Beware - Major Challenges Ahead

By Urs Niggli
FiBL Director and IFOAM World Board Member
email: urs.niggli@fibl.org

Organic agricultural research has a rather compressed history and a very busy future. Agricultural research generally started at universities about 150 years ago, and the earliest state research centres were founded in many parts of the world 120 years ago. Commercially driven research only started to become important 100 years ago with the synthesis of nitrogen and the production of copper fungicides.

Compared to these long epochs of scientific work which enabled conventional agriculture to become so productive, substantial funding for organic research is still in its infancy. It is amazing though how many results have been achieved and how fast the knowledge gathering on organic systems has grown in the last 15 years. The effectiveness of investment into organic research is obviously high and is boosted by the good participation of the users, especially farm families and processors. This makes research activities that target organic farming and food chains attractive for developing countries, as knowledge sharing and mutual learning is a specific quality of organic research.

Currently, organic farming is challenged like never before since the era when pioneers in different parts of the world started to experiment with their novel ideas. By growing out of the niche, the principles of organic farming have to be implemented on a larger scale, which offers opportunities (e.g. by the economy of scale) but might also threaten some of the qualities as they are outlined in the four principles of IFOAM. In addition, huge global problems (climate change, water shortage etc.) will superimpose on the further development of food production in general and will also change the shape of organic farming.

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The most frequent questions raised theses days are - "Isn't organic farming going to increase food insecurity?", or "How sustainable is organic farming when land use, water consumption or biodiversity have to be optimized for fast growing food quantities?", or "Can organic farming reduce the ecological footprint of societies' food consumption pattern?". Mainstream agricultural science cherishes the illusion that food security is a simple problem of yield quantities and it nourishes the desperate hope of policy makers that it can

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be solved by novel technologies alone. To double the yields of crops by 2050 has therefore become a mantra of seed giants like Monsanto. This challenges organic farming with questions like "How powerful and fast is the organic approach in adapting to unpredictable changes?" and "How does organic farming deal with novel technologies and what alternatives can be drawn from the organic principles?".

Policy makers in developing countries often see organic farming as an antiquated European technology exported to them in order to satisfy retro and faddish consumer demands. The fact that only solutions consistently embedded in holistic systems can handle the trade-offs between the eco-system services in a sustainable way needs therefore to be underlain by excellent science. Thus, organic farming becomes the 'cutting-edge technology' of the future.

In regions where organic farming has gained a land coverage of 5 to 15 percent and where the market share of organic foods has passed the 5 percent limit, scientists are challenged. Can high quality and authentic food be preserved along industrialized, anonymous and much longer food chains? Which role does corporate social responsibility play in the organic business, and how are clashes between the advantages of global trade and those of local production avoidable? Do certification methods meet the requirements of fast growing markets and how could modern technologies and tools like GPS, traceability, stable isotopes analyses or specific organic quality methods like biophotones or crystallization improve certification?

Some media people make real or alleged gaps between organic claims and the reality of organic production and business a subject for investigation and discussion. Consumer expectations for organic farming and foods are challenging for all stakeholders along the chain. These expectations cover quality patterns of the foods, environmental and ecological benefits, ethical and social conduct like animal welfare, regional production and fair remuneration of farm family work. They are not always consistent and the price elasticity of de-

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mands for organic produce is low as consumers tend to turn to conventional when the organic premium increases. Many socio-economic, technical and experimental research questions can be deduced from the excellent consumer research done in the last 15 years.

On the production side, productivity remains a weakness of organic food chains, affecting the costs and the ecological footprint. There are still considerable productivity reserves which can be deployed by improved soil fertility management. Maintaining good structure with very active soil micro-organisms and soil animal communities in a highly conservative way will become the 'silver bullet' for global food security. A growing number of farmers and scientists work with reduced tillage techniques on organic and biodynamic farms. In addition, intensified breeding under low-input conditions could probably better exploit effects of genotype x environment interactions on genetic gain in breeding programs, both in organic and low-input crop and livestock systems.

To some extent, novel and innovative non-chemical direct treatments, especially for diseases, might also help. Copper fungicides, still indispensable in a few crops like potatoes, wines, selected vegetables, susceptible fruit varieties or hops, are due to be replaced by resistant varieties, by new nature-derived sprays or completely altered production systems. This challenge will keep a lot of scientists and farmers busy for the next 10 years, as long as funding is available.

Novel medication might also play an increased role in animal husbandry, e.g. for the de-worming of free-range animals, mastitis problems and endo-parasites of different farm animals. Preventive techniques are especially important for animal husbandry systems. They consist of best combinations between the choices of breeds, species-

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appropriate keeping and feeding and the way farmers interact with their herds.

Interactions are also important between different farm branches, especially between livestock and crop husbandry. In order to substitute the traditional mixed farm model which was abandoned because of economic and know how specialisation reasons, novel concepts for co-operation, diversification and recycling between farms, along the food chains and in the landscape strategies need to be developed. A higher system-based productivity and lower trade-offs between economic, ecological and social goals of food production might be gained by such concepts.

In order to address all the questions raised in this brief outline, and elsewhere, highly qualified scientists will play an important role in the coming decades. Will this detach innovation from the stakeholders, mainly from the farmers and their well organised organisations? Although specialisation along the knowledge chain of organics foods has grown with the number of people and organisation involved, organic farming has remained a model for participation of producers, consumers, business people and civil society. There are thousands of organic farmers around to world who are proud to host research activities on their farms and who actively participate in them. Many food processors and traders involved in the organic business are paramount at innovative development and exchange a lot of knowledge with food scientists and profit from their input vice-versa.

The fact remains that organic agriculture and organic food chains offer an excellent framework for developing novel solutions for the challenges that global society faces - challenges that conventional agriculture has not been able to solve so far.