion from compiling a report commissioned by the Global Panel on Agriculture and Food Systems for Nutrition and published in September<sup>4</sup>. It includes a call to scientists, governments and donors to work out how to craft and sustain food systems to provide nutritious diets for all.

As the United Nations Food and Agriculture Organization (FAO) and the WHO meet to discuss the UN's Decade of Action on Nutrition in Rome this week, researchers, governments, industry experts and funders must commit to meeting these challenges — which are inextricably knitted with the Sustainable Development Goals, especially goal 2 (zero hunger) and goal 3 (good health and well-being). Piecemeal action will not do: the trends are so large and interconnected that the entire food system needs overhauling. No single government ministry or sector 'owns' the quality of diets available to the consumer. The lack of well-defined public-sector responsibility in many countries is all too clear.

### TEN RESEARCH PRIORITIES

Here we set out a new global research agenda for nutrition. It is aimed mainly at researchers, funders and governments, but has important messages for all stakeholders.

**Identify entry points for change.** Food systems are dynamic; they comprise production, storage, transport and trade, processing, transformation and retail and the interactions between these. We need to understand how each part of the system can contribute in an integrated way to making high-quality diets more available, affordable and appealing. For example, how can we reduce food spoilage in storage, minimize nutrient losses during transformation and improve food quality with minimal processing? Studies should involve multi-country and site-specific appraisals, qualitative research and mapping, and thorough analyses of value chains. Donors and funders should promote initiatives that are interdisciplinary, involve consumers and policymakers, and analyse which incentives cause actors in the food system to behave differently.

**Make more data on diets widely available.** It is currently difficult to compare diets across cultures, geographies and time. This has hampered a global consensus on what constitutes a healthy diet. A pilot project — the FAO/WHO Global Individual Food consumption data Tool (FAO/WHO GIFT; see [go.nature.com/faogift](http://go.nature.com/faogift)) — aims to answer some elements, but has too few resources to be truly effective. The project needs a larger team to collate many more national surveys and develop guidelines for future surveys. Other initiatives include the Global Dietary Database project and a proposed



Farming on an industrial scale uses feedlots such as these near Yuma, Arizona.

World Gallup Poll initiative to include questions on diet quality. Such efforts are poorly funded and piecemeal. What is needed are open-access portals for diet data, such as the WHO's global database on child malnutrition. This incorporates hundreds of surveys of child heights and weights, and has proved invaluable for documenting progress and holding stakeholders accountable.

### Agree on what constitutes a healthy diet.

People do not choose nutrients, they select combinations of foods in differing amounts. Pairings of single foods and diseases are the basis of risk-factor analysis in global burden studies, but tell us little about diets as a whole. Although there are studies on the value of, say, the Mediterranean diet, there are few from low-income countries. And even the nutritional profile of many important indigenous foods remains poorly known. A better understanding of dose-response relationships is needed. Is it better to eat a little of each food category frequently, or a large amount less often? Food researchers need to be more creative and research funders bolder in assessing the health implications of common combinations of foods.

### Tackle different forms of malnutrition simultaneously.

Credible information on what works to reduce both undernutrition and obesity (and related diseases) is essential if governments and industry are to scale up investments aimed at improving diets. Successful programmes that tackle undernutrition tend to be on a small scale<sup>5</sup>. Evidence on how to address unhealthy diets

associated with obesity are often population-based and thus harder to evaluate. There is analysis on the effect of interventions to improve the availability, affordability and appeal of food, such as taxes, school-food standards and nutrition labelling<sup>6</sup>. But the impact of these on population subgroups or on obesity is little studied. The most serious gap concerns interventions farther back in the food system, such as standards and new incentives for more-effective transport and retail of nutritious foods (see also 'Identify entry points for change').

**Understand the role of chain length.** In 'short-chain' models, food passes directly from those who grow or rear it to those who eat it, such as in subsistence-farming contexts, at farmers' markets, or where school-meals programmes source food from family farms. In 'long-chain' systems, foods travel great distances or go through multiple transactions to reach consumers. What combination of these systems ensures high-quality diets — enough of the right kind of food at the right price, for all? Research must probe sustainability concerns, such as how to reduce food waste and greenhouse-gas emissions, and investigate the social and economic benefits of different types of system (see also 'Fix metrics').

**Analyse business incentives.** Apart from consumers, the most numerous stakeholders in global food systems are private entities — from farmers to food processors, wholesalers and retailers. In 2015, just 4 of the top 25 food and drinks firms made one-third of the total sales. Thus, the private sector could help to tilt food systems towards higher-quality diets, and could respond innovatively to targets and regulations. We need to understand what incentives will tip these levers in a healthier ▶

***"It is difficult to compare diets across cultures, geographies and time."***



► direction. We need better mechanisms for public–private dialogue to shape and implement research priorities. Collaborations between competitors during the early development of commercial products could shift sectors collectively and overcome disincentives for single firms to act in isolation. One such example hosted by the Global Alliance for Improved Nutrition is a programme called Business Platform for Nutritious Research, which seeks to substantially increase business investments in nutritious products and services by addressing evidence gaps that limit companies' willingness and ability to make such investments. To strengthen accountability, research is needed on which public–private partnerships improve diets most. Such research exists in the health field<sup>7</sup>.

**Account for climate.** Global warming will affect the availability of different foods from land and sea, and their nutritional value. Diet changes will also drive significant shifts in land and water use and in greenhouse-gas emissions<sup>8</sup>. How might diversification of local food systems address agricultural resilience and nutritional diversity? The consumption of some of the most micronutrient-dense foods — including fruits, vegetables and animal proteins — must be increased in poor communities, but such foods place substantial demands on environmental resources. Research on less-polluting production of these, in the context of rapidly changing livestock systems, is crucial. Research could also identify ways of achieving big wins for environments and diets. Evidence suggests, for instance, that the adoption of WHO guidance on healthy diets could reduce global mortality by 6–10% and food-related greenhouse-gas emissions by 29–70% compared with a reference scenario in 2050 (ref. 9).

**Study supply and demand.** The availability of food is influenced by consumer preferences, relative prices and supply. Processed foods and sugar-laden beverages are found in remote areas of Nepal and Ethiopia; a choice of vegetables, fruits and fish is not. In part, this is because investment in improving the production and availability of agricultural commodities has for decades been focused on a small number of cereals. Funding in global public-sector research institutions is still focused mostly on rice, wheat, maize (corn) and other grains. About 45% of private-sector agricultural research investment is on maize<sup>10</sup>. Public and private research on neglected nutritious commodities — including fruits and vegetables such as mangoes, carrots and spinach, pulses such as lentils, fish products and seeds and nuts — needs to increase with a focus on their yield and resilience to pests, diseases and climate change. This is an important message for the global research community, broadly led

by the Consultative Group on International Agricultural Research (CGIAR). Donors should support the CGIAR's 2014 commitment to mainstreaming nutrition in all crop-breeding programmes, and its attempts to direct more research to healthy agriculture and food systems. Promoting supply has to be coupled with promoting demand. More research is needed to educate, inform and encourage consumers to make positive choices for healthful diets — in low- and high-income settings.

#### Identify the economic levers for change.

Every US\$1 spent on successful nutrition programmes offers roughly \$16 of benefits<sup>1</sup>. But we do not know enough about where in the food system we should invest in any one policy, regulation or programme to generate

**“More research is needed to encourage consumers to make positive choices for healthful diets.”**

the largest net pay-offs. Policymakers in many countries, including Indonesia, Rwanda and Peru, are calling for such evidence. The economic gains from improving the food system and diet quality must be calculated for different sectors and sub-systems under various scenarios — increased demand, climate change, industry innovation and shifts in consumer preferences.

**Fix metrics.** Raising diet quality through food systems cannot be at the expense of other Sustainable Development Goals. Calls to price the ‘real’ cost of water consumption or carbon production have promoted understanding of the economic externalities of individual and government choices. We need the same approach for diets (see Comment, page 33). We must be able to answer questions such as how the overall benefits and costs of consuming locally sourced fruits and vegetables compares with importing them. The relationship between health, energy use, water use and greenhouse-gas emissions involves trade-offs, but the variety of foods in each category means there is great scope for finding wins — if fine-grained analyses are done.

We urgently need effective methods for measuring both the sustainability and nutritional value of diets. Current work on the carbon footprints of commodities should be extended to analyses of the whole food system. Also essential is transparent annual accounting of what countries are doing to improve different points in the food system and with what effect. There is a real opportunity for the FAO, African, Asian and Latin American development banks and the World Bank to develop scorecards to track how nutrition-sensitive national urban and rural food systems are.

#### WHAT NOW?

The era of commodity research aimed at feeding a starving world is over. A new era has begun that requires us to nourish everyone in ways that can be sustained environmentally, economically and culturally. Policymakers urgently need to recognize that diets are compromising economic productivity and well-being as never before. Delegates to the upcoming G20 and G7 meetings in 2017 should take collective responsibility for fixing our failing food system.

Funders who support agriculture and nutrition research must focus much more of their resources accordingly, doubling their current allocations to more-nutritious food systems by 2020. Scholars and journals must become more pluralistic in the methods and approaches that they support. We can only fix problems in our food systems if we diagnose them correctly. If we do not, the world's future health and economic problems will be very much greater than they are today. ■

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