FiBL
Forschungsinstitut für biologischen Landbau
Institut de recherche de l'agriculture biologique
Research Institute of Organic Agriculture
EXCELLENCE FOR SUSTAINABILITY

Research Institute on Organic Agriculture
Forschungsinstitut für biologischen Landbau
Institut de recherche de l'agriculture biologique






THE ROLE OF SCIENCE, TECHNOLOGY AND INNOVATION IN ENSURING FOOD SECURITY BY 2030 – RESULTS OF A STUDY FOR UNCTAD

Dr. habil. Ulrich HOFFMANN

Inter-Sessional panel meeting of the United Nations Commission on Science and Technology for Development (UNCSTD), Geneva, 23-25 January 2017

INTRO-SLIDE 1: Cornerstones of the Systemic Challenge

Interrelationship between food, feed, fiber and fuel production

Agriculture triggered unrest & migration

1-2 bn people mal or under-nourished, esp. in rural areas

Perspective of sustainable food systems

Developmental role of agriculture & population growth

Adaptation/ resilience

Very high GHG intensity and serious environmental crisis of agriculture

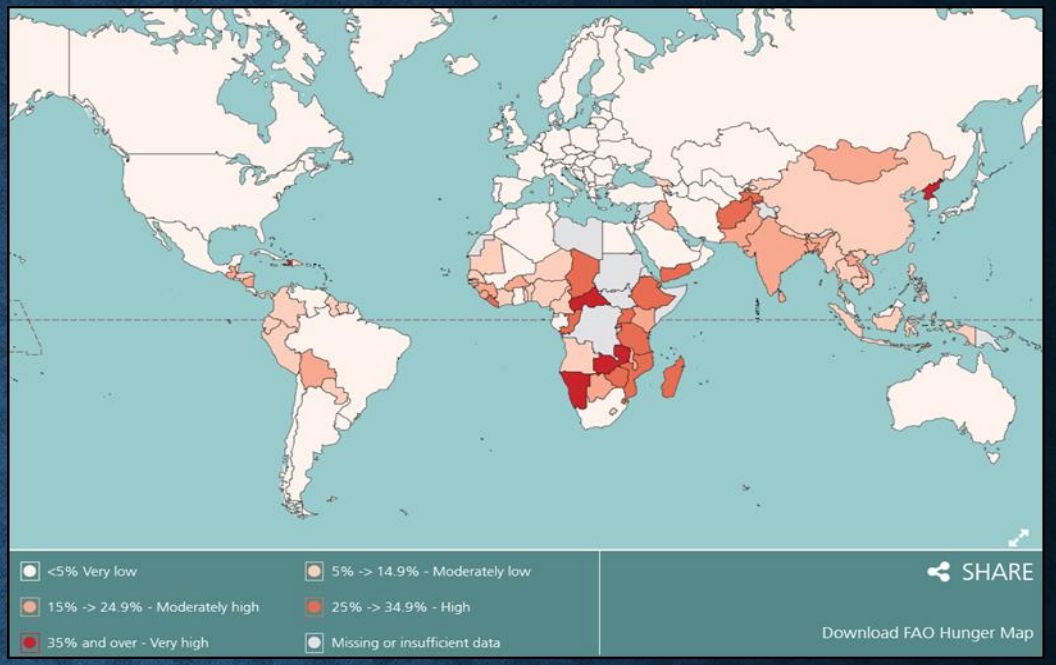
2

INTRO-SLIDE 2:
Making STI Part of System's Thinking on Food Security within a Sustainable Food System

- With the benefit of hindsight, only few problems in agriculture have mainly been caused by a lack of technology, many have been related to social, economic and cultural issues that require structural changes, not techno-fixes. It is therefore critical to first of all define what problems are best solved by changing legal frameworks, trade policies, incentive structures or human behaviour and, second, what contribution technology could make within this very context.
- Poverty, in the sense of limited access to resources, is more likely the cause of low productivity in farming rather than low productivity being the cause of poverty.

Relation between the SDGs, MDGs & the 4 Dimensions of Food Security

- MDGs aimed at halving the proportion of people suffering from hunger & extreme poverty, the SDGs aim at ending all forms of poverty & hunger & achieving food security.



Hunger hotspots in the period 1990-2015

- Except SDG 17 (on building partnerships), the respective SDG targets of each goal deal at least with one of the dimensions of food security (the 4 dimensions are: (i) food availability, (ii) access to food, (iii) food utilization, and (iv) food stability).
- It is crucial to emphasize that the SDGs implement a food system-perspective on food security. The food system approach was already incorporated in the “Zero Hunger Challenge - Transforming our Food Systems to Transform our World”- Initiative, launched in 2012.

Putting STI into the Context of Achieving Food Security

For achieving food security in the context of the 2030 agenda, STI have to be put into a three-pronged context of a sustainable food system:

1. The **socio-economic dimension**, mainly understood as a reduction of poverty and inequality, particularly in rural areas bearing on due access to food.
2. The **environmental dimension**, focusing primarily on environmental integrity and the reproductive capacity of the agro-ecological system.
3. The **resilience dimension**, emphasizing socio-ecological resilience faced with political and environmental crises as well as the challenges of climate change.

Key Challenges to Food Security in the Foreseeable Future

Economic & Social:

- Together with mining, agriculture remains the most important economic sector in many developing countries (10% of GDP, but 50%+ of gross product & 50-80% of direct & indirect employment).
- Hunger is primarily caused by rural poverty (the hungry comprise 50% smallholder farmers, 20% agr. labourers &10% pastoralists, fishermen and gatherers; the remaining 20% live in the periphery of urban centres).
- Although agr. trade accounts for less than 10% of total production (if subsistence supply is included), WTO rules bear significantly on domestic agr. policy space.

Environmental:

- Global env. change, incl. land degradation, loss of biodiversity, changes in hydrology, and changes in climate patterns will have serious consequences for food security.
- Rockström et al. (2016) conclude that agriculture has become the single largest driver of environmental change and, at the same time, it is most affected by these changes.
- Soil must now be regarded as a non-renewable resource.

Political:

- Rising political conflicts and social unrest, and related migration.

Key challenges for future STI

- Env. change, mainly climate change, and economic change impact on all dimensions of food security, not only agricultural production. To achieve SDG 2, locally adapted, context-specific pathways to sust. agr. development for food security, incl. adaptation/resilience strategies are needed.
- Food insecurity is connected to poverty and lack of purchasing power. Improving food security is therefore related to the improvement of the situation of poor, vulnerable population including smallholder farmers.
- Securing food supply for a growing population needs an effort of the whole food system, starting with improved agricultural yields, where yields are poor, diversified production systems, closure of nutrient cycles, investment beyond the farm (reduced food losses and wastage, market access, better distribution) and changed consumption patterns.
- There is a strong need for stepping up the current agricultural extension services, but also education and access to info & knowledge related to food production and nutrition in general to break the vicious circle of ‘poor research and extension for poor farmers’.

7

Key challenges for future STI (cont'd)

- The potential of stakeholder participation and cooperation for the development of locally adapted research and development strategies could improve agricultural production and sustainable consumption.
- Sustainable agriculture and food production based on smallholder farming is often the only economic sector in developing countries that can generate jobs and sufficient income and feed a rapidly increasing population in the foreseeable future, notably in Africa and South-Asia.
- There is a need for well-designed and reliable national and regional policies as important frameworks for food security.

8

Framing Future STI Focus

STI must address a complex set of objectives:

- Adaptation to new challenges (i.e. mitigation of and adaptation to climate change, access to renewable energy, need for energy and resource efficiency and the sustainable management of resources, drastically reducing soil erosion, preservation of biodiversity).
- Addressing the old challenges (productivity growth, product quality).
- Adaptation of food systems to global environmental change will require more than just technological solutions to increase agricultural yields.
- Strengthening production potential of smallholders, including for subsistence production, will be key to addressing the poverty-malnutrition nexus in rural areas.
- Use of off-grid renewable energy sources, big data and the internet of things will have significant bearing on future dynamic development of the sector.

Framing Future STI Focus (cont'd)

There are four broader topics that should play a key role when planning and implementing STI related to food security:

- **The role of fertile soils and soil protection** (it should always be assured that loss of soils is halted and soil fertility is conserved or increased).
- **The role of livestock** (STI approaches and projects should pay more attention to what specific role livestock can play and which options for improvement exist).
- **Adaptation to climate change** (planning and performance assessments of STI should always refer to a number of climate change adaptation indicatorsin particular water availability and temperatures, but also extreme events).
- **Support agro-ecological, low external input and extensive production systems** (such systems tend to increase diversity and resilience of agr. production systems thus contributing to a reliable livelihood basis, particularly for smallholder farmers and agricultural labourers).

10

Framing Future STI Focus (cont'd)

In our report, we see research topics that are not in the direct focus of the SDGs:

1. **Provide knowledge on how to improve resilience of food systems in rural areas:**

- Provide and improve strategies for sustainable intensification (e.g. organic, permaculture, integrated pest management, low-external-input-dependent, high-diversity and regenerative agriculture).
- Enhance production diversification with underutilized and locally adapted crops for food, feed, wood and fibre production.
- Develop strategies on how to strengthen integration of livestock in sustainable agricultural systems.
- Adaptation of food production to climate change e.g. production methods, water management, weather forecast, disaster prevention and anticipation.
- Need to increase public investment in research & advisory extension services that are coherent with agro-ecological production systems adapted to smallholder farmers' needs.

11

Framing Future STI Focus (cont'd)

As regards specific smallholder needs, STI should focus on:

- Developing partnerships with rural producers' organizations and NGOs.
- Use of non-proprietary genetic material and research to develop locally adapted genetic material able to produce under difficult conditions.
- Development of low-cost innovative proposals for investments.
- Promotion of diversification of production systems.
- Support to the development of activities that increase the value added at smallholder level.

12

Framing Future STI Focus (cont'd)

2. Use the potential of cooperation

- Develop approaches for community management of soils, grasslands and water resources.
- Explore the potential of domestic market access and trade.
- Develop frameworks for cooperative investment in agriculture.
- Promote new forms of interaction between researchers, farmers and their organizations, and collaborative dissemination and extension services.

13

Framing Future STI Focus (cont'd)

3. Develop coherent policy

- Develop food security policies adapted to the needs of rural, urban, peri-urban, remote and mountainous areas.
- Besides focusing on efficiency measures (impacts or resource use per unit of product), more emphasis should be placed on sufficiency measures that target overall production and consumption levels (e.g. food wastage; animal product shares in human diets) and consistency measures that address adequate resource use (e.g. the role of grasslands, landscape management) in sust. food systems .
- Assuring shorter-term food security for 2030 in a context of still dominating rural population needs to already prepare the ground for food security in 2050, when two-thirds of all people are expected to dwell in urban areas.
- Support participatory and cooperative research approaches.
- All that is likely to require new ways to approach the science-policy interface.

14

Framing Future STI Focus (cont'd)

4. Reflective knowledge sharing and extension

- Explore the potential of farmer field schools, peasant innovation systems and demonstration farms & duly use indigenous & local knowledge.
- Support participatory development and utilization of ICTs and related new developments aimed at empowering people.

5. Innovative food sources

- Explore the potential of additional food and feed source (insects, algae).
- Analyse the potential of aquaponics and vertical farming.
- Harness urban farming and gardening approaches.
- However: what is technically possible doesn't mean that it is viable/sust. at large scale.

6. Remote technologies

- Explore the potential of 3d-printing and drones for assuring supply to remote and inaccessible regions.
- Utilize the high coverage of cell-phones in many areas of high undernourishment.
- Utilize remote sensing for improved data collection as a basis for extension services and information provision.
- Use 'big data' for effective land-use and crop planning in the context of landscape-level, local deployment of agro-ecological and other truly sustainable eco-functional intensification approaches.

THANK YOU