

This brief series was developed in preparation for the Foresight Breakout Session of the Global Conference on Agricultural Research for Development (GCARD 2012) and the Global Foresight Hub¹. The briefs were written to communicate to a wider audience, such as policy makers, civil society organizations, researchers, and funders. The briefs were classified into three categories: Future Studies, Regional Update, and Visioning.

Sustainable Food Consumption and Production in a Resource-constrained World

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“By 2050 the world’s population will reach 9.2 billion (...). Nearly all of this population increase will occur in developing countries. (...) about 70 percent of the world’s population will be urban (...). Income levels will be many multiples of what they are now. In order to feed this larger, more urban and richer population, food production (net of food used for biofuels) must increase by 70 percent.”

This quote from the Issue Brief “How to feed the world in 2050”³ sketches an apparently inevitable path towards the future. But is this path really inevitable? Is it really necessary to increase food production by 70 percent? Boosting agricultural productivity seems to be the inevitable solution, but to what extent is this analysis based on an underlying worldview that is not made explicit?

In 2010, the Standing Committee on Agricultural Research (SCAR), a committee consisting of European Union (EU) Member State representatives and European Commission officials, asked a group of eight independent experts from various disciplines to carry out a foresight exercise to guide European agricultural research. The aim was to provide policy makers with building blocks to engage in a transition towards a world with resource constraints and environmental limits. The report, which was published in February 2011, was based on a desk study of relevant national, regional and international documents published in 2009 and 2010. It took a long-term perspective towards 2050 and focused on developments within the EU, but taking into consideration the global context. The process was monitored by the Foresight Working Group of the SCAR, and feedback on intermediary results was provided in an interactive workshop attended by stakeholders from agriculture, industry, trade, academia and government.

A picture of a resource-scarce world

The report highlights that many of today’s food production systems compromise the capacity of the Earth to produce food in the future. This makes future global food security highly uncertain. Food production is exceeding environmental limits or is close to doing so.

Nitrogen synthesis exceeds the planetary boundary by a factor of four, while phosphorus use reaches the planetary boundary. Land use change and subsequent land degradation, and the dependence on fossil fuels, contribute to about one fourth of greenhouse gas emissions. Agriculture and fisheries are the single largest driver of biodiversity loss.

¹<http://www.egfar.org/our-work/shaping-future-together/global-foresight-hub>

²This text is the intellectual property of the authors; neither the text nor this policy brief necessarily represent the opinion of the European Commission and the SCAR.

³http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

Regionally, irrigation exceeds the replenishment of water resources. Given population growth and increasing prosperity and the accompanying rise in consumption, ecosystem services and entire ecosystems such as coral reefs are expected to collapse by 2050 if production systems and consumption patterns do not change. The various scarcities the food system touches upon and the driving forces causing these scarcities are characterized by many similarities and interlinkages between issues, such as biodiversity and climate change, but also across different scales. Hence, global governance is badly needed to tackle these issues.

Pathways towards a resilient and sustainable food system

The experts identified three main pathways to facilitate the transformation of the current food consumption and production system towards greater resilience and sustainability: (1) changing consumption patterns; (2) technological innovation; and (3) organizational innovation. Each of these domains contains important levers for change.

Consumption patterns:

Trends in consumption include the increasing variety of food consumption, changing habits and the divergence in diet between the rich and poor, leading to a health gap. The average Western diet, with high intakes of meat, fat and sugar, is a risk for individual health, social security systems and environmental life support systems. Obesity, type-2 diabetes, hypertension, osteoarthritis and cancer are widespread diet-related diseases. The nutrition transition towards more meat-based consumption that is occurring in low- and middle-income countries has worldwide consequences for food supply and places major stress on natural resources, as well as on climate change. However, evidence is emerging that in developed countries a second transition is occurring from a diet rich in animal proteins to one that is closer to health guidelines and that at the same time puts less pressure on the environment. In addition, consumers need to be empowered to choose themselves, instead of being told what to eat and what to avoid, as structural elements such as the food industry, the retail sector and the media play a key role in changing consumer habits.

Technological innovation:

Investment in technological innovation is critical to achieving the transition required to make the food system more efficient and resilient. Trends in technological innovation are manifold, and include advances in biotechnology, nanotechnology, information and communication technologies, and agro-ecology. However, advances in these fields may hold threats as well as opportunities. Moreover, there is an increasing consensus that technology cannot provide silver-bullet solutions and that socioeconomic changes have to accompany technological change.

Organizational innovation:

Organizational innovation is an emerging lever of change, but one that many studies have underestimated. Changes in the governance of food supply chains are particularly central, as contrasting trends can be observed. On the one hand, the increasing concentration of resources and power into a limited number of multinational corporations raises concerns. In addition, the increasing importance of services added to foodstuffs can have both positive and negative effects on sustainability. On the other hand, some businesses are taking the lead in making the food system more sustainable by setting up corporate social responsibility programs and participating in multi-stakeholder policy platforms.



Community Supported Agriculture (CSA) farm in Leuven, Belgium. Personal photograph by author. 2012

Making worldviews explicit

Foresight studies always use a certain discourse that makes up a consistent storyline or narrative that reflects underlying worldviews and paradigms. These are sometimes made explicit, but are mostly implicit, particularly when the narrative reflects the dominant paradigm. An important observation in the context of foresight studies is that a dominant narrative tends to succeed in attracting financial resources at the expense of alternative narratives proposing alternative futures.

In the discourse used by foresight studies on the future of the agricultural and food system, several narratives can be found. The experts chose two narratives to represent the two ends of the spectrum. The dominant narrative is referred to as the Productivity Narrative and the alternative narrative as the Sufficiency Narrative. Making these underlying worldviews explicit is a first step towards a better understanding of our possible futures.

According to the Productivity Narrative, science has the potential to develop technologies that can boost productivity while addressing resource scarcities and environmental problems. Science, therefore, offers solutions to the problems of world population growth and to slowing agricultural productivity over recent decades. To avert inadequate food supply, massive investments need to be made in research and development, in accelerating the adoption of technology by farmers and in addressing barriers in rural infrastructure, trade barriers and access to markets.

According to the Sufficiency Narrative, demand increases need to be mitigated through behavioral change and structural changes in food systems and supply chains. Moreover, environmental externalities need to be internalized in markets through appropriate governance structures that also address the disruptive effect of unregulated trade. This is the alternative solution to a world population of 9.2 billion people in 2050 and consequential environmental problems, as the Earth does not have the capacity to support expected rates of consumption.

Building a vision for the future of agriculture and the food system involves using at least these two narratives to make more explicit assumptions about what we consider as possible trends and possible levers for action, on the productivity side, the efficiency side, or the demand side.

The way forward

The study concludes that smarter and more targeted application of existing technologies will help resolve many of the challenges facing agriculture over the next 50 years, but that new science and innovation will be required to address the more deep-seated challenges. These challenges include climate change, land degradation, water and energy availability, biodiversity loss, as well as the changing patterns of pests and diseases. Advances in science and technology in areas such as biotechnology, nanotechnology, remote sensing and information and communication technologies, and a better understanding and use of agro-ecological processes, hold the potential to greatly change our approach to the sustainable use of resources and production of a secure supply of food. Breakthroughs in science and technology must complement and underpin new approaches to farming systems. Therefore a two-tier approach to agricultural research is needed in order to address issues of productivity and sufficiency.

The first approach expands and intensifies ongoing research on productivity and sustainability. This approach is referred to by the US National Research Council as the 'Incremental Approach'⁴ and by The Royal Society as 'Sustainable Intensification'⁵. In the same way that yields can be increased by using existing technologies, many options exist to reduce negative externalities. Fundamentally, it involves expanding ongoing research that seeks to improve productivity while enhancing natural resources and addressing environmental concerns. The goal of this 'component type' research, which tackles the parts rather than the whole of the farming system, is to identify and develop farming techniques that can improve specific aspects of sustainability.

⁴NRC. 2010. *Towards Sustainable Systems of Agriculture in the 21st Century*. Committee on Twenty-First Century Agriculture, Systems and Board on Agriculture and Natural Resources, National Research Council (NRC). Washington, D.C: The National Academies Press.

⁵The Royal Society. 2009. *Reaping the Benefits: Science and Sustainable Intensification of Global Agriculture*. London: The Royal Society.

The second approach recognizes agriculture as a vital component in the management of natural resources and emphasizes the importance of a holistic and systems-based approach to knowledge production and sharing. The current knowledge infrastructure has historically excluded ecological, environmental, local and traditional knowledge, but also the social sciences and humanities. Agricultural science will need to embrace a much broader set of understandings and data if future challenges are to be addressed. This approach is based on designing farming systems that balance the various dimensions of sustainability from the outset. The resulting systems must, of necessity, differ in significant respects from current mainstream production systems. Developing these new systems will result in a different approach to farming practices and the natural environment, the use of scarce resources, food markets and the ecological systems in which the systems operate.



Cattle Feedlot. NDSU Ag Communication. February 11, 2011

Impact and lessons learned

This meta-analysis has pointed to the criticality of resource scarcities on the one hand and to the importance of underlying narratives or worldviews in dealing with these scarcities on the other. In this way, the foresight report is having an impact on the implementation of policies that are being developed for the 2014-2020 policy period in the framework of the Innovation Partnership on Agricultural Productivity and Sustainability and Horizon 2020, the EU's upcoming research and innovation program. Recently, the report has been used as an input into the process that will result in the European Commission's Communication on Sustainable Food in 2013.

Process-wise, several lessons can be drawn from the foresight exercise. First, foresight may benefit more from an exercise that truly integrates a wide range of disciplines than from an effort in which various disciplines work towards a common goal but do so in separation. Second, the relatively independent mandate given to the experts who carried out the exercise gave rise to a number of frame-breaking considerations. It is an open question whether such considerations would have been formulated if stakeholders had been involved from the outset. However, frame-breaking considerations are by definition difficult to communicate, as they question the worldviews held by many stakeholders, and particularly when they are not produced together with stakeholders.

Citation:

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