Ecology & Farming

Ecology and Farming

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Research Special Edition

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INTERNATIONAL FEDERATION OF ORGANIC AGRICULTURE MOVEMENTS

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Cover photograph: Thai experimental nursery paddy. *Source:* IFOAM.

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THE ORGANIC STANDARD

Grolink

www.organicstandard.com

The Organic Standard is a monthly journal published by Grolink. Distributed by email as a pdf file the journal deals with issues concerning international organic standards, regulations and certification.

Editorial

Too often organic agriculture is portrayed as a mysterious process of muck and magic.

In this issue of Ecology and Farming we have set out to show that in many ways organic production is just as "high tech" and well researched as the rest of world agriculture.

Our "health check" of organic research across the globe reveals real strength and vigour. We look at the search for agro-ecological systems in Latin America; at work in Denmark on eco-functional enhancement; and review the on-going Rodale project in the USA on carbon cycling in the run up to the all important Copenhagen summit.

But, as IFOAM World Board member Urs Niggli points out in his overview article on the future of organic research, there are big challenges ahead in ensuring that we do have the best organic knowledge to continue to lead the way on such crucial issues as fighting climate change and feeding a crowded and hungry planet. Funding and political engagement and support are two key elements that must be enhanced.

Politically though, in many parts of the world, the momentum now appears to be running in the right direction. In the United States - that historically most intensive farming country – a speech in June this year from U.S. Deputy Secretary of Agriculture Kathleen Merrigan, to the third annual Organic Summit, in Stevenson, Washington underlined just how far and how fast farm policy is changing.

Ms Merrigan said -

"On the legislative front, we're very pleased at USDA that organic agriculture gained strong support from Congress in the 2008 Farm Bill…. Congress saw fit to focus on the organic program authorizing a huge increase in research funding. With this measure both sides of the aisle [Republicans and Democrats] sent a powerful signal about their vision for the organic program. These research dollars will go toward production, breeding, and processing methods. They'll help develop seed varieties particularly suited for organic agriculture. That's so important. And [research dollars will] look at some of the constraints to expanding organic agriculture from the marketing and policy side too."

Such enthusiastic support for future organic research and production should give organic movements across the World a real confidence boost. We are on the correct, sustainable path and governments increasingly realise that, too.

MARKUS ARBENZ
IFOAM EXECUTIVE DIRECTOR
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IFOAM Pages

How to Feed The World in 2050

Putting the last first

On the occasion of the World Food Day (October 16th), agro-industry proposed a second Green Revolution based on genetic engineering. This suits their interests but does not contribute to feeding the poor. Organic Agriculture, based on its encouraging concepts, experience and examples, proposes a paradigm-shift in food security policies to ensure that hunger is history by 2050, says Markus Arbenz, IFOAM Executive Director.

In 2009, the number of undernourished people reached over one billion, and three quarters of them live in rural areas. This is more than ever before. Despite the fact that the world produces 125% of that required, 15% of people are hungry, and most of them are women and children. Global agricultural production today fails to feed the world's poorest people since they lack access to income and resources such as fertile land, water, seeds and knowledge for a farming system adapted to local conditions and the demands of markets. The Green Revolution accomplished a lot but failed to combat hunger. It focused only on technology and relied on huge quantities of climate damaging inputs such as agro-chemicals.

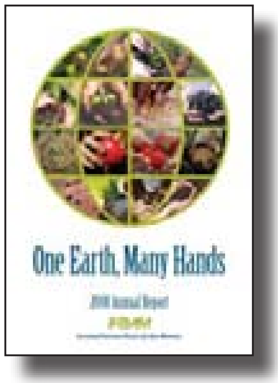
IFOAM advocates for a paradigm shift in agricultural policies and offers its practices and systems to policy makers for adoption especially in the global south and for regions with food insecurity. Organic Agriculture puts the needs of rural people and the sustainable use of natural resources at the centre of the farming system. Locally adapted technologies create employment opportunities and income. Low external inputs minimize the risk of indebtedness and damage to the environment. It increases harvests through practices that favor the optimization of biological processes and local resources over expensive, toxic and climate damaging agro-chemicals.

Organic agricultural practices bring land degraded by unsustainable farming practices, severe drought and soil erosion back into production. And in response to a frequently asked question: Yes, the world can be fed by the worldwide adoption of Organic Agriculture. The slightly lower yields of Organic Agriculture in favorable, temperate zones are compensated with approximately 10% to 20% higher yields in difficult environments such as arid areas.

IFOAM 2008 Annual Report

We are proud to announce that the 2008 IFOAM Annual Report has been completed and is available on our homepage.

The Report, boasting a new, enhanced design, not only provides an institutional overview of IFOAM in 2008, but it also illustrates the work that many hands – together – can achieve.



The impact of IFOAM's knowledge transfer and capacity building activities can be seen in the field - from Thailand to Peru, and from Italy to the Dominican Republic. The activities and their impact are described firsthand by IFOAM members. Interested persons can browse and/or download the 2008 Annual Report on the IFOAM website.

Job Vacancy at ICROFS in Denmark

ICROFS is looking for an academic employee to coordinate European transnational research in organic agriculture and food under the ERA-net CORE Organic II.

The main tasks of the CORE Organic assistant coordinator include communicating with partners of CORE Organic/European Commission, planning and organising meetings, liaising with the EU Commission member states and other stakeholders, overseeing maintenance of the open access database Organic Eprints, and organising joint transnational calls for research projects.

Deadline for applications is November 15, 2009.

Read more at www.icrofs.org/job.

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IFOAM Pages

European Organic Congress on Climate Change, Biodiversity and the Global Food Crisis

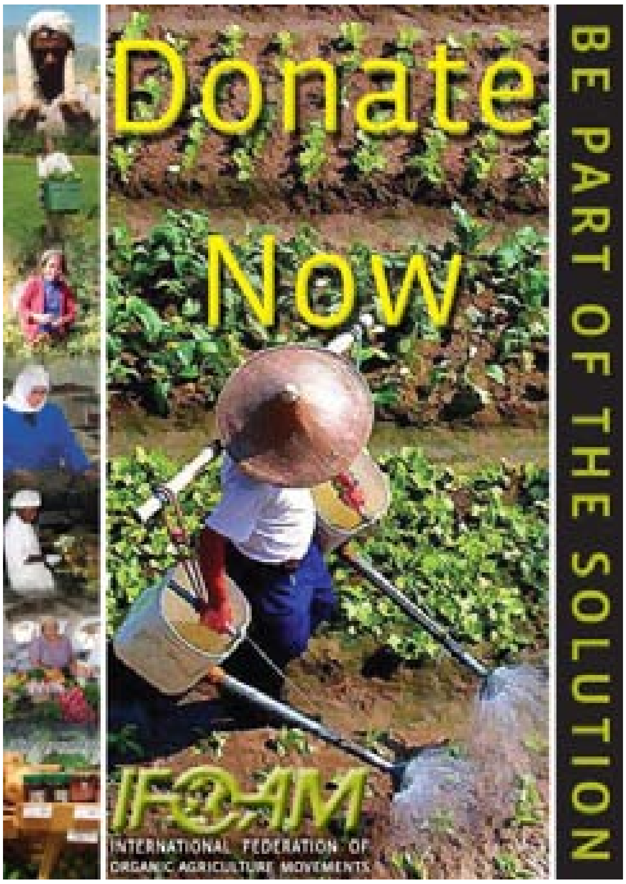
The chances and challenges for organic farming in times of climate change, biodiversity loss and global food crisis. That's the focus of the Second European Organic Congress to be held in Brussels on December 1,2009.

The congress is organised by the IFOAM EU Group and will provide an opportunity for the organic sector and other stakeholders from all over Europe to discuss current challenges and the contributions the organic food system offers to face them.

Delegates will analyse the potential of organic production to face major challenges like climate change, biodiversity loss and global food crisis. Participants will discuss the further development of the CAP after 2013 and the role of the organic food system as the leading concept for sustainable food production. They will also look into necessary policy changes in agriculture policies, look at redirecting research funds and priorities, and will highlight the innovations produced by organic farming in low carbon practices.

The IFOAM EU Group invites all interested stakeholders to the Congress and is seeking co-operation with organic sector operators, farmers and food sector organisations as well as environmental and consumer organisations and trade unions. Further information through the Congress website.

Save the date! The Congress Organic Farming in times of Climate Change, Biodiversity Loss and Global Food Crisis will be held in Brussels, December 1, 2009.



IFOAM and Copenhagen Climate Change Campaign

IFOAM is preparing for the UN Climate Change Conference in Copenhagen this December. IFOAM is an accredited observer organization to the UN Climate Change Convention and will attend the conference to expose key decision-makers to the role that Organic Agriculture (OA) has to play in climate change mitigation and helping farmers and communities adapt to the impacts. The key message that we will take to Copenhagen is that OA is a high sequestration, low emission, food secure solution to climate change.

We have engaged leading organic research members amongst others in the development of climate change publications and messages. Messages and information will be made available for members to display on their websites to increase awareness of the climate change benefits of OA. If your organization would like content for uploading to your website please contact Anna Wissmann in Bonn, a.wissmann@ifoam.org

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Organic Farming Research Worldwide – An Overview

By Helga Willer
FiBL Switzerland
Web: www.fibl.org

Research in organic farming has increased considerably in recent years. Up to now, activity has been greatest in Europe, but recently organic research has increased in other parts of the world, and more and more players are appearing on the scene. Research is mostly carried out in a national context, but international coordination and cooperative efforts are increasing. This article summarizes some key facts about organic farming research worldwide.

Key institutions

Europe is the cradle of organic farming research; and it was where the first biodynamic research was conducted as early as the 1920s. Today there are many specialized organic research institutions. For instance, there are private institutes like Forschungsring (Germany), FiBL (Switzerland, Germany, Austria), the Organic Research Centre Elm Farm (UK), the Louis-Bolk-Institute (NL), the Bioforschung Austria and government-funded institutes such as the International Centre of Organic Food Systems (ICROFS) in Denmark.

Furthermore there are many specialized university chairs and institutes (e.g. in Bonn, Budapest, Kassel, Munich, Newcastle, Tartu, Vienna, Wageningen, and Warsaw). In addition, many key agricultural research institutions in Europe have taken organic projects on board, even where the institution has no specific organic focus, like Aarhus University in Denmark; Wageningen University and Research Centre in the Netherlands; INRA, France; von Thünen-Institute, Germany; Agroscope, Switzerland; Gumpenstein, Austria.

In most other parts of the world organic farming research is mostly carried out at universities, even though only a few have specialized university chairs. The universities that do include the University of Georgia in Tbilisi, at Iowa State University and Dan Kok University in the Republic of Korea. There are numerous other universities that, even though they have no chairs for organic farming, play an important role in organic farming research and teaching. In Africa, for instance, two universities in Nigeria, the Universities of Ibadan and of Abeokuta, and in Uganda, the Martyrs University, have a leading organic research role in the continent. In Latin America, the Autonomous University of Chapingo in Mexico and the University of La Molina in Peru have been important in the development of organic farming research. In North America there are many universities with research and teaching activities, Washington State University being one of them.

However, state research institutes are also key players. In Canada, there is the government-funded Organic Centre of Canada (OACC), which has the mandate to carry out research but also coordinate related activities in the country.

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The Brazilian Agricultural Research Corporation (EMBRAPA), now has scientists at 27 research centres working on a common project entitled "Scientific and technological basis for the development of organic agriculture in Brazil." In Australia, too, organic research is mainly carried out at state research institutes.

Outside Europe, there are only few private organic research institutes. One of them is the Rodale Institute in the US.

Some key funding programs

In many parts of the world organic farming research is largely government-funded, in some cases, though, the organic industry also contributes some funding. Few countries have specific funding programs for organic farming research, however, an increasing number of research projects are conducted by state research institutes as well as universities.

In Europe, funding mechanisms tend to be through government support within the framework of specific organic research programs to which (mainly but not exclusively) state institutions can apply for funding. In Germany government support for organic farming research takes place within the framework of the Federal Organic Farming Scheme (BOEL). The BOEL money is available to the whole research community, consisting of state research stations, universities, private institutes and consultants. In Switzerland, organic farming research in both the private, e.g. FiBL, and state research stations, is carried out under the mandate of the Federal Office for Agriculture (FOAG). In addition, FiBL has succeeded in attracting substantial funding from the organic sector and industry.

Under the European Union's Research Framework Programmes a large number of organic farming projects have been funded, the

Source: FiBL

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first having been started at the beginnings of the 1990s. A second noteworthy initiative is the CORE Organic project in which 11 government funding agencies work together to fund common research projects. This cooperative project, funded under the European Unions' ERA-Net scheme between 2004 and 2007 (phase II has just started), launched eight transnational organic farming projects in 2007.

In the US there are two major funding schemes: the Cooperative State Research, Education and Extension scheme (CSREES) and the US Farm Bill. For 2009, 17.3 million US dollars were granted under the CSREES scheme. Under the current US farm bill, 105 million US dollars will be made available (2009-2012).

The first African organic conference with a strong scientific focus took place in May 2009, organized by the Martyrs University in Kampala, Uganda.

The Australian Government has been the major investor in organic research and development in Australia. One of the current research priorities for organic farming is to develop an Australian Organic "Hub," through which gaps in organic research topics can be identified and research institutions and partners can collaborate.

International coordination and cooperation efforts

Conferences

The first international conferences on organic farming research were the international scientific conferences of the International Federation of Organic Agriculture Movements (IFOAM). The first one took place in Sissach, Switzerland in 1977, then called the "International IFOAM Scientific Conference." Since 2005 this conference (now named "Organic World Congress") has been held in cooperation with the International Society of Organic Farming Research (ISOFAR), which shares the responsibility of organizing the scientific part of the each congress. The scientific conference proceedings give a unique overview of ongoing organic farming research worldwide and of the key players.

Regional scientific conferences are becoming more and more important. There was an Asian conference in 2008, hosted by the Dan Kok University in South Korea. The first African organic conference with a strong scientific focus took place in May 2009, organized by the Martyrs University in Kampala, Uganda; the next one will be held in Zambia in 2012. A very successful initiative is the Latin American/Caribbean series of conferences for producers and researchers; the fourth taking place in October 2009 in El Salvador.

Networks

In 2003, the International Society of Organic Agriculture Research (ISOFAR) was founded by the German Institute of Organic Agriculture (IOL) in Germany and the Research Institute of Organic Agriculture (FiBL). The goals of ISOFAR are to promote research in organic agriculture by facilitating global cooperation in re-

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Source: FiBL

search and education and knowledge exchange. The individual scientist members of ISOFAR are from all parts of the globe, although the majority reside in Europe where ISOFAR is based.

At the recent Africa Organic Conference in Kampala, Uganda, the Network for Organic Agriculture Research in Africa (NORA) was launched with the aim of boosting organic farming research in the continent. There are other transnational initiatives, including the Mediterranean Organic Agriculture Network (MOAN). Coordinated by the Mediterranean Agronomic Institute in Bari, MOAN has research as its main focus. There are also numerous national initiatives, such as the Italian Network of Organic Researchers (RIRAB) and the Colloquium of Organic Researchers (COR) in the UK.

Together with IFOAM, ISOFAR facilitated a discussion among scientists from European countries to draw up an organic research agenda for the next 20 years. Published in 2008, this agenda constitutes the first publication of the Technology Platform TP Organics, which joins the efforts of industry and civil society in defining organic research priorities and defending them vis-à-vis the policy-makers. The platform was launched in December 2008. TP Organics is hosted by the

The International Society of Organic Agriculture Research (ISOFAR) was founded in 2003 to facilitate global cooperation in research and knowledge exchange on Organic Agriculture.

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IFOAM EU Group, based in Brussels. Recently a technology platform was also set up for Hungary.

Journals, websites and newsletters

Journals, websites and newsletters are important communication tools for researchers. Increasingly, researchers are also publishing in general peer reviewed journals and this has helped increase the scientific credibility of organic farming research. Recently ISOFAR has announced that it will launch a scientific journal in association with Springer Science.

The open access Organic Eprints Archive has almost 10,000 entries now. Only two percent of the papers are from outside Europe. It would be good if more research institutions would use this archive. A disadvantage is that many peer-reviewed scientific papers are subject to the copyright of the publishers and cannot, therefore, be archived publicly.

ORCA

The proposed Organic Research Centres Alliance (ORCA) intends to internationally network and strengthen existing institutions with scientific credentials and to empower them into becoming centres of excellence in transdisciplinary organic agriculture research. ORCA is a joint initiative of the Food and Agriculture Organization of the United Nations (FAO), the Swiss Research Institute of Organic Agriculture (FiBL) and the Danish International Centre for Research in Organic Food Systems (ICROFS). More partners, including IFOAM and ISOFAR, have joined since its establishment.

Outlook

Organic farming research has developed rapidly in the past few years. Many countries, including developing countries, are increasing their efforts to promote organic farming research. It is expected that in the near future research output will increase substantially as well as coordinated projects and cooperative efforts.

Literature related to this text is available at www.organic-world.net/research.html

Key Links	
www.isofar.org	International Society of Organic Agriculture Research (ISOFAR)
www.coreorganic.org	CORE Organic
www.organic-center.org	Organic Centre
www.orgprints.org	Organic Eprints
www.fao.org/organicag/oa-portal/en/?no_cache=1	Organic Research Centres Alliance (ORCA)
www.qlif.org	Quality Low Input Food (QLIF)
www.tporganics.eu	Technology Platform TP Organics

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Beware - Major Challenges Ahead

By Urs Niggli
FiBL Director and IFOAM World Board Member
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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.

> *"It is amazing how fast the knowledge gathering on organic systems has grown in the last 15 years."*

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 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-

Source: FiBL

Source: FiBL

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.

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Clearing the Air: Prioritizing Organic Practices and Promoting Environmental Policy

By Timothy LaSalle
Rodale Institute CEO
Email: Greg.bowman@rodaleinst.org

The increasing concentration of greenhouse gases (GHG) in our atmosphere requires immediate attention by citizens, scientists, and global leaders. These issues must be prioritized when linking organic agriculture to the future of global climate policy initiatives, represented by this year's Copenhagen climate conference.

As scientists around the world alert political leaders to the urgency of climate issues, few options offer as much opportunity as organic agriculture. However, current research is not designed to demonstrate the potential of organic systems at cutting future emissions and reducing carbon dioxide in the atmosphere.

The Rodale Institute includes two historic farmsteads with flat and sloping fields in the Siegfriedale Valley of Berks County, northwest of Philadelphia, Pennsylvania, USA.
Source: The Rodale Institute

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The broader ecological benefits of farming without synthetic chemicals must be emphasized. The organic community is demonstrating how biological attributes can be enhanced to combat climate change despite limited funding for research on production systems analysis, organic conversion, and nutritional, health and environmental benefits of organic food and fiber.

To challenge the status quo, new strategies must be adopted that not only highlight the environmental benefits of organic farming but also publicize those benefits as an effective alternative to other, better-funded technological initiatives.

Learning from carbon

Organic agriculture centered on building soil quality has the best-tested and most practical strategy for capturing and storing atmospheric carbon dioxide in the form of organic matter. In addition to climate stabilization, organic agriculture's ability to sequester carbon can also prevent erosion, improve food quality, and increase yield during times of both low and high rainfall.

Rodale Institute research confirms the proposition: "Healthy Soils, Healthy Food, Healthy People, Healthy Planet." This recapitulates the possibility of organic agriculture to reverse the negative impacts of chemical agriculture: polluted soils, polluted food and excess greenhouse emissions.

Rodale's Farming Systems Trial is North America's oldest comparative scientific study of organic agriculture. Since 1981, an organic legume system and organic raw manure system have been compared to non-organic, chemically-treated fields. During the conversion to organic management, and throughout the first 14 years of organic production, the legume system sequestered an average of about 1 ton of CO_2 in the soil per acre per year (0.4 tonnes/ha), while the manure system added about 2 tons of CO_2 per acre per year (0.8 tonnes/ha). Since then, other field experiments combining composted manure and cover crops have sequestered CO_2 at average annual rate of about 3.75 tons CO_2 per acre per year (1.5 tonnes/ha).

These figures have been presented to the climate policy community in the United States at both the state and federal levels. However, good research is not enough on its own. Practitioners must be actively engaged and policy leaders need to be convinced that strategies for mitigating threats posed by GHGs must be created.

Challenges

There are a number of challenges facing the organic science community. A lack of farming research-based information is a serious issue, and more is needed to shape climate policy initiatives and to improve on-farm ecological practices.

1. Assemble more comprehensive data on soil carbon sequestration

a. The reproducibility of statistics must be improved by factoring in soil bulk density variations across soil types. Failure to account for soil bulk density (a measure of mass per volume) confounds effective comparisons among most current soil studies.

b. Techniques to measure soil carbon and other indicators related to overall greenhouse gas emissions must be standardized, and used by all IFOAM members in their research. This should include the use of comparable designs for soil sampling, and the establishment of specific intervals in time, seasons or crop cycles for collecting comparative data.

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Long-term research requires a commitment of land use, consistent management, data gathering and analysis. Rodale Institute gathered soil carbon data for decades before its tremendous value for documenting carbon sequestration from organic systems became was recognized.
Source: The Rodale Institute

c. Through collaborative effort, standard measures of currently achievable net terrestrial carbon sequestration rates in arable, agroforestry and pasture lands must be determined and accepted. These levels can then act as benchmarks, enabling better analysis of innovative ecological practices in different settings.

2. Highlight the benefits of organic agriculture as an integrated biological system.

a. There is a need for whole systems to be investigated at over a period of at least five years. Areas that should be monitored are the chemical application effects on land and water resources, as well as all issues pertaining to run-off and erosion.

b. Standard reference points should be developed for energy expenditures of major inputs (seed, fertilizer, pesticides, machine use) and for assessing soil and farm-level biological changes tied to management practices.

c. Consistent measurement standards across all farming systems for livestock methane and crop nitrogen pollution, essential to begin mitigation of these emissions in organic systems, must be developed.

d. Novel, integrated systems should be devised so that fossil fuel-dependence on conventional farms can be displaced with on-site, biologically-sustainable methods.

Strategies

Only the best science can lead the way to the best organic practices, which can then inspire the best organic policy. To ensure global research that addresses the most strategic topics is being carried out, research strategies should be made available to farmers. Additionally, it is necessary to encourage farmer adoption, and maintain a robust monitoring protocol. Policymakers should be able to use the data-based agricultural benchmarks to create justifiable, results-oriented policies that are to the public benefit while also being equitable to farmers using improved methods.

1. Maximize the ability of organic systems to reduce greenhouse gas emissions:

a. An efficient and verifiable method of conducting on-farm measurements and their documentation is needed, as well as effective techniques to sequester more carbon, on more hectares, by more farmers with assured permanence.

Developing successful techniques using a wide range of measurement techniques will favor adoption, and be the foundation for observing added ecological benefits of soils with a high organic matter. Such benefits include water retention in dry years, run-off reduction, crop root development, biological nutrient cycling and microbial biodiversity.

Suggested projects:

a. Analyze productivity and economic outcomes across a range of management techniques that enhance carbon-sequestration, comparing the trade-off between carbon sequestration with crop income potential. This allows farmers to plan for optimum levels of productivity and carbon sequestration, while considering other factors such as compliance with organic certification and economic incentives for crop sales or available climate credits.

Organic soil samples.
Source: The Rodale Institute

b. Explore ways of increasing the land area under agroforestry by planting woody species in hedgerows and on the contours of pasture and arable fields; by integrating these species into vegetable and fruit production systems; and by promoting the development of silvopastures.

c. Identify optimal techniques for short-term, high-impact soil carbon sequestration and input-reduction that lay a sustainable foundation for long-term soil health. Possible research outcomes could help farmers select initial treatments, rotation sequence, timing of carbon-based inputs such as compost, manure and cover crops, biological enhancement (using soil fungi inoculation or other biological agents), timing of practices, use of specialized tillage that promotes deep aeration and water infiltration, and livestock grazing. Further benefits would be recommendations customized for specific soil types, annual rainfall and climate zones.

d. Establish collaborative, long-term trials in widely disparate climatic conditions using standardization techniques. The purpose would be to develop complex integrated systems targeted for maximum carbon-sequestration as well as nitrogen and methane reduction, with and without livestock in each location.

e. Devise social, economic and political methods, e.g. incentives, penalties and risk-management tools, to assure sequestered carbon

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stays sequestered. When the method has been evaluated for over a five year period it will be possible to make a prediction for the next 25-years.

2. Document the impact of meat production on greenhouse gases

The work will be conducted over a number of years and will compare an organic production system that integrates intensively grazed pastures rotated with annual crops, with a non-organic system that keeps the livestock confined. Several variables will be monitored, including net greenhouse gas impact per ton of meat produced.

Suggested projects:

a. Assess nitrogen recycling efficiency from manure on the two farms by measuring the soil's organic matter levels, fertility, biological life and physical structure.

b. Use control fields that are managed "organically," but with no rotations for both crops and pastures.

c. Quantify the amount of solar energy captured in grass and converted to beef, pork and chicken protein. This can then be compared to amount of ancient solar energy – via the use of fossil fuels – required to produce the same amount of meat protein in systems where livestock are confined. Energy, transport, grain and other costs should be included in the calculations.

d. Calculate the levels of carbon added to soils in both systems, using a total system approach to account for all feedstuffs used.

e. Compare the nitrogen compound flows of solid and liquid manure management systems.

f. Assess the impact on GHGs of year-round crops, i.e. forage and cover crops compared to grain production.

g. Calculate the impact on soil erosion.

h. Assess the impact on GHGs from reducing methane emissions through feeding strategies (flaxseed and special variety flaxseed). Trials can compare grass-based and confinement systems livestock systems.

These suggestions – an attempt at agenda-setting for research and policy– need a correspondingly dynamic organizational push to secure the healthy soils, healthy people, and the healthy planet we need for a sustainable future.

RODALE INSTITUTE

Rodale Institute *is a 501(c)(3) nonprofit organization engaged in research and advocacy for "Healthy Soil, Healthy Food, Healthy People, Healthy Planet."*

Its soil scientists and a cooperative network of scientists have documented that organic farming techniques offer the best solution to global warming and famine. The Institute was founded in Kutztown, Pennsylvania, in 1947 by organic pioneer J.I. Rodale. The Farming Systems Trial®, the longest-running U.S. study comparing organic and conventional farming techniques, is the basis for Rodales practical training to thousands of farmers in Africa, Asia and the Americas.

Rodale's findings are clear: A global organic transformation will mitigate greenhouse gas emissions in our atmosphere and restore soil fertility.

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Securing Food and Ecosystems by Eco-Functional Intensification

By Niels Halberg
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Organic cropping systems need to be productive and stable (yield stability) while at the same time be robust, resilient and environmentally friendly. The principles of organic agriculture express the core assumptions that agriculture and farming should emulate and sustain living ecological systems and cycles and *enhance the health of soil, water, plants and animals and the balance between them*[1]. This should be achieved mainly by *the appropriate design and management of biological processes based on ecological systems using natural resources which are internal to the system*.

Organic agriculture has established itself as the main alternative agricultural practice and is increasingly seen as a model for agricultural development amongst poorer smallholder farmers for improved food security. In other regions and countries organic agriculture is supported for rural development purposes and organic food constitutes the fastest growing high value market segment reaching retail market shares of 6-7 % in several countries.

In this situation it is pertinent to ask ourselves to what extent these agro-ecological principles are being utilized on most organic farms today. How much do we benefit from conscious "*design and management of biological processes based on ecological systems"?* And, is lack knowledge or simple pragmatism the main barrier for the implementation of more agro-ecological methods? Most likely it is a combination of the two, and there is still a need for more agro-ecological research and innovation in all regions of the world in order to take the next steps in the development of organic agriculture.

While organic farmers strive to achieve high overall productivity based primarily on natural resources and in combination with high environmental standards, the productivity and the stability of yields and quality have in many cases been insufficient, especially in systems with restricted access to animal manure.

In other regions there are good examples of yield improvements when implementing organic farming methods starting from a low yield base. In the light of future global demands for food it is important that yields in organic agriculture continue to grow even though it might be measured as a basket of products per area unit rather than in the form of traditional mono-crop yields per ha. However, when travelling the world of organic farming in Asia, Africa, America and Europe, one often experiences cropping systems with a narrow range of diversity and limited use of agro-ecological methods. The organic farming systems - by

1 Council regulation (EC) No 834/2007, articles 3 and 4

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and large - still present themselves as relatively immature in comparison with the movements's principles and aims. This is not surprising when compared to the relatively feeble research efforts thus far in the development of agro-ecological methods.

Still, it is a hypothesis that higher productivity and stability of yields may be achieved by means of appropriate "eco-functional intensification." By this term we wish to stress that "intensification" of organic farming systems should be achieved by higher input of knowledge, observation skills and management and by the improved use of agro-ecological methods. The search is for a more intelligent use of locally available natural resources and processes, improved nutrient recycling techniques, and innovative methods for enhancing and benefitting from the diversity and the health of soils, crops and livestock.

But what does "eco-functional intensification" mean? Eco-functional intensification is characterized by (increased) co-operation and synergy between different components of agro-eco systems and food systems, with the aim of enhancing the productivity and stability and the health of all components.

For example, it is a core principle of organic agriculture to enhance the health of the soil, physically, chemically and biologically, in order to have healthy plants for food and feed. But, besides improving soil tilth and fertility by adding compost what is the next step?

Russ Lester of California explaining about his experiences with intercropping of grass-legumes under walnut trees.

In a recent review of rhizosphere processes Philippe Hinsinger and colleagues conclude that better accounting for the root traits of different cultivated plants and for soil-root-microbe interactions that occur in the rhizosphere (root zone) holds an important potential for a new Green Revolution. This is especially so when such knowledge is coupled with crop breeding efforts which address soil nutrient use efficiency in low input systems. There is a need for crop varieties which better explore the soil for less mobile nutrients such as phosphorus through good root architecture and by better knowledge of symbiosis with micro-organisms such as mycorhizal fungi, P-solubilising bacteria and fungi.

It is well know that in agro-forestry systems, diverse trees and crop types may complement each other in terms of utilising nutrients and water from different soil layers. Moreover, trees with deep roots may recycle nutrients such as Phosphorus from deeper soil layers to the benefit of other crops. Traditionally such facilitation and complementation processes have also been exploited in field crops through combinations of perennials, and for example cereals. A European project (SAFE) tested combinations of wheat and poplar trees and sunflowers in combination with walnut trees building on traditional systems from Southern Europe. The results were promising and showed higher total output per acre than when each is grown separately. This should be followed up with efforts to adapt these experiences to organic agriculture building for example on pilot tests done by innovative farmers (photo 1).

Planning for high crop diversity (intercropping) is an underexploited agro-ecological method in more intensive agricultural areas such as Europe. For many reasons the development has been towards simplification of cropping systems and this is still reflected in much organic agriculture. This is sad because the relatively limited research done in field crops suggest that - for example - mixtures of legumes and cereals may benefit the cereal in terms of Nitrogen supply. However, not all combinations of annual crops will express synergy in terms of complementarity (crop types using the available resources differently) or facilitation (that one crop provides advantages for the other in terms of nutrient supply or pest control). Even though a number of computer models exist to describe the mechanisms of intercropping, often these only deal with the nutrient and light dynamics of a combination of two or three crops. There is a need for better understanding of the effects on weeds, pests and diseases and the potential for adaptation to changing climates in multispecies intercropping.

Besides mixtures of annual crops it would be interesting to develop systems where annual crops are established in perennial crops (including legumes), which would prevent erosion, reduce pests, and improve nutrient cycling. As an example of such a system a vegetable crop rotation is tested in one of the ICROFS projects – Vegqure - where carrots, onions, lettuce, and cabbage are grown in rows established in mixtures of legume and non-legume species. The intercrop in this study was established by undersowing in the year before, to optimize its beneficial effects, and then mechanical root pruning was performed in the spring to reduce its competition against the vegetable crops. (photo 2).

An important side effect of increasing the planned diversity on a farm is the potential benefit from the associated diversity. This consists of all the non-harvested components of the farm and may provide eco-system services such as enhanced pollination, habitats for beneficial insects, improvement of micro-climate and local hydrology, soil surface protection and improved soil fertility. There is a great need for greater understanding of the relationship between the planned diversity and the associated diversity on farm and landscape levels to better benefit from eco-functional intensification.

For the future, we need combinations of participatory on-farm research, controlled experiments and more basic research to improve our understanding of the fundamental processes in order

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to improve the use of natural processes. Testing different types of crop mixtures and intercropping will of course give information on the practicality and yield effects and whether the chosen combination of crops is complementary or not. However, in order to take the next step in the development of agro-ecological methods suitable for organic agriculture we need to employ a number of advanced research methodologies. Organic research should also benefit from ecological and bio-chemical methods to understand better the signal processes between host plants and their potential pests and beneficial organisms. And molecular methods will be deployed to study, for example, differences in metabolic processes of plants under different low input growth conditions (metabol-omics).

Eco-functional intensification builds on the knowledge of all stakeholders involved, and relies on powerful information and decision-making tools in combination with new research knowledge and tools in the biological and ecological sciences. Research should lead to improved recycling of macro- and micro-nutrients and enhanced self-reliance in nitrogen supply and new crop combinations and sequences. Improved techniques and products for the management of weeds, diseases and pests (e.g. bio-control, phyto-pesticides, physical barriers) should be developed.

Growing carrots in rows between grass-legume mixtures for enhanced pest control and nutrient recycling in Danish horticulture crop rotation experiment "Vegqure," www.vegqure.elr.dk/uk.
Source: ICROFS

This combination of research and innovation efforts is the aim of the EU technology platform under preparation, TP Organics. Achieving the sufficient level of knowledge of agro-ecological methods will be a huge effort and requires significant funding but the results will potentially benefit a large part of the agricultural sector as described by the recent IAASTD reports. Under the headline "Agriculture at a Crossroads" a range of reports on the future of agricultural research, innovation and extension calls for more interdisciplinary and agro-ecological approaches in order to account for complexity of agricultural systems within the diverse social and ecological contexts. This is at the heart of organic agriculture. So we should get moving.

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Linking Sustainable Agriculture Research to Farmers in the Field in Africa

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This short article highlights some of the outstanding obstacles and barriers impeding the adoption of sustainable agriculture (SA) and sustainable land management (SLM) practices in Africa. Ideas expressed below were debated at a meeting on "Sustainable Land Management and Agricultural Practices in Africa: Bridging the Gap Between Research and Farmers." The meeting, organized by the United Nations Department of Economic and Social Affairs (UNDESA) and the Environment for Development initiative (EfD), was held in April 2009.[1] Through discussions at the meeting, three areas needing a paradigm shift were identified:

1. Farmers should be at the center of agricultural research.
2. Agricultural stakeholders should be provided with decision-making tools.
3. Extension services need reinvention.

Sub-Saharan Africa (SSA) is still predominantly agriculture-based with the rural, mostly poor population still comprising more than 60 percent of the total population of the region (UNDP, 2005). The region needs huge increases in agricultural production to meet the needs of its growing population and to initiate regional development.

There is now a large body of evidence showing that SA and SLM practices have the potential to significantly improve the productivity of African farmers, as well as increase the resilience of farming systems to weather extremes and climate change. In addition to increasing yields, SLM and SA practices, which are suited to the agro-ecological conditions and limited farmers' resources endowment, provide land regeneration benefits critical to most of arid Africa.[2]

Recent assessments have called for a shift in paradigm to an agricultural system that is characterized by organic or sustainable practices, local, multi-crop, energy and water efficient, low-carbon, socially just, and self-sustaining. Yet, despite recent increases, uptake in sustainable practices remains limited (UNDESA, 2009), impeded by various barriers and a policy biased towards the Green Revolution intensive package. Indeed, very limited resources have been invested by governments and international donors to promote SLM and SA practices.

1 *Held in Gothenburg, Sweden, 16-17th April. Presentations from the meeting can be accessed here. The opinions expressed here are those of the authors and do not reflect the official view of the United Nations.*

2 *UNDESA, 2009, The contribution of sustainable agriculture and land management to sustainable development, Sustainable Development Innovation Brief, 7 May, www.un.org/esa/dsd/resources/res_pdfs/publications/ib/no7.pdf*

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Various studies have demonstrated that no single factor leads to the adoption of sustainable practices. Instead, it is a constellation of factors, starting with favorable economic returns, which, in turn, are influenced by strong local and national institutions supportive of sustainable agriculture, the engagement of farmers and farmers' associations in the research and extension work, secure tenure rights, and access to information and extension. This article addresses the barriers in the knowledge chain that exist between agricultural research and the farmers on the ground, then back to the scientists.

1. Transforming the agricultural research model so that farmers are the center-piece

Agricultural research is now dominated by the private sector. By definition, the private research sector investigates technologies that have the broadest application possible in markets with purchasing power. These technologies are often not applicable to poor smallholders that tend to operate in marginalized areas.

Lines of research that try to investigate the genetic potential of existing, locally adapted species, and better soil and land management practices and root systems are still largely ignored by mainstream research.

Therefore, public sector research is also needed. Up to now research on minor crops, such as sorghum, millet, cassava, yams and legumes, and on small ruminants and buffaloes, has been limited and few genotype improvements have been made. This means that research on these topics are likely to produce results leading to enormous benefits.

In addition, mainstream agricultural research continues to focus on what happens above the ground, optimizing yields through a combination of genetic modifications, optimized fertilizer and other inputs applications. Lines of research that try to investigate the genetic potential of existing, locally adapted species, and better soil and land management practices and root systems are still largely ignored by mainstream research. Yet, sustainable agricultural science has provided a number of key insights over the last decades. Optimizing soil and water management, as in the System of Rice Intensification (SRI), has resulted in huge yield increases and resilience benefits. In fact, SRI has often achieved yields higher than those obtained in research stations and as a result is slowly acquiring legitimacy, supported by thousands of trials in different agro-climatic conditions, across crops and regions of the world.

While agricultural research focused on new varieties is important, research that supports the adoption of sustainable practices is equally important.

Perhaps the key lesson from sustainable agriculture is that agricultural practices have to be tailored to local biological, physical and socio-economic conditions.

Diffusion of knowledge acquired from research to agronomists and extension agents has been identified as a "weak link" in Africa. The link breaks down first in the way knowledge is generated and taught. Researchers at national and international research centers typically do not teach; and the

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teachers tend not to do research. Agricultural curricula are often outdated and heavily biased towards conventional techniques, with little focus on the benefits of long term soil and land management on soil fertility, or the advantages of reducing pesticides use. Conversely, what farmers and extension agents learn in the field is seldom transmitted back to research and teaching institutions. Achieving closer cooperation between cutting-edge applied research and in-field farm experiments and university curricula should, therefore, be made a priority. At a more fundamental level, basic and specialized education of the farmers themselves is important. A farmer with four years of elementary education is, on average, 8.7 percent more productive than a farmer with no education (Nkonya, 2009).

Technology adaptation programs are more likely to succeed if they are grounded in the local context and stakeholders' priorities. It is no surprise that no-one has more information about agricultural fields and the cultural and economic conditions that largely determine the potential performance and viability of various agricultural practices and systems than the farmers themselves. Yet, these same farmers may not be aware of best practices given the various conditions. Farmers and local communities should be given the opportunity to participate in the planning and management of technology adaptation programs and be given appropriate decision-making responsibilities in assessing the local applicability of agricultural technologies.

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Farmers' organizations can help farmers do more with limited resources, facilitate on-farm trials, share practices and techniques, and facilitate the dissemination of knowledge to bigger networks. Recent technologies provide cheap ways of supporting the decentralized exchanges of information among these networks, in a way that complements the traditional centralized and top-down information systems. Potentially the most significant impact of i*nformation and communication technologies* (ICTs) on agricultural technology generation will be in connecting and engaging communities in participatory agricultural innovation.

2. Providing decision-making tools to agricultural stakeholders

An important objective of research should, ideally, be to combine farmers' site-specific information with meta-analysis of farmers in similar conditions. In addition, basic science should provide extension agents and farmers with decision-making tools enabling them to select the land management and crop types and practices that will most likely succeed in their site-specific environment.

Over recent decades knowledge about SLM and SA practices has been accumulating steadily, however, this knowledge has not been systematically aggregated and fed into models with predictive abilities. While there is considerable evidence on the prevailing conditions under which sustainable practices have been successful, it is still not possible to go in the other direction, i.e. using the prevailing conditions to assess which practices would be most successful.

Recent developments in remote sensing technologies and access to inexpensive satellite data can quickly and cheaply provide comprehensive data on the biophysical composition of a soil as well as measures of biomass and biodiversity. In Mozambique, a rapid assessment of soil and biodiversity conditions with a spatial resolution of 30 x 30 meters can be obtained within a few weeks. This data can be combined with socio-economic data to build locally-relevant knowledge in a way that was unconceivable just a few years ago.

To turn from developing soil and agro-climatic models to implementing decision-making tools all factors that may affect the success of specific crops or land management practices must be taken into account. These factors encompass market, legal, political and institutional factors. For example, they include the level of rural development, which will determine whether it should rely on capital or labor intensive techniques; land tenure, which influences the chance of success of different land management practices; and market access, which determines the types of crops planted. The meta-model must be able to use local data combined with data on world-wide agro-climatic practices.

A key obstacle is the difficulty of compiling the knowledge gained from vast combinations of data gathered worldwide, with all the relevant data. The need for a worldwide coverage was illustrated with an example at the Gothenburg meeting. Recently, over a period of just a few years, a region in Ethiopia has turned into an onion-exporting region. The only reason this happened was because a fortuitous "discovery" found out that, though they had never been cultivated there before, the climatic conditions of the region were ideal for growing onions. The same conclusions would have been drawn if a meta-model, us-

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ing information on agro-climatic conditions, had done a systematic search for worldwide crops and practices. Networks of institutions, supported by international development agencies, could support the development of such a model.

Questions remains in terms of how best to bring this tool to communities and what institutional support they may require.

3. Reinventing extension services

If the goal is the prompt adoption of sustainable practices, rebuilding agricultural extension services as well as ensuring agents are adequately trained in these practices is essential. In developing countries, agricultural extension services are among the most important rural services, often being responsible for outcomes that exceed those of research.3 Evidence indicates that agricultural extension is also a pro-poor public investment, and their impact can be measured by the influence visits by extension service workers have on individual household poverty, child stunting and the prevalence of underweight children below five in the household.4 To be successful extension services must take into account socio-economic conditions and locally available resources.

However, in many African countries extension services have been dismantled or those that do exist often fail to address entire subject areas and practices. In addition, extension services are often poorly funded, necessitating dependence on donor-funding and jeopardizing their longevity. Greater investment in extension services is essential if they are to increase coverage to include remote areas, self-subsistence crops and women farmers.

There is no one-size-fits-all extension service model; however, participatory approaches have been shown to perform better than top-down approaches. Supply-driven extension services still play an important role in promoting emerging sustainable agricultural land and management practices that may not be demanded by the farmers themselves, due to limited knowledge about their effectiveness. Farmer-to-farmer extension, which has proven to be highly effective as it is often able to address the resistance of farmers to new technologies through demonstration, has not received the same support as "classical" extension services.

Several African countries have started reforming their extension services. However, much needs to be done to ensure they use the right mix of supply and demand-driven models, including targeting full participation and empowerment of farmers, increasing the quality and number of providers and targeting vulnerable groups.5

Making greater use of farmer-to-farmer extension, including establishing field schools where farmers can be trained as extension workers, combining their traditional knowledge with contemporary science and technology, is also important. These agents must be able to use the meta-model while incorporating new results based on interactions with farmers.

3 *For example, a review of social rates of return to research and extension in 95 developing countries finds a return for extension of 80 percent (compared to 50 percent for research). See Alston, J.M., Pardey, P. G. (2000). Attribution and other problems in assessing the returns to agricultural R&D, Agricultural Economics, 25, 141–152.*

4 *Dercon, S., et al. (2008). The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages IFPRI Discussion Paper 00840 ; and Nkonya, E., Benin, S., Okecho, G. (2009). Enhancing the use of improved agricultural technologies, IFPRI mimeo.*

5 *Nkonya, E. (2009). Current extension service models, what works and what does not work. UN expert group meeting on Sustainable land management and agricultural practices in Africa, Univ Gothenburg.*

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Scientific Studies that Validate High Yield Environmentally Sustainable Organic Systems

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Introduction

Organic agriculture is often attacked as unsustainable and not capable of feeding the world due to lower yields. However, while many organic systems do produce lower yields, there are numerous studies showing that best practice organic agriculture can achieve comparable yields to intensive conventional agriculture (Pretty 1995, Pretty 1998a, Welsh 1999, Reganold et al. 2001, Parrot 2002, Pimentel 2005 and Wynen 2006).

This article looks at some of the published research showing that best practice organic systems can achieve yields that are equal or higher than comparable conventional systems. More research and extension is still necessary in this area, though, so organic farmers can be shown appropriate best practice for their particular system in order to improve their yields.

Yields

The assumption that greater inputs of synthetic chemical fertilizers and pesticides are needed to increase food yields is not always accurate. In a study published in The Living Land, Professor Pretty looked at projects conducted in seven industrialized countries in Europe and North America. He stated: 'Farmers are finding that they can cut their inputs of costly pesticides and fertilisers substantially, varying from 20-80%, and be financially better off. Yields do fall to begin with (by 10-15% typically), but there is compelling evidence that they soon rise and go on increasing. In the USA, for example, the top quarter sustainable agriculture farmers now have higher yields than conventional farmers, as well as a much lower negative impact on the environment.' (Pretty1998a).

Below are examples of studies into organic systems that show high yields and good environmental outcomes.

United Nations Study – organic agriculture increased yields by 116%.

The report by the United National Conference on Trade and Development (UNCTAD) and the United Nations Environment Programme (UNEP) found that organic agriculture increases yields in Africa. '…the average crop yield was … 116 percent increase for all African projects and 128 percent increase for the projects in East Africa.'

The report notes that despite the introduction of conventional agriculture in Africa food production per person is 10% lower now than it was in the 1960s. According to Supachai Panitchpakdi, Secretary General of UNCTAD and Achim Steiner, Executive Director of UNEP, 'The evidence presented in this study supports the argument that organic agriculture can be more conducive to food security in Africa than most conventional production systems, and that it is

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more likely to be sustainable in the long term.' G (Unep-Unctad 2008)

US Agricultural Research Service (ARS) Pecan Trial

Over a five year period an organically managed ARS pecan orchard consistently out-yielded a commercial, conventionally managed, chemically fertilized orchard. For example, yields from the organic test site surpassed the commercial orchard by 18 pounds (8 kg) of pecan nuts per tree in 2005, and by 12 pounds (5.4 kg) per tree in 2007 (Bradford J.M., 2008).

The Wisconsin Integrated Cropping Systems Trials

In the US, an integrated cropping trial called the Wisconsin Integrated Cropping Systems Trials, found that in drought years organic yields were higher than conventional yields and the same in normal weather years.

In years with a wet spring weed control though mechanical cultivation was delayed, resulting in 10% lower organic yields. This could be corrected by using steam or vinegar for weed control, rather than tillage.

The researchers attributed the higher yields in dry years to the ability of soils on organic farms to absorb the rainfall more readily than conventional soils. They felt this is due to the higher levels of organic carbon, making the soils more friable and better able to store and capture rain (Posner et al. 2008).

Scientific Review by Cornell University of a 22 year Rodale Field Study

A 22-year field study conducted by the Rodale Institute was reviewed by Cornell University. The review concluded that:

- After five years under organic management organic land generated crop yields that were

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equal to or greater than the conventional crops.

- The conventional crop yields collapsed in drought years.
- The organic crop yields fluctuated only slightly during drought years, due to greater water holding capacity in the enriched soil.
- The organic crops used 30% less fossil energy inputs than the conventional crops. (Pimentel D et al 2005)

Rodale Organic Low/No Till

The Rodale Institute has been trialling a range of organic low tillage and no tillage systems.

The 2006 trails resulted in organic yields of 160 bushels per acre (10,000 kg/ha) compared to the country average of 130 bu/ac (8,200 kg/ac).

"The average corn yield of the two organic no-till production fields was 160 bu/ac, while the no-till research field plots averaged 146 bu/ac [9,200 kg/ha] over 24 plots. The standard-till organic production field yielded 143 bu/ac [9,000 kg/ha], while the Farming Systems Trial's (FST's) standard-till organic plots yielded 139 bu/ac [8,700 kg/ha] in the manure system (which received compost but no vetch N inputs) and 132 bu/ac [8,300 kg/ha] in the legume system (which received vetch but no compost). At the same time, the FST's non-organic standard-till field yielded 113 bu/ac 7,100 kg/ha]."

To compare, the Berks County average non-organic corn yield for 2006 was 130 bu/ac [8,200 kg/ha], and the average yield for Southeastern Pennsylvania was 147 bu/ac [9,300 kg/ha]' (Rodale 2006).

Further studies include:

- Professor George Monbiot, wrote in an article published in The Guardian, 24th August 2000, that wheat grown with manure in UK trials has for the past 150 years produced consistently higher yields than wheat grown with chemical nutrients (Monbiot 2000).
- A study into apple production conducted by Washington State University compared the economic and environmental sustainability of conventional, organic and integrated growing systems in apple production and found similar yields. *"Here we report the sustainability of organic, conventional and integrated apple production systems in Washington State from 1994 to 1999. All three systems gave similar apple yields"* (Reganold et al. 2001).
- In an article published in the peer review scientific journal, Nature, Laurie Drinkwater and colleagues from the Rodale Institute showed that organic farming had better environmental outcomes while producing similar yields of both products and profits when compared to conventional, intensive agriculture (Drinkwater 1998).
- Dr Rick Welsh, of the Henry A. Wallace Institute, reviewed numerous academic publications that compared organic production with conventional production systems in the USA. The data showed that the organic systems were more profitable. This profit was not always due to premiums but sometimes due to lower production and input costs as well as more consistent yields. Dr Welsh's study also showed that organic agriculture produced better yields than conventional agriculture in

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adverse weather events, such as droughts or higher than average rainfall (Welsh 1999).

- Nicolas Parrott of Cardiff University, UK, authored a report, 'The Real Green Revolution'. He gives case studies that confirm the success of organic and agroecological farming techniques in the developing world:
    - *In Madhya Pradesh, India, average cotton yields on farms participating in the Maikaal Bio-Cotton Project are 20 percent higher than on neighbouring conventional farms.*
    - *In Madagascar, SRI (System of Rice Intensification) has increased yields from the usual 2-3 tons per hectare to yields of 6, 8 or 10 tons per hectare.*
    - *In Tigray, Ethiopia, a move away from intensive agrochemical usage in favour of composting has seen an increase in yields and in the range of crops it is possible to grow.*

• In the highlands of Bolivia, the use of bonemeal and phosphate rock and intercropping with nitrogen fixing Lupin species have significantly contributed to increases in potato yields (Parrott 2002).

Farm Income

A viable income is an essential element of farm sustainability. Published studies looking at the income of farmers with organic farms compared with those running conventional farms have found that the net incomes are generally similar. However, farmers conducting best practice organic systems have higher net incomes (Cacek 1986 and Wynen 2006).

The United Nations report found that: "Organic production allows access to markets and food for farmers, enabling them to obtain premium prices for their produce (export and domestic) and to use the additional incomes earned to buy extra foodstuffs, education and/or health care."

The report noted: "A transition to integrated organic agriculture, delivering greater benefits at the scale occurring in these projects, has been shown to increase access to food in a variety of ways: by increasing yields, increasing total on-farm productivity, enabling farmers to use their higher earnings from export to buy food, and, as a result of higher on-farm yields, enabling the wider community to buy organic food at local markets.' (Unep-Unctad 2008)

A review in the USA by Dr Rick Welsh of the Wallace Institute has shown that organic farms can be more profitable, and that the premium paid for organic produce is not always a factor in this extra profitability. Dr Welsh drew his conclusions after analyzing a diverse set of academic studies comparing organic and conventional cropping systems, including six university studies that compared organic and conventional systems (Welsh 1999).

A study into apple production conducted by Washington State University showed that the break-even point was nine years after planting for the organic system and 15 and 16 years respectively for conventional and integrated farming systems (Reganold et. al. 2001).

'When compared with the conventional and integrated systems, the organic system produced sweeter and less tart apples, higher profitability and greater energy efficiency' (Reganold et. al. 2001).

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Conclusion

There is very good research that clearly shows organic agriculture can achieve the yields that are needed to feed the world's poor. This is especially the case in smallholder agriculture – the majority of the world's farmers.

The United Nations report stated: 'All case studies which focused on food production in this research where data have been reported have shown increases in per hectare productivity of food crops, which challenges the popular myth that organic agriculture cannot increase agricultural productivity.' (Unep-Unctad 2008)

Organic agriculture is a low cost and effective way of helping many of the world's poorest people achieve higher incomes, good levels of nutrition and a better quality of life.

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Research in Organic Animals and Livestock Production

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Introduction

Over the last 80 years a wide range of diverse organic livestock systems have developed. The driving force behind these developments has mainly been the farmers, consumers and various movements; and it has happened more "despite research" than "because of research." Most production methods have developed in Western Europe and USA, where they are primarily niche products for consumers who give priority to environmental and animal welfare concerns. In these countries organic livestock production offers the option of establishing a niche product that can be sold at a higher price, e.g. as for milk and eggs. In some cases, the potential of organic farming is associated with the adoption of organic principles into existing systems with the aim of improving sustainability, and achieving environmentally friendly production, food security and good food quality. In the US, government support for organic research, some of which was for livestock studies, increased from 15 million dollars in 2002 to 78 million in 2008.

In Australia where more than 95% of the certified organic land is pasture, government-supported research tends to focus on organic dairy and meat production. In addition, research into agro-forestry systems is also of potential interest to the Australian organic sector. In many African and Asian countries, organic livestock plays a very minor role compared with production of high value organic crops, and hence is not covered specifically in research initiatives. A recent survey on African organically-oriented research projects concluded that no significant research focuses on organic livestock. In South America, a number of research projects have been carried out on integrated agro-ecological farming, which includes livestock. These are not necessarily certified organic systems, as "organic" is often perceived as high value products, while "agro-ecological farming" is basically the application of the fundamental organic principles, so research in these systems provides valuable insights for organic research in general.

Research is necessary for many reasons, but at a fundamental level it is relevant to both provide specialised knowledge relevant to organic situations (e.g. feed stuffs) and to take a systems approach through interdisciplinary research (e.g. how grazing systems integrate good animal welfare aims with environmental care). A third aspect important to consider is the human and social structures around organic livestock systems, e.g. farmer attitudes, actions, practices and interactions with advisory services.

Different approaches to organic livestock research

There have been a number of research projects that have compared organic systems with non-organic systems. These have provided documentation about differences and similarities within the same cultural, geographical and traditional context. Other research projects have focussed more on the development of organic farming involving farmers, farmer organizations and/or other stakeholders within the organic sector. This type of research has emerged partly through the engagement of the organic movements and producers in the development of their sector. It generally involves small, often privately funded, non-governmental, sometimes non-mainstream institutions that are interested in local and context-oriented research.

In recent decades, there have been a number of EU projects involving organic livestock production, including network projects like the "Network for Animal Health and Welfare in Organic Agriculture" (NAHWOA) and "Sustaining Animal Health and Food Safety in Organic Farming" (SAFO), both linked at www.safonetwork.org. These have contributed hugely to international project collaboration, exchange of information and joint research proposals, and have involved new and emerging EU Member States, which often have more diversified and integrated farming systems inspiring a focus on the robustness of organic systems. The integrated project "Quality Low Input Food" (QLIF) is another example of an EU project that includes a major combined research focus. QLIF focuses on organic and non-organic low input systems, product quality and consumers' understanding of "organic," as well as certain identified risks related to organic production.

Organic animal welfare concept needs a certain research focus

All organic systems should allow animals to perform their natural behavior. Consequently, "naturalness" is an important key feature of organic livestock farming, combined with a strong emphasis on human care. This philosophical framework for organic animal husbandry gives rise to many, very different challenges, and different types of focus areas for research are involved in identifying the dilemmas and then finding relevant solutions. For example, the objective of naturalness, as well as the acknowledgement of the many health benefits of exercise and open air, leads to grazing as the major emphasis of management for all animal species. Research has contributed greatly towards gaining knowledge on numerous topics relevant for outdoor keeping of animals, including behavioral studies (e.g. contributing to design of outdoor poultry runs), prevention of parasitic diseases in small ruminants (e.g. WORMCOPS (QLK5-CT-2001-01843), feeding of different age groups, as well as management of grassland under intensive and extensive farming conditions. The combined aim of access to "naturalness" and human care represents two widely different challenges in practice as well as scientifically.

Need for an interdisciplinary research approach

Interdisciplinary approaches deal with the complexity of whole systems. In relation to organic grassland farming, the research does not stop with the management of the animals (one or more species per farm). It also aims at providing solutions

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to dilemmas between the behavioral needs of the animals on one hand, and environmental care on the other hand (e.g. outdoor pig systems). Much interdisciplinary research has been carried out to enable the sector meet such challenges, although in many research environments a narrower focus would often be preferable in order to reduce complexity and to be able to work from a simple hypotheses. Until recently, relatively few initiatives within organic livestock research had, for example, integrated natural sciences with social issues.

> *Interdisciplinary reserach aims at providing solutions to dilemmas between the behavioral needs of the animals on one hand, and environmental care on the other hand.*

Research in human perceptions, actions and interactions related to organic animal farming

Some scientific work has focused on animal husbandry practices and disease handling. In the USA, no antibiotics can be used in organic farming, which clearly raises interesting and relevant questions regarding disease prevention and epidemiology. A number of North American studies have compared organic and non-organic dairy systems, and because of the huge differences regarding disease handling between the two systems, these comparative studies may highlight relevant issues important to both the organic and non-organic farming sectors. As the organic livestock sector's aim is to keep animals in a manner that allows them maximum "naturalness," while at the same time providing them human care to a degree that ensures they never suffer, the human-animal interaction is a highly relevant focus area for organic livestock farming. The complex animal systems also put high demands on reflective and contextually specific system development, which emphasizes the need for both supporting and understanding human decision-making and how human perception, actions and interactions influence the design of the livestock farming system as well as daily life in organic herds. The projects, the CORE-Organic-funded "Core-pig" and "ANIPLAN" (http://aniplan.coreportal.org) investigated human assessment and decision-making related to the whole production chain and to the conscious process of planning for animal health and welfare improvements, respectively.

Future research needs towards sustainability and resilience in organic livestock systems

A huge number of research needs could be listed in relation to each specific type of production. For example, organic dairy production involves mainly dairy cows, but goats and sheep are also used in dairy systems. However, there is very little research that focuses on organic dairy goats and sheep. Breeding for disease resistance, robustness and use of indigenous breeds still need a considerable research effort, despite some previous research. Feeding with 100% organic feed, especially to mono-gastric animals, is still very difficult and need further investigation. With regard to disease handling, the role of vaccination, traditional medicine and alternatives to biomedical treatments needs further research efforts, mostly in order to guide the sector on responsible use,

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rather than attempting to prove that "so-called alternative treatment can work." Potential control of vector-borne diseases in the development of organic systems in tropical areas is a focus area that should be prioritized, along with other endemic tropical diseases.

The challenges associated with developing resilient livestock systems are clearly different – but equally important– between regions. However, prticular elements of traditional farming in tropical areas can be transferred to systems that are more eco-intensive. Many pastoralist systems rely on using huge tracts of land, but increasing populations have resulted in pressure on the land, which then reflects in pressure on the animals. For example, the balance to keep the animals free of parasitic diseases, which was previously solved by moving over large distances, is lost when population pressures restrict movements. This leads to a heavy use of "non-organic" medicines. To solve such problems a combined research and development effort with a strong interdisciplinary approach and with a strong element of farmer input is necessary. This approach is in complete contrast to research for improved resilience and mitigation related to climate change in highly intensive and industrialised livestock systems. These later systems need to balance the requirements of animal welfare friendly systems following organic principles, with pressure from markets for continuous production and for low consumer prices. The reliance on imported feed, the vulnerability of intensive mono-cultural livestock farming (e.g. in terms of disease pressure), and providing very big herds with sufficient outdoor access and grazing possibilities are matters that need a combined effort from farmer innovation, development and interdisciplinary research approaches.

More research is needed on organic dairy goats and sheep.
Source: www.oekolandbau.de

In-Farm Research - a Swiss Perspective

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Swiss dairy farms are currently under financial pressure, particularly in these times of decreasing milk prices. They need help from science, but not just with ready-made solutions such as new products against diseases. And the farmers are also under pressure in respect to their motives. Should they drop animal husbandry? What is the value of their livestock beyond the economic return?

But can a question like "Why have animals on farms?" be addressed by scientists at all? This is not an issue that can be answered though analytical analysis.

In agricultural sciences, especially in organic farming, interdisciplinary and transdisciplinary approaches are prescribed as the method of choice (Vogtmann et al. 2002). Application- oriented research acknowledges that problems on farms are very individual and that the price of renunciation of high quality data may be compensated by improved solutions for the farmers (Schmidt 2007).

Attempts to bridge the gap between laboratory research and practical farming is often through on-farm research. On-farm research brings the experiment onto the farm. Farmers can observe the research process in their own fields and eventually obtain solutions that fit their situation. However, the setting of the experiment remains an artificial situation, even though it is on the farm. The transfer of knowledge is shortened dramatically, but a distance between science and farm still exists.

According to Lockeretz (2000) in some cases science should be practiced within the farm organizationsitself . At the same time Stimmer (2007) concluded that "both holistic and reductionistic approaches are needed to advance the efficiency of organic farming."

In-farm research approach

Questions like "Why have animals on farms" require a deep look into the farm's intrinsic features. Such values can hardly be explored by standard methodologies, and very likely, they have to be identified in their real context. Considering a farm as a single organism or even as an individual – a common approach in biodynamics (Steiner 1924) – brings the question right to the farmer, the farm's decision center. As a consequence, it is pertinent to support and acknowledge the farmer as the expert of his own farm – which is the core principle of "in-farm research." This approach allows farmers to reflect on issues that may go unnoticed in their daily working life (Fry 2001, Baars 2007). Interviews help farmers acknowledge their experiences, thoughts, ideas and philosophy. But if the farm is viewed as an organism, every single organ within it must be

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fully scrutinized (Fuchs 2003). The scientist is compelled to become fully involved in the farm as an organism. Their impressions and observations complement the farmers' views. Whereas "on-farm" approaches are based on objectiveness or third-person perspective, "in-farm" approaches enter the organism itself and becomes part of it.

To investigate the question concerning the role of animals on the farm, in-farm research was conducted on four farms for about ten days. Working data, the farm profile, and farm records were examined to establish a clear view of the farm and its history. To examine the daily routine, the farm animals and the interaction between farmers and their cows more closely the researcher worked along side the farmer on the farm. Besides formal interviews with the farmers, "barn-conversations," conversations that took place while working, (e.g. while milking) allowed the researcher access detailed information in a natural setting. When working the farmers tend to talk more openly about impressions, ideas, visions and problems. Farm observations were made on different days and at varied times. The observations included personal "body sense experiences" (Schmitz 2007) as a tool to experience life processes (Jonas 1994, Brenner 2006). Personal experiences and impressions were synthesized into a "farm portrait" that, combined with information from the interviews, provided the basis for answers to pertinent questions. Six months after the first visits, the farms were visited again and follow up interviews conducted.

In addition to the well known reasons for keeping animals, such as financial gain and enhancing soil fertility, all farmers talked of personal motives for keeping cows. For example they said they like "the feelings that they have with animals on the farm" or "cows are an important part of the farm individuality." Other answers were more individualistic, including: "Cows are an important component to develop a farm," "the farm would be a dead place without animals," "cows radiate ease and comfort," "animals influence the expression of a farm," "cows have a positive effect on humans," and "cows enliven the landscape." In addition, barn-conversations revealed a very strong relationship between the farmer and the cows, demonstrated by the treatment of and the behaviour towards the animals. And finally, it was clear that the milking and feeding hours set the rhythm of the daily work of the farm.

The scientist's observations, including body sense experiences, revealed "pictures" and moods of the individual farms. The mood on one farm was as if it was an "oasis," whereas another felt more like

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a “stronghold.” Interestingly, these observations made by the scientist corresponded to the cattle breed kept on the farm. Whether consciously or unconsciously, the farmers had selected breeds that suited the atmosphere of the farm: While the “oasis” farm chose “Rotbunte,” a gentle breed of cattle, the “stronghold” farm opted for “Salers,” a more tough breed from the southern mountains of France.

The overall conclusion was that animals on the farm represent the soul of each individual farm. They are not a supplement, but an essential ingredient of farm life.

Discussion

Undoubtedly, the question will arise as to what extent in-farm research methodology meets scientific standards. Agricultural research on organic farming is always in conflict between the reductionistic character of analytical sciences and the holistic character of their object. Several strategies are commonly used to deal with this tension. Suggestions that research should specialize and information integrated by the farmers themselves (Rümker (1906) have been countered by the argument that to improve the “holistic” quality of science research performed already should be extensively embraced (Lockeretz 2000). Leiber and Fuchs 2008 coined the term “cognitive holism” where all details are put into context by farmers themselves within their own minds.

Asked what the biggest mistake in agricultural science was, Monkombu Sambasivan Swaminathan, the father of the Green Revolution in India, answered that it was the discrepancy between economic and social realities and the laboratory in which technologies are developed, and that this gap had been underestimated for too long: “the gap between the know-how and the do-how on the field is big” (DIE ZEIT 2008). The International Agrar Assessment IAASTD concludes that world food shortages would be overcome best through a combination of indigenous knowledge and science (Bongert and Albrecht 2009). Some good examples have been documented (Hoffmann, Probst and Christinck 2007), but this approach is far from receiving general recognition and is underrepresented in mainstream research.

The German Research Society DFG stated in its memorandum on agricultural sciences that “agricultural sciences are different to other sciences by including mankind in its methodology” (DFG 2005). Likewise, Daston and Galison (2007) in their book about objectivity elaborated on the association of the scientist with his research topic, a prerequisite to becoming an expert in trained judgement in this field of research. The involvement of the researcher in the research process itself needs reflection on the underlying worldviews, values and goals (Alroe and Kristensen 2002). In this light, in-farm research can be accepted as a science, in fact, a “life science” in the best sense of the meaning.

Conclusions

The examination of the question, “why animals on farms” demonstrates the potential of “in-farm research” to gaining in-depth knowledge of the farm. The scientist’s observations and co-working on the farm are a method of choices that allows an accurate evaluation of the current situation of the farm, its atmosphere and the inner perspective of the farmers. It also lets the scientist contrast impressions from a personal point of view and to challenge statements made by the farmers. In addition, farmers were grateful for the “non-economic” assessments of the farm. As a con-

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sequence of this work, the reasons farmers give for keeping cows has become more conscious, and their decisions may strengthen their motives while also helping with public relations.

Interestingly enough, looking at the farm as an individual organism, and trying to understand its intrinsic values the research methodology increasingly resembles that of social science, e.g. participative research.

The researcher has to be trained in "objectivity" and precision in observational skills, and professional experience in agriculture is mandatory. Curricula in agri-science should include training programs to develop them.

In-farm research cannot, and will not, be an alternative to other scientific endeavors. Rather, it is a complementary approach, especially for developing sustainable farming practices.

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The Latin American Scientific Society of Agroecology (SOCLA)

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The growing push toward industrialization and globalization with its emphasis on export crops such as transgenic soybeans for cattle feed for countries such as China, Europe, USA and the rapidly increasing demand from the North for agrofuel crops, is increasingly reshaping Latin America's agriculture and food supply, with growing economic, social and ecological impacts and risks. In addition to threatening the integrity of ecosystems and biodiversity, the advancement of industrial agriculture puts the region at risk given the vulnerability of monocultures to climate change and heavy dependence on costly petroleum. The continual growth of the agroexport and agrofuel dominant model undermines food production in the region by driving small farmers off the land.

> *SOCLA is a network of researchers, professors, extentionists and other professionals promoting agroecological alternatives to confront the crisis of industrial agriculture in Latin America.*

As these trends unfold, the concepts of food sovereignty and agro-ecologically based production systems have gained much attention in the last two decades. New approaches and technologies involving application of blended modern agricultural science and indigenous knowledge systems are emerging. These are spearheaded by thousands of farmers, NGOs and some government and academic institutions and are proving to enhance food security while conserving natural resources, agrobiodiversity, and soil and water conservation throughout hundreds of rural communities in the region. The science of agro-ecology, which is defined as the application of ecological concepts and principles in the design and management of sustainable agro-ecosystems, provides a framework to assess the complexity of the systems.

The idea of agro-ecology is to go beyond the use of alternative practices and to develop agro-ecosystems with a minimal dependence on high agrochemical and energy inputs. It emphasizes complex agricultural systems in which ecological interactions and synergisms between biological components provide the mechanisms for the systems to support their own soil fertility, productivity and crop protection. In addition to providing the scientific basis to sustainable enhance productivity, agro-ecology emphasizes the capability of local communities to innovate, evaluate, and adapt themselves through farmer-to-farmer research and grassroots

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extension approaches. Technological approaches emphasizing diversity, synergy, recycling and integration, and social processes that value community involvement, point to the fact that human resource development is the cornerstone of any strategy aimed at increasing options for rural people and especially resource-poor farmers

SOCLA was born out of the growing awareness of a group of professionals involved in research, education and extension about the need to design a new agriculture that enhances the environment, preserves local cultures and associated biodiversity, and promotes food sovereignty and the multiple functions of small farm agriculture. The immediate challenge of SOCLA is to transform industrial agriculture by transitioning the world's food systems away from reliance on fossil fuels, to develop an agriculture that is resilient to climatic variability and to promote local forms of agriculture that ensure food sovereignty and the livelihoods of rural communities.

A major commitment of SOCLA is to reverse the devastating trends of the industrial agricultural model by promoting the development of the science of agro-ecology as the scientific basis of a sustainable rural development strategy in Latin America. To accomplish its objectives SOCLA organizes one scientific congress every three years, short training courses in various countries, produces publications on key issues and maintains working groups that provide information, analysis and technical advise to a number of civil society and farmers organizations involved in agoecology in the region.

In Latin America agro-ecology has developed rapidly in the last two decades. Hundreds of NGOs have used the science to promote sustainable agriculture initiatives, several universities have created courses, undergraduate and masters programs on the subject, some governments (Brasil, Cuba, Venezuela, Bolivia, Peru) have incorporated agro-ecology as part of their rural development strategy and recently rural movements (Via Campesina, MST, MPA etc) have embraced agro-ecology to promote their agenda on food sovereignty.

Currently, there is no organized forum of academics (professors, researchers, extensionists) committed to agroecology to engage in common analysis of major forces shaping the future of agriculture in the region and to provide information on alternative technologies. SOCLA is filling this

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gap by making sustainable agriculture scientific research, education and extension available to the various stakeholders via a series of educational, outreach and research activities. In collaboration with the Univeridad Nacional de Colombia and the Universidad de Antioquia, SOCLA has also created a Latin American Doctoral Program on Agro-ecology which will train a critical mass of high level professionals on the theory and practice of agroecology (http://agronomia.unal.edu.co/prog/post/doct/phd_agroeco.html).

SOCLA defined a strategic plan at its first regional scientific congress held in Medellin, Colombia, in August 2007. Several working groups have been formed to engage in analysis, research, education and outreach on pressing contemporary problems affecting Latin America (i.e. climate change, the impacts of biotechnology and agrofuel crops, impacts of globalization and free trade agreements, food sovereignty, etc), as well as a major analysis of the status of agro-ecology on various scientific fields such as soil management, pest management, indicators of sustainability, ecological economics, ethnoecology and rural development.

Working groups conduct research, analysis and outreach on key issues defining sustainable agriculture in the region, informing rural social movements and civil society on trends, challenges and opportunities affecting food systems, thus improving their work on development of technological alternatives, fair local/national markets, local rural development strategies and policy change conducive to sustainable food systems. SOCLA also widely publishes results of the working groups via a website (www.agroeco.org/socla) , a journal (in collaboration with SEAE and the Universidad de Murcia) and a series of white papers of wide access by civil society. A series of graduate and web-based courses on agroecology and the creation of a scientific journal are planned.

A great number of organizations (Universities, NGOs, organized farmers organizations, etc) working on sustainable agriculture will be empowered by authoritative studies and/or other educational -outreach activities organized and/or endorsed by SOCLA on issues of major importance to the future path of agriculture in the region. For example, there is today a major push in the region to devote large amounts of agricultural lands to the production of agrofuel crops, but no authoritative study coming out of a major scientific society exists analyzing what will be the impacts of such developments on food security, biodiversity, etc. in the region. Similarly, researchers have developed models predicting impacts of climate change on agricultural productivity, but studies on how to make agro-ecosystems resilient to climate drought or erratic rainfall patterns are sorely lacking.

The Latin American Congress of SOCLA is being held in Curitiba, Brazil, November 9-12, 2009, in collaboration with the Associação Brasileira de Agroecologia-ABA (http://www.agroecologia2009.org.br/modules/conteudo/conteudo.php?conteudo=44).

The theme of the congress is “Peasant and Family Agriculture: past and present experiences to build a sustainable future.” More than 2,000 people (students, farmers, researchers, professors, etc) are attending to engage in key discussions and the forging of partnerships to advance agro-ecology as a truly sustainable alternative to the cul de sac of industrial agriculture.

TP Organics – Technology Platform for Organic Food and Farming: Vision and Strategic Research Agenda for Future Organic Knowledge

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Introduction

In December 2008 TP Organics, the Technology Platform for organic food and farming officially published its Vision for Organic Food and Farming 2025[1]. Technology Platforms (TPs) are important consortia playing a key role in better aligning EU research priorities to industry's needs. TPs are industry led, involving the research community, public authorities and civil society. They have a major influence on current and future European Research Framework programmes. Currently 35 TP exists, covering a wide range of topics, but none consider agricultural systems as such, nor the science of complex ecological and socio-economic systems. Since 2007, a consortium with several organizations from the organic sector gathered together to address this gap. Intensive discussions about different scenarios for agriculture and food systems up to the year of 2025 and further consultations with a wide range of actors resulted in the publication of the vision and the launch of TP Organics.

The vision was prepared on the basis of wide-ranging discussions with farmers' organizations, scientists, organic traders and retailers, as well as EU-wide umbrella organizations representing a variety of commercial, non-commercial and civil interests. It reveals the potential of organic food production to contribute to some of the major global challenges of the future, such as climate change, food security and to a whole range of socio-economic challenges in the rural areas.

The main aim of the Technology Platform 'TP Organics' is to agree with producers and other operators and civil society on the priorities for research in support of this vision, and to help translate them into funding for concrete research programs and projects. It is a growing, bottom-up initiative of European umbrella organizations, enterprises, and national and EU-level public and private actors in the organic sector.

Vision on organic food and farming research agenda to 2025

Up to now, research projects and national framework programs on organic agriculture have mainly addressed technology gaps in organic agriculture and food production and have responded to policy needs. Thus, many organic research projects have focussed on the delivery of short-term perspectives. In contrast, the vision of TP Organics takes a more strategic and long-term perspective on the research needs of organic agriculture and food systems. The three strategic research priorities presented in the vision focus, in particular, on the potential trade-offs and conflicts

1 http://www.tporganics.eu/upload/TPOrganics_VisionResearchAgenda.pdf

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between economy, ecology and social cohesion in agriculture and food production, and propose research activities and insightful learning concepts for organic and other farming systems.

Taking into consideration the major challenges that human society will face over the next 20 years, three priority fields of research were identified:

1. Empowerment of rural areas and economies.
2. Eco-functional intensification of food production.
3. Production of food for health and human wellbeing.

Organic agriculture is strongly based on ethical values and on principles, such as the principles of health, ecology, fairness and care2, and the objectives and principles of organic production as stated in the Council Regulation (EC) on organic food (834/2007)3. These principles provide a unique basis for developing assessment and decision-making tools and for modelling future sustainable food and farming systems in a practical context of the whole food chain. They also have implications for research. Apart from producing high quality food, organic agriculture also aims to deliver public benefits in response to societal demand, such as contributing to a high level of bio-diversity, making responsible use of energy and natural resources (soil, water, air), respecting animal welfare and contributing to rural development. Representations of civil society are, therefore, also important partners in technology development and innovation.

TP Organics Strategic Research Agenda

During 2009 TP Organics has been developing a so-called Strategic Research Agenda (SRA) covering key challenges under each theme and topics for research proposals. Each theme is coordinated by a senior scientist and assisted by experts from research and from industry familiar with organic food and farming. A first draft identifying challenges faced by the sector and suggestions for research topics was published in April 2009[4]. Several workshops throughout Europe and on-line consultations gave farmer, processors, market actors, advisors, and members of inspection/certification bodies, individuals from civil society organizations and researchers the opportunity to prioritize key challenges and make suggestions for research topics. A stakeholder forum was held in Brussels in July 2008 with representatives from different EU umbrella organizations, small and medium sized enterprises (SMEs), the European Commission, civil society and research community.

The following sections presents the main visions and related key challenges in relation to the three themes (see Figure 1).

Empowerment of rural economies in a regional and global context (co-ordinated by Susanne Padel, Aberystwyth University): By 2025, new concepts, knowledge and practices will halt or even reverse migration from rural areas to urban centres. A diversified local economy will attract people and improve livelihoods. Organic agri-

2 *IFOAM (2005). Principles of Organic Agriculture Bonn, International Federation of Organic Agriculture Movements. Online at http://www.ifoam.org/about_ifoam/principles/index.html*

3 *EC (2007). "Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91." Official Journal of the European Union L 189(20.7.2007): 1-23.*

4 *www.tporganics.eu/upload/TPOrganics_SRA_firstdraft.pdf*

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Figure 1: Vision for 2025: Strategic research priority for food and farming research

culture, food processing and eco-tourism will become important drivers of the empowerment of rural economies. The dialogue between urban and rural populations will improve considerably and intensified forms of partnership between consumers and producers will emerge. Five key challenges related to this theme are identified:

- Use and further develop the concept of multifunctionality to deliver sustainable rural development.
- Build and maintain competitive, trustworthy and fair supply chains of high quality organic food.
- Improve knowledge and communication systems for multi-functional organic and low input food production.
- Improve organic farming's contribution to food security and international development.
- Develop an integrated policy framework for organic farming and sustainable rural development.

Securing food and ecosystems by eco-functional intensification (co-ordinated by Niels Halberg from ICROFS): By 2025, the availability of food and the stability of food supply will be noticeably increased through eco-functional intensification, and access to food will be considerably improved due to the revitalization of rural areas. Knowledge among farmers on how to manage ecosystem services in a sustainable way will be much greater, and animal welfare and environmentally sound farming will be cutting-edge technologies in food production. The key challenges related to this theme are:

- Improve ecological support functions for resilient crop production.
- Develop modern mixed farming systems.
- Develop appropriate and robust livestock production systems.

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- Encourage green improvement of genetic resources.
- Develop and adapt novel technology.
- Consider the role of organic agriculture in relation to climate change.

High quality foods – a basis for healthy diets and a key to improving the quality of life and health (co-ordinated by Machteld Huber from Louis Bolk Institute): By 2025, people will have more healthy and balanced diets. Food and quality preferences will change: higher proportions of fresh and whole foods will be the target and processing technology will produce foods with only minimal alterations to the intrinsic qualities of the raw ingredients. The specific taste of food items and its regional variation will be more appreciated than artificially designed.

The key challenges related to this theme are:

- Conduct studies on health and well-being in humans consuming organic food or foods of different qualities.
- Determine methods to assess organic food quality and vitality and development of reference standards.
- Develop unobtrusive processing technologies that maintain and improve organic food quality.

The published SRA document will also highlight cross cutting issues, such as the contribution of organic farming to mitigating climate change, the further development of organic production and supply chains in line with its principles and the contribution to global challenges, such as climate change, water management, dissemination strategies. In addition, the document will describ the process of SRA development.

TP Organics has made significant progress in formulating the Strategic Research Agenda (SRA). The involvement of many stakeholders has clearly shaped the research priorities and work plan and a further on-line consultation is planned for October with the aim to prioritize which research topics are to be included in the final document. In December, the findings will be presented to the EU institutions for a final feedback before the document is officially published.

To find out more please visit the website at: http://www.tporganics.eu or contact the secretariat (eduardo.cuoco@ifoam-eu.org).

QLIF - A Milestone in Research on Organic Farming and Food Systems

By Urs Niggli

Director of FiBL, Switzerland and IFOAM World Board Member

Email: urs.niggli@fibl.org

In April 2009, the biggest research activity on organic farming and food systems so far – the Integrated Project1, abbreviated to Quality Low Input Food or "QLIF" (see information box) – came to an end after five years. Sixty-one work packages provided conclusive answers based on comprehensive analyses from scientific experiments, socio-economic data and complex modelling. The scope of QLIF was on quality and safety of organic and low-input foods in the context of cost efficiency and sound environments.

QLIF produced a solid scientific basis for understanding organic food chains. It resulted in the number of peer reviewed publications on organic food and farming growing considerably. Many findings had already been disseminated to consumers and farmers by the end of the project. Some of the most important conclusions are summarized below by the deputy co-ordinator of the project, FiBL Director and IFOAM World Board Member, Urs Niggli.

A shift towards sustainable agricultural production entails the adoption of comprehensive, more system-oriented strategies. Such strategies include using farm-derived inputs and basing productivity on ecological processes and functions. Furthermore, they involve the traditional knowledge and entrepreneurial skills of farmers. The most consistent approach within the different sustainable or "low-input" agricultural methods is organic farming. However, organic food and farming systems are still criticized by some scientists and policy makers because their claims are said to be insufficiently based on science. The conclusions arising from the QLIF project have consolidated the practical knowledge behind the organic strategy by cutting-edge science. Unfortunately, cut and dried opinions, such as those recently published by the British Food Standard Agency (FSA), have not changed.

Conclusion 1: The quality of organic food is high and matches the expectations of European consumers

The field and animal experiments carried out in different parts of Europe showed that organic production methods result in (a) food with higher levels of nutritionally desirable compounds, e.g. secondary plant compounds/vitamins/antioxidants and poly-unsaturated fatty acids such as CLA and omega-3; and (b) lower levels of nutritionally undesirable compounds such as heavy metals, mycotoxins, pesticide residues and glyco-alkaloids (bitter tasting, slightly toxic compounds) in a range of crops and milk. Harvested plants (tomatoes, lettuce, onions, potatoes, carrots, cabbage,

1 The Integrated Project (IP) is an instrument of the European Commission's 6th research framework programme to support objective-driven research, where the primary deliverable is new knowledge.

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apples and wheat), had an antioxidant content that was 40 percent higher when organically grown. In the case of milk, nutritionally desirable compounds were up to 70 percent higher in organic samples. The multi-factorial design of the QLIF experiments made it possible for the first time to correlate the higher quality of organic food to management practices. The nutritional composition in a range of crops was improved by the use organic fertilizers. The content of antioxidants seems to be linked to higher soil fertility, especially to higher soil microorganism activity. In fruit production, the less intensive use of pesticides increased the contents of antioxidants, probably as these compounds are part of the defense system of the plant. Milk quality improved when the lactating cows were on a roughage-based feeding regime and when the maize silage content was kept low, or during outdoor grazing periods. The QLIF results increased knowledge on how producers can further improve the quality of organic plant and animal foods. Some experiments targeted very specific quality aspects, for example (a) to increase protein contents and quality of wheat through soil fertility management and variety choice, (b) to improve the intramuscular fat content that affects the sensory quality of pork through the feeding of grain legumes; and (c) to improve milk and milk protein yields through the feeding of red clover silages.

Project title	Improving quality and safety and reduction of costs in the European organic and low-input supply chains (QLIF)
Scientific and SME partners	31 partners (Universities, state and private research institutes, SMEs) from 15 European countries, see www.qlif.org/topmenu/contact/partners.html
Coordinators	Prof Carlo Leifert (University of Newcastle and Dr Urs Niggli (FiBL)
Project duration	Five years (2004 to end April 2009)
Budget	18 million Euros under the 6th Framework Programme for Research and Technological Development (12.4 million Euros from the European Commission and 5.6 million Euros from national funding [CH, DK, NL, F, UK, TK, ISR]).
Website of the project	www.qlif.org
Publications	www.fibl.org/index.php?id=488

Overview of QLIF

The QLIF results increased knowledge on how producers can further improve the quality of organic plant and animal foods. Some experiments targeted very specific quality aspects, for example (a) to increase protein contents and quality of wheat through soil fertility management and va-

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riety choice; (b) to improve the intramuscular fat content that affects the sensory quality of pork through the feeding of grain legumes; and (c) to improve milk and milk protein yields through the feeding of red clover silages.

Conclusion 2: Organic foods are safe

Consumers regard organic food to be not only better, but also safer, more hygienic, and to be free of chemical residues and artificial ingredients. This was the conclusion of several consumer surveys carried out in Germany, Denmark, Switzerland, Italy, the United Kingdom and Greece. Organic food was shown to live up to these expectations – another major result of the QLIF project. Studies in Denmark proved that there is a lower risk of faecal Salmonella shedding in pigs from outdoor rearing systems. This was shown to be true for both organic and non-organic outdoor systems. Intensive indoor systems had 2 to 3 times higher Salmonella levels and, therefore, pose a greater risk of enteric pathogen transfer into the human food chain. A study in Germany looked at the microbiological safety of lettuce fertilized with organic manure. Even in worst case scenarios, no additional safety risks could be detected with respect to Salmonella or E. coli transfer risks where organic manure was used. However, these studies concluded that to minimise safety risks it is essential to follow good agricultural practice with respect to manure use and processing. Many nutritionally undesirable compounds are present at lower levels in organic foods than in conventional ones. Again, protocols for specific organic Hazard Analysis with the relevant Critical Control Points were developed.

Conclusion 3: Processing of organic commodities is a challenging trend

Regular purchasers of organic food are suspicious of over-processed organic foods sold in supermarkets. Occasional buyers on the other hand are sensitive to convenience food, and this customer group represents the most dynamic potential for further market growth. Therefore, there is a high demand for processing methods that only spar-

QLIF focuses in part on consumers' understanding of "organic."
Source: FiBL

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ingly use chemicals, additives and preservatives. The QLIF project proposed a code of practice, with guidelines for processing standards that also include an aspect of maintaining the authenticity and naturalness of organic foods. In a case study with fresh-cut vegetables, alternative disinfectant strategies using ozone were successfully tested on both laboratory and industry levels in order to avoid chlorine treatments. Furthermore, processing technologies were assessed that may improve the nutritional composition of dairy products.

Conclusion 4: Health claims for organic foods are not yet substantiated

The positive findings on the quality and safety of organic foods might be the reason a majority of European baby food producers have shifted to processing organic raw ingredients. In contrast, studies investigating the effect of organic food consumption on the health of experimental animals have only produced preliminary results. Interestingly, organic and conventional feed from the field trials affected the hormonal balances and immune status of rats differently and significant correlations with fertilisation and crop protection techniques occurred. However, further and more detailed studies are required to provide conclusive proof of the positive health impacts of organic diets on human and animal health.

Conclusion 5: Factors identified that impede an increased consumption of organic and low-input foods

The main barriers hindering an increase in consumer demand for organic food are (a) insufficient availability; (b) limited range and assortment; and (c) high prices or an insufficient perceived price-performance ratio. Perception may possibly change when the information gained by QLIF research on the actual qualities of organic food becomes more widely known. In countries where availability and assortment is already very good (e.g., Denmark, Austria, Switzerland), the share of organic food sold was 5 to 6 percent of all food purchases, but the relatively high premiums on consumer prices continue to obstruct large scale organic sales.

Conclusion 6: Bottlenecks along the organic food chains addressed and some solved

A number of QLIF experiments investigated bottlenecks within organic crop and livestock production systems that reduce yields and/or increase economic risk and, therefore, push up prices.

In line with the organic concept, a major focus of the project was soil fertility management. Studies investigated how the soil's potential could be deployed to release nitrogen and increase its ability to suppress economically important diseases. The consequent application of good organic practices over decades was shown to be more effective than short-term interventions. Therefore, well-managed organic farms become significantly more productive in the long run.

Yield stability and increases were achieved by novel indirect and direct control of pests and diseases. Examples of successful methods include sowing companion plants in Brassica crops, attracting beneficial insects, applying β-aminobutyric acid against mildew in lettuce, and treating seeds, e.g., with compost extracts and acidified nitrite solutions.

Livestock performance was successfully improved by preventive management strategies in the case of mastitis of dairy cows and, in the case of poultry production, two helminth species were controlled by using outdoor runs.

In other cases, alternative treatments such as diatomaceous earth and liquid formulation of silicas were successful against red mite in poultry. While, dried chicory roots added to the diet of

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sows and boars abolished egg excretion of parasitic roundworms. Some of these new techniques have already been adopted by practitioners.

Case studies of organic food supply chains revealed economically important weaknesses, especially in the high logistic and transport cost, high input costs and low spending on research and product development. Good cooperation among the supply chain actors was identified as a factor that improved both non-financial and financial performances.

Conclusions

The QLIF project has been a showcase for demonstrating how demanding science is when solutions are sought under the premise of analyzing and optimizing entire agro-ecosystems and along whole food chains. Any progress in agricultural production, e.g. higher yields, better plant or livestock health status, lower costs per unit, has to be scrutinized to determine whether the intrinsic quality and authenticity of the food produced has been affected, and whether it increases any negative impact on the environment. Therefore, the organic way is not the easy course for scientists as it requires both an interdisciplinary and transdisciplinary approach. The QLIF project paid particular attention to assessing the impact of the results on the farms' ecology and on the socio-economic situation of the farmers. The dairy research projects achieved a net benefit from the optimized organic production systems 49,700 € per year for 100 cows. By implication, the added-value of research is likely to be very high and the potential of research in organic food and farming systems to make them ecologically, economically and socially more productive is exiting. Thus, organic research merits special consideration for public funding.

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Health Claims on Organic Food – a Chance or a Risk?

By Jessica Aschemann-Witzel
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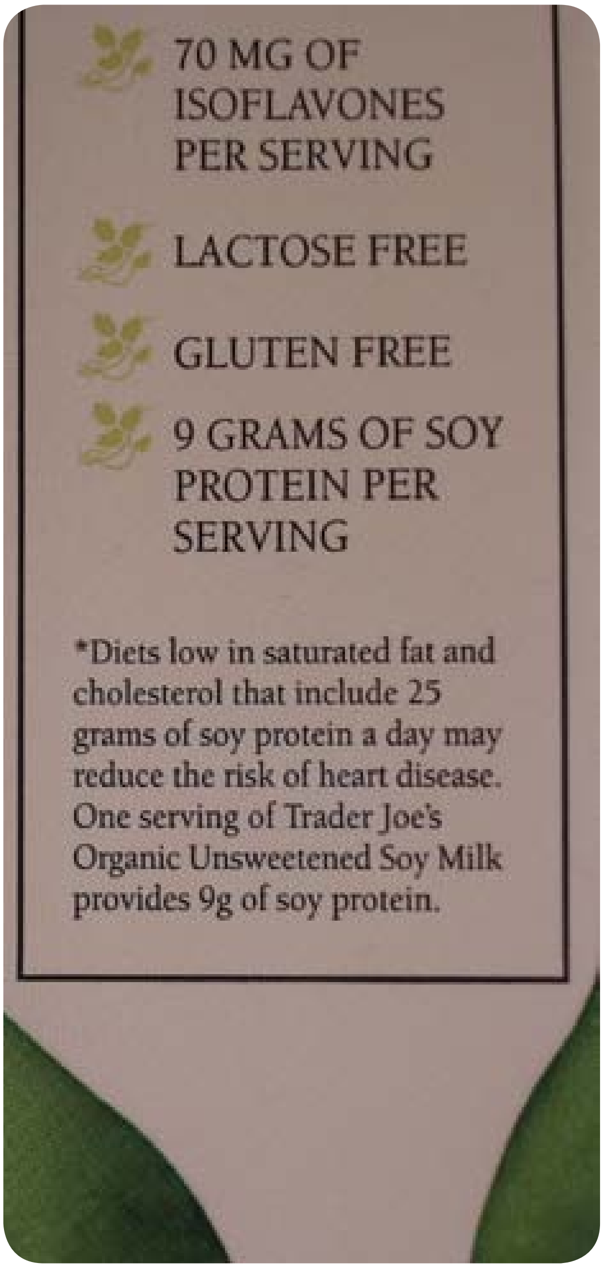
Email: jeaw@asb.dk

Health is a topic often highlighted on food packaging worldwide, but above all in industrialized countries. This trend can be explained by the increase in lifestyle-related diseases and obesity, but also by the fact that people have a long life expectancy, in which health and well-being are highly valued goods – even an obsession.

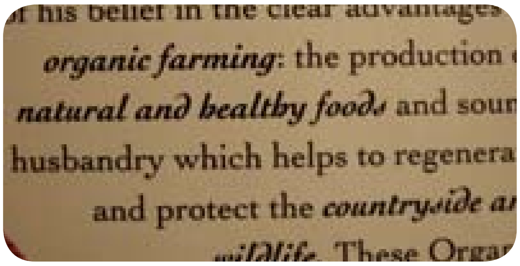
Governments and consumer organizations are, however, concerned that some of the health messages might be misleading, convincing consumers to buy a food product which in fact is less healthy than the alternative product or encouraging them to replace fresh food for processed food. Contrary to that, correct claims on food might also be a tool to educate the population about the role of certain substances or the importance of a balanced diet. These considerations triggered the establishment of regulations about health claims on food in the main food markets of the US and Japan in the 1990's, while the EU has only followed recently: the regulation (EC) 1924/2006 came into force in 2006.

Nutrition and health claims on food are defined as non-mandatory claims on a food package or in the product advertisement which state that the food has special properties regarding a nutrient or a substance, and that this, in the case of a health or a health risk reduction claim, has an



A health claim according to the regulation in the USA on an organic soy milk carton.

impact on the health status of the person consuming the product. Examples are "high in calcium" and "calcium strenghtens bones" or "calcium reduces the risk of osteoporosis." Claims must be



Organic cookies with a statement relating to overall healthiness. Such claims might be considered as not being in accordance with the regulation about nutrition and health claims in the EU by food law authorities, in case it is not accompanied by a specific claim which is already allowed, or because the product does not meet the nutritional profiles (see regulation (EC) 1924/2006 for further details).

scientifically substantiated, officially authorised, non-misleading and truthful regarding the impact which normal consumption of the food in question can have on health.

In the EU, claims will only be allowed on foods which comply with a certain nutrition profile, in order to prevent a claim overshadowing the fact that the product as such ought to be regarded as 'unhealthy', because, for example, it contains a lot of salt, sugar, fat etc. There are some differences in the regulations between Japan, the USA and the EU, but a common basis has been agreed upon by the international WHO/FAO-body of the Codex Alimentarius Commission in its guidelines about nutrition and claims on foods.

Products with claims are at the same time functional foods, because those foods – although there is no common definition – are regarded as having a special health-promoting property. Functional food is associated with genetic modification or other processes of modification of the original food and is also named "nutraceuticals." "technical food" etc. The health property is mostly based on a single-substance, and this substance is often added or is the result of further and novel processing of the food.

Claims for natural substances or unprocessed foods are not only rare, they are also difficult to verify because in order for the claim to be truthful, it has to be certain that every unit of the product contains enough of the substance in question. Fulfilling this requirement is difficult for a product such as an apple, for example. The description shows that there is a certain difference between the concept of functional food or products with claims on the one hand and organic food on the other hand: organic foods are associated with natural ingredients, absence of genetic modification, less processing and a "holistic" healthiness which is not solely based on one individual substance, but on an approach encompassing all steps from the farm to the plate.

A text on an organic crunchy muesli stating that the product provides "long lasting energy." This claim might be understood as being a health claim, and thus has to be substantiated by scientific evidence.

Health concerns or the aim of being healthy is the driving factor behind consumer preferences for products with claims. They are also the main driver for consumers choosing organic products. What does this mean for the organic movement and the organic market – is it a threat, or a chance? Concerning the first, it can be argued that if consumers choose an organic product solely due to health reasons, products with claims might be increasingly more convincing. Claims are based on scientifically proven facts and the nutrition-health-relationships described in the claims are repeatedly mentioned in the media. With a regulation in force, the manufacturers' claims are approved by a more trusted authority – the government or other state/pan-national regulators - than manufacturers alone. Credibility of the claim might even be higher when independent organisations and charities such as the Heart Foundation enforce the health-message on the food product.

In a situation where more and more conventional food products as well as whole companies – such as Nestlé – use claims and the health argument, consumers might start to ask for proof that organic products are healthier. They might switch to choosing the products with the proudest claims whilst the "quieter" health-arguments regarding organic products lose out. Going the down the same road as the conventional food manufacturers and combining organic products with claims is a possible option. However, the scientific substantiation of claims is costly and will largely only be accessible to big multinational companies, which then use the claims as product-specific marketing.

Instead of being a threat, claims and the regulations for claims can also be a chance for the organic market. The healthiness of organic products has only been proven for some substances, and these substances are not present in every single unit of an organic end-product, because organic production is process and not product oriented. Organic products cannot thus be depicted as intrinsically healthy. In spite of that, consumers generally believe that organic products are healthier. Health claims might even be perceived as more credible on the organic product than on the conventional product, because consumers trust the organic producers/manufacturers to a greater extent.

Of course, many consumers expect more than healthiness in a food product, and organic products offer animal-friendliness, environmental protection etc. too. This can be an advantage over conventional products with claims, which may offer only one attribute. Organic food manufacturers might choose different claims than the manufacturers of the conventional products, in that the claims on the organic products are based on natural ingredients or natural processes in order to fit into the organic product's image. The research results regarding the healthiness of organic products highlights which claims can be verified for organic products more easily - although not exclusively - as for example in the case of omega-3-fatty-acids.

Global Monitor & Publications

The Mystery of GM Flax Contamination in Canada

Flax seed exports from Canada – organic and intensive – have been hit by a mysterious contamination with genetically modified (GM) flax. By mid-October 2009 some 28 countries, including many European states as well as Sri Lanka, Singapore, and Thailand, had been affected by the contamination, which was first reported on September 8th.

Across the Canadian prairies farmers are angry and worried. "Farmers face the threat of unwanted contamination from GM crops, even when the crops are not supposed to be grown," said Arnold Taylor, an organic flax grower and Chair of the Organic Agriculture Protection Fund of the Saskatchewan Organic Directorate. "Someone's going to have to pay for testing our crops for contamination and any required clean-up. Who will be liable?"

"Our organic market is probably sabotaged because of this," said Mr. Taylor. GM flax is not approved for human consumption in the following 28 countries where contamination has now been confirmed.[1] Companies have been removing products from the market as the GM flax has been found in cereals, bakery products, bakery mixtures and nut/seed products. At least nine GM flax contamination notices have been filed so far through the European Commission's Rapid Alert System for Food and Feed. European authorities have named the source of contamination as the GM flax variety "Triffid," which was developed in Canada. It was deregistered in 2001 and has been illegal to sell since that time.

"It's been nearly a month since contamination was first found, but neither the Canadian government nor industry has come forward with any answers," said Stewart Wells, President of the National Farmers Union of Canada. "The continued uncertainty and unanswered questions show the need for more strict regulation of GM crops in Canada." "The Canadian government still refuses to consider market harm when they decide to approve GM crops. This obviously has to change immediately," says Lucy Sharratt, Coordinator of the Canadian Biotechnology Action Network. "The entire regulatory system needs urgent reform or we will see even more widespread market chaos."

Can Organic Milk Put India on Global Dairy Export Map?

Only organic milk will address the concerns of Indian citizens regarding the quality of milk they have been consuming. So says Dr. Selvam Daniel, Managing Director of Ecocert India. Ecocert has organized a national convention on organic milk and milk products in Ummed Ahmedabad, Gujarat on November 14, 2009 with eminent organic dairy and food experts looking at the opportunities and challenges facing the India dairy industry.

"In view of the consumer's increasing concerns about milk adulteration, there is a huge demand for organic milk in India," says Dr Daniel. "According to a study done by the International Competence Centre for Organic Agriculture and the marketing research and agribusiness consultancy Genus AB, milk is among the top 10 organic foods categories in demand in India."

For overseas markets, India exports little milk, though it is the largest global producer of milk (some 125 million tonnes of milk annually). "This is primarily because of quality issues," says Dr Daniel. "Only organic milk can put India on the global dairy export map. Global consumption of organic milk has been increasing 20 percent annually in view of its well-documented health benefits."

According to UN FAO data, milk production in Asia last year was expected to rise by 4.0 percent,

1 *Germany, United Kingdom, Italy, Luxembourg, Netherlands, Switzerland, Belgium, Sweden, Austria, Poland, Hungary, Croatia, Czech Republic, Spain, Denmark, Estonia, Norway, Finland, France, Greece, Romania, Portugal, Iceland, Republic of Korea, Singapore, Thailand, Sri Lanka and Mauritius.*

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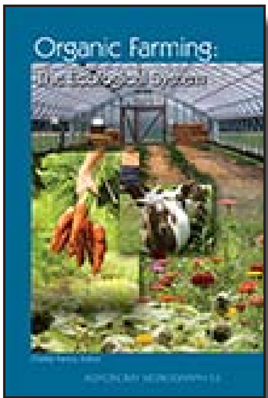
Global Monitor & Publications

the same rate as in 2007. The expansion in the region was less than expected in recent years, as estimates in China were revised down to show a growth of “only” 9.5 percent in 2006. Production in China is now projected to have expanded by 8.5 percent in 2008, down considerably from the near 20 percent average of the previous decade, as growth is being tempered by capacity constraints and high feed costs. The slower pace of expansion in China may be critical in the longer term for world dairy markets and, if domestic demand continues to grow at its current pace, Chinese imports could rise significantly.

The FAO data shows India and Pakistan, with strong annual milk production growth at 3 and 4 percent, respectively and poised to take a greater role in regional and international dairy trading.

Ecocert India has a presence in all Indian states. To date, the company has certified around 300,000 hectares of land in India. Its mission is to create a healthier and greener India by encouraging the consumption of certified organic food. The company has also been striving for global recognition for the trademark/brand Organic India.

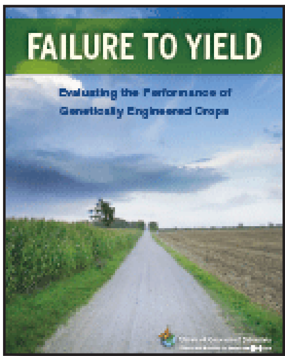
Organic Farming: The Ecological System



Agriculture is going through a profound revolution -- one that rivals the industrial revolution of the 19th Century and the Green Revolution of the 20th Century, according to the authors of a new book, *Organic Farming: The Ecological System*, which combines farmer experience and wisdom with the best that science has to offer. The book’s chapters can help consumers better understand how organic systems can be designed to meet human needs while also preserving the natural environment.

Organic Farming: The Ecological System is 378-pages, hardcover, and is available for $70 at www.societystore.org, or by emailing books@agronomy.org. The book covers many topics surrounding organic agriculture including: history and certification, ecological knowledge as the basis of sustainability, biodiversity, crop–animal systems, forages, grain, oil seed, specialty crops, soil nutrient needs, vegetation and pest management, marketing, food security, education and research, and the future outlook of organic agriculture. View the full Table of Contents here.

Failure to Yield



Genetically engineered crops are often falsely promoted on account of their capacity to “feed the world,” i.e., because they allegedly produce higher yields.

But the promises of the biotechnology industry are hollow, according to *Failure to Yield*, a report published in March 2009 by Doug Gurian-Sherman from the Union of Concerned Scientists (UCS), a scientific research nonprofit in the U.S. The report concludes contrary to popular belief: “despite 20 years of research and 13 years of commercialization, genetic engineering has failed to significantly increase U.S. crop yields.”

The 53-page report is available for free download from the Union of Concerned Scientists website.

Calendar of Events 2009-10

5th National Conference on Organic Agriculture, Owerri, Imo State, Nigeria
November 15-19
Contact: Prof. M. C. Ofoh,
mcofoh@yahoo.com.

BioFach India - Mumbai, India
November 18-20
Contact: Frank Venjakob,
Frank.Venjakob@ngfmail.com

MENOPE - Dubai, United Arab Emirates
December 7-9

Bio Egypt - Cairo, Egypt
December 10-12
Contact: Khaled Moniem,
Khaled@organicegypt.com

BioVak - Zwolle, NL
January 20-21, 2010
Website: www.biovak.nl/

3rd Global Meeting of the Farmers‘ Forum (IFAD)
February 15-16, 2010
Contact: Christina Grandi
c.grandi@ifoam.org

BioFach - Nuremberg, Germany
February 17-20, 2010
Website: www.biofach.de/en/

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