Strengthening research on organic food and farming: a strategic advantage for the EU and European countries.

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Introduction

There has been a constantly increasing consumer demand for organic foods over the last 20 years, which has accelerated again over the last 2 years in many European countries, including the new member states (Willer and Yussefi, 2006; Richter et al., 2006). But organic farming does not only offer a unique possibility for economic growth, it is also a highly relevant tool in order to solve simultaneously a range of problems relating to food production, environment, animal welfare, and rural development, as the Copenhagen Declaration stated in May 2001, a declaration signed by Ministers from governments all around Europe. The Copenhagen Declaration has been taken up by the EU Action Plan for Organic Food and Farming.

The societal benefits of organic farming were widely published by several meta-studies (Stolze et al, 2000; El-Hage and Hattam, 2002; Mäder et al., 2002; Hole et al., 2005). The major conclusion of these studies is that organic faming is an integrative and well defined pathway to a sustainable use of land and natural resources.

On the other hand, the problematic impact of conventional farming practice on the environment and the costs of these negative side effects for the society are also scientifically qualified and quantified by different authors (e.g. Pimentel et al., 1995 and Pretty et al., 2000).

Organic agriculture is a highly knowledge-based food and farming technique. It exploits interactions in natural and semi-natural habitats and biological and ecological self-regulation. As many of these mechanisms are intuitively used by skilled organic farmers and are not yet widely explored by science, research activities in this field of agriculture and food production have a fast and high impact on technology progress and economic performance.

On the background of these reflections, it is obvious how important both basic and applied research work on organic food and farming are. Innovation and optimization triggered by science will be crucial in order to make organic food and farming economically, ecologically and socially more efficient.

Major activities and achievements of organic food and farming research in Europe

Europe is far leading when it comes to organic food and farming research. The national and EU budgets spent on organic farming projects are estimated to amount at 70 to 90 million € per annum. In comparison: The US spending on organic farming research is below 20 million € and also other countries like Canada, Australia or Russia are far lower budgets. On the other

hand, in Asian countries like India and South Korea, the funding for organic farming research has tremendously increased in recent years.

The budgets spent by the European Commission for projects focussing on organic food and farming have increased from programme to programme. In the 3rd Framework (AIR4), 7 concerted actions were funded (5 million €), in the 4th Framework (FAIR), 9 scientific projects and 2 concerted actions were funded (11 million €) and in the 5th Framework, 13 scientific projects and also 2 concerted actions (33 millions) (Hansen, 2002). The on-going 6th Framework is expected to contribute approximately 35 million € to organic food and farming research. The most important project is QualityLowInputFood (QLIF) with a EU contribution of 14 million €.

Data on the spending of national authorities for organic food and farming research is difficult to collect because the budgets have been varying considerable over the last ten years and many countries can only give information on the size of their national programmes for organic food and farming (with open calls). Data on regional research activities and data on research activities of permanent research staff at universities and state research centres are often not available. The latest survey of the Commission on national public funding for organic food and farming research covered 2003 and 2004 and showed, that the funding differed greatly around Europe. Total funding per year is highest in the Netherlands (€13 million), Germany (€7-10 million), Switzerland (€7.5 million), Denmark (€7 million), France (€7 million), Sweden (€6 million)and Italy (over €4 million). Austria, Finland, Norway and the UK form an intermediate grouping in terms of annual funding (€1-3 million), while other European countries either have funding below €1 million, or the information is unavailable. Unfortunately, Spain belongs to those countries were funding of organic research activities has become more important only very recently. In contrast to that fact, Spanish scientists played a major role in initiating research activities for organic farming on the European level in the early 1990ies. The concerted action "European Network for Research in Organic Farming (ENOF)" running from 1995 to 1999 was the first network on European level and was co-ordinated by Juan Isart. They published the "White Book on Organic Farming Research in Europe" with very important recommendations for future research activities.

Situation of organic farming research in different European countries

The most relevant countries for organic farming research in Europe are Austria, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland and UK.

The national spending of these 11 countries on organic farming research amounted at 25 million € in the years 2000, at 32 million € in 2001, at 44 million € in 2002, at 55 million in 2003, at 50 million in 2004 and at 41 million € in 2005.

Reports from the 11 countries (Lange et al., 2006):

In **Austria**, organic farming research started in 1980, initiated by the private Ludwig-Boltzmann Institute for Organic Farming and Applied Ecology in Vienna (the institute has been renamed recently into Bio Forschung Austria). In 1996, the Institute for Organic Farming at the Agricultural University in Vienna (BOKU) was set up in order to intensify teaching of students and to do research.

Most recently, the national Centre for Agricultural Research at Raumberg Gumpenstein set apart an institute dedicated to organic farming research. In addition, the Veterinary University in Vienna and the University of Innsbruck are involved in organic farming research.

In Austria, organic farming is one topic of the national research programme PFEIL 05 (2002 to 2005) which has been funded by the Federal Ministry of Agriculture, Forestry, Environment and Water Management. A new programme (PFEIL 10, from 2006 to 2010) will also fund organic farming research in a considerable way. From 2000 to 2004, 4.45 million € were spent on organic projects. A network of scientists and stakeholders called 'BioEnquête' helped to set priorities and to survey the research activities.
The Federal Ministry of Agriculture, Forestry, Environment and Water Management also funds the dissemination of the results towards commercial farms and the organic industry. The major partner for outreach is the Austrian umbrella organisation Bio Austria.

Denmark: During the 1990s organic farming and food production became an important sector in Danish agriculture.

Within the framework of the first Danish action plan for Organic Food and Farming the Danish Research Centre of Organic Agriculture (DARCOF) was founded in 1995. It is part of the state research centre, the Danish Institute of Agricultural Sciences (DIAS).

Since 1996, DARCOF has been running the organic farming research programmes DARCOF 1 – 3, financed by the Danish Ministry of Agriculture. The current DARCOF 3 programme running from 2005 to 2010 is equipped with 27 Million Euro. Most of the organic farming research is carried out at DIAS / DARCOF, even though other institutes and universities are also involved in organic farming research.

Stakeholder involvement is very important in Denmark and the Board of Directors of DARCOF is the most important way how this involvement is ensured. There is a national organic conference for farmers, the organic business and scientists every 2 years in Odense and www.orgprints.org is an important tool to communicate research results as well.

In **Finland**, the first trials in organic farming were carried out in the 1980s, and already in 1991 the first research programme on organic food and farming was started.

Most of the organic farming research is taking place within the state research institutes MMT (Agrifood Research Finland). Universities (Helsinki and Joensuu) play also a major role. The University of Helsinki has a professorship for organic farming. Other players are the National Consumer Research Centre, the Technical Research Centre of Finland (VTT) and the Work Efficiency Institute (TTS Institute).

Currently the third research programme on organic food and farming is running, and in 2005 2.23 Million Euro were spent under this programme. In total, 2.5 million € were spent on organic farming research in 2005 by all state funds. Looking at the period from 2000 to 2005, 17.5 million € were spent on organic farming research.

Organic farming research in Finland is coordinated by the Research Network on organic farming (ReNOAF).

Organic Farming research in **France** started in 1983 when the Research Institute of Organic Farming (ITAB) was launched. The state research institute INRA has been active in organic farming research since the end of the 1990ies. In France the most important organic research programme is the Agribio programme (Agribio I: 2000-2003; Agribio II: 2004-2007). There are also other programmes funding organic farming research; these programmes do not specialise in organic farming though.

Currently the following sums are given to organic farming research:
> Agribio 2 (2004-2007) 7.4 Million Euro
> Programme of the Agency for agricultural development ADAR (2005) 1.9 Million Euro
> RARE-Programme of the Ministry of Research h (2000 to 2004) 0,323 Million Euro.
> Furthermore there are two regional programmes: Programme Pôle Bio Massif Central (2004-2006) with 1 Million Euro and the GRAB-Programme (2004-2006) with 2.5 Million Euro.

Research is mainly carried out at INRA but also at numerous other, mainly state research stations and institutes. The private ITAB institute plays an important role in the coordination of organic farming research but does not run projects by itself. Organic farming research at INRA is coordinated by its internal committee on organic agriculture.

Germany was a pioneer country in organic farming research. The bio-dynamic research institute in Darmstadt was already funded in 1950, the first university chair dedicated only to organic food and farming started 1981 at the Kassel University in Witzenhausen, the second University chair 1987 in Bonn, followed by others since. In 1996, the entire Faculty for Agronomy at the Kassel University with 20 chairs got oriented towards organic food and farming research. In 2000, the Federal Agricultural Research Centre FAL in Braunschweig was diversified by an institute with 80 staff focussing on organic farming (located at Trenthorst in the very Northern part of Germany).
In 2001, the German Ministry established after wide consultation with all stakeholders the Federal scheme on organic farming which funded research activities in 2002 and 2003 with 10 million € each. In the second phase from 2004 to 2007, 7 million € were allocated to research project every each year. It will be continued until 2009 at least. The communication of research activities through the internet site forschung.oekolandbau.de. Grey and official papers in the open archive Organic Eprints (http://orgprints.org/).

Italy: In 2001, the Italian ministry for agriculture launched an action plan on organic farming research. This action plan was worked out after consultations with the regional provinces and with the national committee for organic agriculture. The first open call was published in 2002 and many research projects are on-going. A broader action plan focussing on research on the one hand and on promotion of organic farming on the other hand was launched for the period from 2005 to 2007.

In total, 10 million € were spent for organic farming research between 1998 and 2005. In 2005, the funding of organic farming research reached a sum of 3.4 million €. The main actors

for research are the National Centres for Research (CRA) and various agricultural universities. Many universities offer Master Courses in organic farming and the Research Centre for Mediterranean Agriculture in Bari (IAMB-CIHEAM) is an international player in organic farming training and research.

The dissemination of research results is a crucial requirement of the research contracts. It is done by publications, courses and meetings among scientists and stakeholders.

In the **Netherlands**, the Ministry of Agriculture, Environment and Food Quality introduced a policy in favour of organic farming with the goal to convert 10 % of the agricultural land area until 2010. In parallel, the Ministry increased the funding for organic farming research from 3 million € in the year 1999 to 10 million in the year 2003. In order to integrate the stakeholders into priority setting and into the annual work program, they attached a stakeholder network called "Bioconnect" to the Ministry. Bioconnect is paid by the Ministry for its consultation and supervising work. The work program can be influenced by the stakeholders from year to year.

The funding goes to the Wageningen University and Research Centre (WUR). Between WUR and the private Louis Bolk Institute (an early pioneer institute in organic farming research), there exists a bilateral contract on many research projects so that part of the funding goes to Louis Bolk Institute as well. The total amount of funding from 2000 to 2004 was 45 million €; in 2005, the funding amounts at 9.3 million €.

Commercial farmers are closely linked to the research projects. Therefore, results from research work have been very relevant to the practice and the mutual flow of information has been very strong so far.

In **Norway**, research activities were started in 1986 by the private Institute NORSØK at Tingvoll. 20 years later, in 2006, NORSØK was merged with two conventional research institutes; the new state research centre is now called Bioforsk and organic farming is a small part of their activities. In addition to Bioforsk, several other Universities and research centres are involved in organic farming research.

The funding of research activities is granted by:

> The Research Council of Norway (RCN)
> The Agricultural Agreement Research Fund (AA-funding), a program jointly steered by producer organizations and the government.
> The Foundation for Research Levy on Agricultural Products (Levy funding), financed by a levy on the agricultural produce.

The funding for organic farming research amounted at 10.8 million € from 1990 to 2003. In 2004, 2.8 million € were spent for organic food and farming research. In 2005, it was 1.8 million €. The average annual funding for the years 2004 to 2009 has been and will be 1.33 million €.

When deciding on the work program, the political and social objectives of the government play an important role. In all priority setting, for conventional as well as for organic agriculture, the stakeholders are involved.

In **Sweden**, the start of organic farming research was the long-term comparison field trial in Järna in 1960 (Pettersson et al., 1992). The first national research program on organic farming was launched in 1996, funded by the Forestry and Agriculture Research Board (SJFR), rename later Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas). Since 1996, there has been a permanent sequence of 3 year programs on organic farming.

Other funding agencies in Sweden are:
> Swedish Board of Agriculture (SJV)
> Swedish University of Agricultural Sciences (SLU) and its program «Ekoforsk»
> Swedish Farmers' Foundation for Agricultural Research (SLF)
> National Veterinary Institute (SVA)
> National Food Administration (SLV)

The total funding for organic farming research was 5.2 million € for the years 1998 to 2000, 7.6 million € for the years 2001 to 2003, 7.4 million € for the year 2004 and 7.3 million for the year 2005.

The Centre for Sustainable Agriculture (CUL) at the SLU co-ordinates the programs «Formas» and «Ekoforsk». The co-ordination is accompanied by a group of stakeholders.

The research projects are run by the Universities of Halmstadt, Linköping, Lund, Uppsala, by SLU (main actor), and by the two private Institutes 'Svalöf Weibull AB' and the Swedish Institute of Agricultural and Environmental Engineering.

Switzerland was an important pioneer for the development of organic farming research. First research projects were started at the anthroposophic centre Goetheanum at Dornach (Ehrenfried Pfeiffer and others) in the 1920ies. Organic pioneers like Hans Muller and Hans Peter Rusch initiated research work on commercial organic farms between 1950 and 1970. In 1973, the private Research Institute of Organic Agriculture Research (FiBL) was founded. From 1973 to 2000, FiBL successfully developed a broad research program with private and state money. The annual private and official funding of FiBL increased from 200'000 € to 5 million €. Since 2000, the Federal state research centres Agroscope started to become involved into organic farming research. Since 2000, the total input of human resources and funding into organic farming research amounts at 7.5 million € per year. 60 % of the research projects are carried out at FiBL, 25 % at Agroscope Reckenholz-Tänikon and the other 15 % at the Agroscope Centres Changins-Wädenswil and Bern-Posieux.

The funding agency for Agroscope and FiBL is the Federal Office for Agriculture which is a branch of the Federal Department of Economic Affairs. There are also other sources of funding like grants from the industry (food retailers, biocontrol companies, alternative veterinary pharmaceutical companies etc.), and from charities. These sources are mainly used by FiBL. The Swiss National Science Foundation grants projects in basic research linked to organic farming as well, mainly at the Technical University ETH Zurich.

The research program covers all aspects of crop husbandry (including horticultural crops), livestock husbandry (including livestock health), food quality research, food processing and socio-economic topics (including market research). The priorities are set in a 4 year-rhythm. The stakeholders are involved, but not in a systematic way. The most important stakeholder of the organic farmers and the organic industry is Bio Suisse. Their technical committees (usually crop- or product-wise organised) accompany the priority setting and the work program of research.

For the dissemination of work, the FiBL-Website (www.fibl.org), different journals and technical leaflets as well as http://orgprint.org are important.

In **UK**, several private pioneer organizations and institutes carried out research work on organic farming: the Soil Association (founded in 1946), Henry Doubleday Research Association (HDRA, founded in 1954) and the Elm Farm Research Centre (EFRC, founded in 1981). Since 1991, the government (via DEFRA, The Department for Food, Environment and Rural Affairs) has been funding research, the current funding amounts at 3 million € per year. As a consequence, many universities and state research institutes have become involved in organic food and farming research.

The main objectives of the government funding are: transparency for the economic performance of different types of organic farms, evaluation of ecological impacts of organic farming, improvement of the production technique of organic farming and gaining scientific data for amending the standards of organic farming.

There are several methods of how the funding is done: open calls, direct grants to research institutes and the LINK program (50 % state funding, 50 % industry funding).

In addition to DEFRA, several other funding agencies give grants for organic farming projects:
Scottish Executive Environmental and Rural Affair's (SEERAD), Northern Ireland: Department of Agriculture and Rural Affairs (DARD), Research Councils, Food Standards Agency, The Environment Agency, The Welsh Assembly Government (WAG).

DEFRA uses different networks of stakeholders and experts in order to decide on the priorities and on the program. In the most recent program, 30 % of the funding is for crop husbandry, 22 % for food systems, 16 % for farming systems, 10 % for animal husbandry, 9 % for knowledge management, 8 % for environmental aspects and 5 % for soil research.

Trans-national co-operation (CORE ORGANIC)

The 11 countries mentioned in the previous chapter started a trans-national co-operation in the year 2004. The aim of this co-operation is to use national funding for a trans-national call and to join resources for improved synergies. The first call was published on the 5th of September 2006 (see www.coreorganic.org). The thematic topics of the call are livestock health, quality of organic food and innovative marketing strategies. During the next e years, 2.76 million € per year are available for research projects under this call.

The first call is planned to be a pilot one. In case that the trans-national co-operation on organic food and farming will be continued in the 7th Framework, a participation of the Spanish Ministry of Education and Research would be very important.

Future needs and priorities for research activities, stakeholder involvement

The priority setting for future research priorities depends on the objectives one wants to aim at: i) speeding up the conversion of farms to organic agriculture, ii) ensuring and guaranteeing immediate market success and iii) making organic agriculture more sustainable and trustworthy.

In order to speed up the conversion to organic agriculture, research must focus on production technique and on economic optimisation strategies, e.g.:

- Arable and horticultural crops (reducing labour costs, improve weeding techniques, efficient plant protection like bio-control, appropriate cultivars, improved organo-leptic and inner quality).
- Non-ruminants (nutrient cycles, protein supply, appropriate housing, appropriate races, free range systems).
- Ruminants (utter health, improved fertility, management of endoparasites, appropriate races).
- Grassland (management and control of permanent weeds).
- Economic aspects of farm management.
- Policy advice (optimal support instruments for organic agriculture; research into ecological, economic, social advantages of organic farming and optimisation strategies).

In order to avoid food scares and disappointed organic consumers, research must focus on food quality and safety aspects and on deficiencies of the organic standards, e.g.:

- Developing innovative marketing concepts.
- Ruminants (alternatives to antibiotics for dairy cows, improved organic milk quality, housing techniques without tethering).
- Horticultural crops (improved plant protection, copper replacement, reduction of external inputs in vegetable production, improved organo-leptic and inner quality)
- Labour situation/fair trade issues
- Non-ruminants (close nutrient cycles, protein supply for poultry and pigs, species appropriate housing, systems without zoonose problems, alternative medication)
- Arable crops (reduction of nitrate losses, improved crop rotations, better soil tillage techniques [soil compaction, soil erosion]).
- Nature conservation (hedges, natural habitats or species rich fallows on the farm land).
- Grassland (improving biodiversity)
- Processing (soft and careful processing techniques, food authenticity, residues like pesticides and GMO)

In order to make organic farming trustworthy and really sustainable in the long run, research must focus on animal welfare, genetic resources, landscape, nature conservation, biodiversity and ethical and social aspects, e.g.:

- > Ruminants (breeds adapted to organic and low input environments, holistic approach to animal health).
- > Non-ruminants (closed nutrient cycles, appropriate races, improved free range husbandry systems).
- > Nature conservation (organic farms must become best partners of nature conservation and bird life, making best use of a high biodiversity, functional biodiversity)
- > Rural development (exploring the potential of organic farming and food processing for rural regions, landscape management, employment, decentralised economic growth)
- > Sustainable marketing strategies and channels for organic food (conventional supermarkets, organic supermarkets, specialised health food and gourmet shops, producer-consumer initiatives?)
- > Plant production (breeding, improvement of ecological plant protection
- > and fertilisation systems)
- > Energy (use of on-farm-generated/renewable energies, reduction of energy
- > consumption, optimisation of packaging, transport, life cycle assessment)
- > Processing (ingredients, energy use, convenience food)
- > Soil management (minimum tillage)

In the last 5 years, the IFOAM EU group – representing all European organic stakeholders – has also discussed the role of research activities for the future development of organic food and farming more intensively. The highest research priority, identified by all IFOAMEU Group members, was organic plant production, particularly techniques for improving soil health and plant health. Other areas deemed universally important were environment and biodiversity, and food processing to support innovation in SMEs.

Old and new EU Member States listed slightly different additional priorities in the IFOAM EU Group survey. The old member states (EU-15) gave a relatively high priority to socio-economic aspects of organic farming, the investigation of organic farming and climate change, and improving animal husbandry systems with respect to animal welfare. The new EU Member States, on the other hand, gave higher priority to nutrient losses and recycling, the development of novel pesticides suited for organic farming, and particular socio-economic aspects involving consumer attitudes and the organic food market.

The IFOAM EU Group especially highlighted a greater involvement of stakeholders. Over the past 30 years, conventional agricultural research and extension activities have tended to be carried out by specialised research teams, often with little input from farmers. These research findings have frequently been designed for a generic or ‘average’ farm. In contrast, organic agriculture has always been a farmer-driven movement. Organic farming research has typically been applied and technically orientated. The involvement of farmers in research enhances their trust in the findings. The IFOAM EU Group stressed the importance of farmer participation, in practical on-farm collaborations, to ensure that relevant research is conducted, that new skills and techniques are learned, and that results are disseminated rapidly.

The involvement of other stakeholder groups in all stages of research programmes was also considered important. These groups include food processors, marketing people, environmentalists, importers and consumers. The IFOAM EU Group recommended that research budgets should include the costs of stakeholder participation.

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Annex : On-going research projects in the 6th Framework

- **Organic Wine ORWINE**
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  Via Piave 14, 00187 Roma, Italy
  Tel. +39 06 45437485-6-7, Fax +39 06 45437469
  Internet www.orwine.org (under construction)
  Info at www.organic-europe.net

- **Coordination of European Transnational Research in Organic Food and Farming**(CORE Organic)
  c/o Danish Research Centre for Organic Agriculture (DARCOF)
  Erik Steen Kristensen
  Foulum, P.O. Box 50, DK-8830 Tjele
  Tel. +45 89 99 10 35, Fax +45 89 99 16 73
  >>Project Homepage: http://www.coreorganic.org/

- **Development of criteria and procedures for the evaluation of the EU Action Plan for Organic Agriculture (ORGAP)**
  c/o Research Institute of Organic Agriculture (FiBL)
  Otto Schmid
  Ackerstrasse , CH-5070 Frick
  Tel. +41 62 8657272, Fax +41 62 8657273
  >>Project Homepage: http://www.orgap.org/

- **Opening channels of communication between Associated Candidate Countries and the EU in Ecological Farming (CHANNEL)**
  c/o Corvinus University
  Business Unit Crop and Production Ecology
  Laszlo Radics
  Pf 53, 1118 Villányi út 29-35, HU- 1518 Budapest
  Tel. +36 1 372 6235, Fax +36 1 371 6325
  >>Project Homepage: http://www.channel.uni-corvinus.hu/content.php?content.9

- **Intercropping of cereals and grain legumes for increased production, weed control, improved product quality and prevention of N-losses in European organic farming systems (INTERCROP)**
  c/o Risø National Laboratory, Plant Research Department
  Erik Steen Jensen
  DK-4000, Roskilde
  Tel. +45 46774108, Fax +45 46774260
  >>Project Homepage: http://www.intercrop.dk/

- **Seed Treatments for Organic Vegetable Production (STOVE)**
  Federal Biological Research Centre for Agriculture and Forestry BBA

Eckhard Koch
Institute for Biological Control
Heinrichstr. 243, D- 64287 Darmstadt
>>Project Homepage: http://www.stove-project.net/index2.html

- **Replacement of Copper Fungicides in Organic Production of Grapevine and Apple in Europe (REPCO)**
  c/o Plant Research International (PRI)
  Business Unit Crop and Production Ecology
  Jürgen Köhl
  Bornsesteeg 65, P.O. Box 16,, 6700 Wageningen, The Netherlands
  Tel. +31 317 47001, Fax +31 317 418094
  >>Project Homepage: http://www.rep-co.nl/

- **Food from low input and organic production systems: Ensuring the safety and improving quality along the whole chain (QualityLowInputFood / QLIF)**
  c/o Tesco Centre for Organic Agriculture
  University Newcastle upon Tyne
  Carlo Leifert
  King George VI Building, Newcastle upon Tyne, UK
  >>Project Homepage: http://www.qlif.org/
  >>Organic Eprints: http://orgprints.org/view/projects/eu_qlif.html

- **Organic Revision**
  Danish Research Centre for Organic Farming (DARCOF)
  Erik Steen Kristensen
  P.O. Box 50, Foulum, 8830 Tjele, Denmark
  >>Project Homepage: http://www.organic-revision.org/
  >>Project Publications in the Organic Eprints Database:
  http://orgprints.org/view/projects/eu_organicrevision.html