CORE Organic Country Report

Swedish research in organic farming and food systems

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1 History of organic farming research programmes in Sweden

During the 1980s and 1990s the organic farming movement went through a period of institutionalisation, which manifested itself both in agricultural policy and in research development. In the 1980s a major public debate on food and agriculture came up. Issues discussed included leaching of nutrients, unethical treatment of domestic animals and pesticide residues in food. At the same time societal costs of surplus production were getting higher and higher. The first funding of research in organic farming and "biological medicine" however, was started by the private Ekhaga Foundation in 1944.

The first triennial national research programme in organic farming was launched in 1996 (until 1998) by the Forestry and Agriculture Research Board (SJFR), later Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas)[1]. This programme was followed by research programmes for the years 1998 to 2000, 2001 to 2003 and 2004 to 2007.

The Swedish Board of Agriculture (SJV)[2] launched the first programme for applied research and development in organic primary production research in 1997.

In 2001 the Swedish government started to earmark funds of the Swedish University of Agricultural Sciences to launch a research programme "Ekoforsk" for applied research in order to solve bottlenecks in organic primary production.

In 2001 the Swedish Board of Agriculture (SJV) launched the first 'Action Plan for Organic Production 2005' to fulfil the political goals of organic farming in Sweden.

With an increasing political and economic importance of organic farming for Swedish farmers, the Swedish Farmers' Foundation for Agricultural Research (SLF), a levy board, has increasingly funded research projects in organic farming.

2 Organisation

Research is mainly conducted by researchers at the Swedish University of Agricultural Sciences (SLU) (see the diagrams in the chapter on Financing). The SLU departments of Soil Science, Ecology and Crop Production Science (now Crop Production Ecology), Entomology, Animal Nutrition and Management, Animal Breeding and Genetics, Animal Environment and Health, Agricultural Biosystems and Technology, Crop Science and Agricultural Research for Northern Sweden are conducting research . This research is mainly financed by the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) through the national programme for organic agricultural research. Furthermore SLU research is funded under the programme for applied research experimentation and development in organic farming, which is financed by the Swedish Board of Agriculture (SJV). Within the "Ekoforsk" Programme based at the Swedish University of Agricultural Sciences (SLU) university scientists are commonly cooperating with advisors connected to private and public extension service institutions and organisations.

[1] Formas, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, is a governmental research-funding agency related to several ministries, the Ministry of Sustainable Development, the Ministry of Agriculture, Food and Consumer Affairs, and the Ministry of Education, Research and Culture, http://www.formas.se/

[2] The Swedish Board of Agriculture / Jordbruksverket is the Government's expert authority in the field of agricultural and food policy, and the authority responsible for the sectors agriculture, horticulture and reindeer husbandry. Its responsibility therefore includes monitoring, analysing and reporting to the Government on developments in these areas, and implementing policy decisions within its designated field of activities. http://www.sjv.se

Single research projects in the national Formas programme are also conducted at the universities of Uppsala, Göteborg and Stockholm and by the privately owned seed company Svalöf Weibull AB. The National Veterinary Institute (SVA) and the National Food Administration (SLV) are conducting research which is directly financed by the Swedish state.

2.1 Financing of research

The Swedish Government has allocated funds for research in organic farming and food systems in different research programmes with approximately € 6 million since 2001. The public financing of research is mainly administrated through three bodies;

1) the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) with two national programmes on organic agricultural and horticultural research (Formas I and Formas II) since 2000;

2) the Swedish Board of Agriculture (SJV), financing a yearly programme with applied research experiments and development projects related to organic farming and animal health, animal husbandry, horticulture and crop production science, and;

3) the Swedish University of Agricultural Sciences (SLU) which has earmarked funding for applied research in organic primary production systems (Ekoforsk I and Ekoforsk II).

The Government also allocates funding for research directly to the National Veterinary Institute (SVA) and to the National Food Administration (SLV). Each institution receives € 0.2 million annually for research on forage, on infections in nutrient circulation production systems and on food safety and nutritional aspects of organic foodstuffs.

The private Ekhaga Foundation finances organic farming research with up to € 0.5 million per year, depending on the interest revenues of the foundation. There is no specific programme published for the calls and applied research as well as more theoretically focused organic farming research are financed. The Swedish Farmers' Foundation for Agricultural Research (SLF) has no specific programme in organic farming research but finances an increasing share of organic farming research projects in different applied research areas, summing up to approximately € 1.5 million per year.

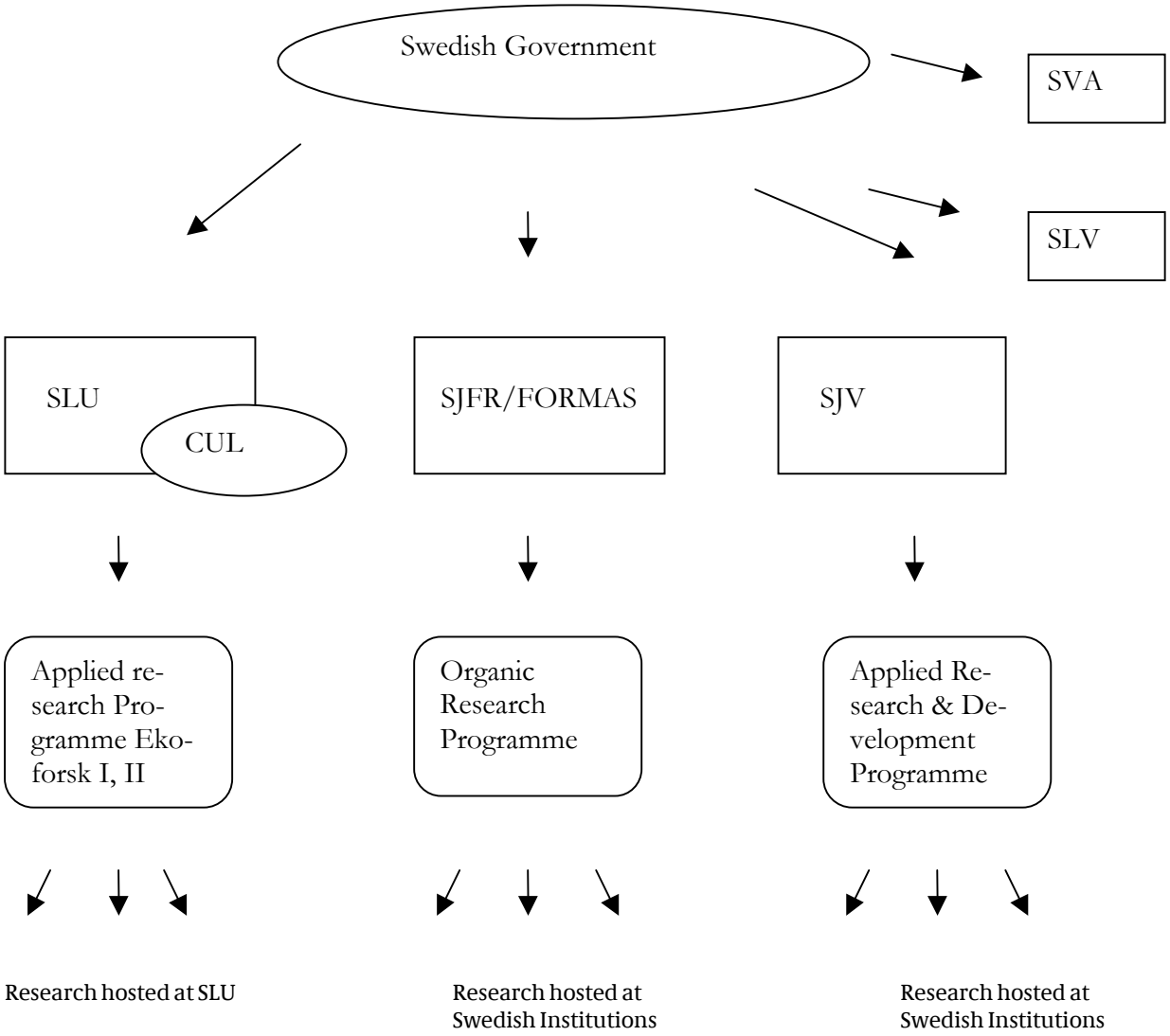

Figure 1: Main actors in national public research programmes on organic farming and food systems

2.2 Planning and coordinating of research

The Centre for Sustainable Agriculture (CUL) at the Swedish University of Agricultural Sciences (SLU) is coordinating the formulation of a triennial research programme. The stakeholders are involved in order to identify national needs. The main stakeholders and organisations, mainly also represented in the CUL reference group are:

- The Swedish Ecological Farmers Association
- Association of Swedish Growers (GRO)
- Federation of Swedish Farmers (LRF)
- Swedish Farmers' Foundation for Agricultural Research (SLF),
- Swedish Organisation of Leisure Gardening Societies(FOR)
- The Swedish Federation of Rural Economy and Agricultural Societies (HS)
- Swedish Board of Agriculture (SJV)
- Swedish Environmental Protection Agency(NV)
- National Food Administration (SLV)

- The National Veterinary Institute (SVA)
- Swedish Consumer Agency
- Swedish Cooperative Union, retailer representative
- Researchers active in major ecological and sustainability research programmes
- The Swedish Research Council for Environment, Agricultural Sciences and Spatial planning, Formas

The national programme for organic farm and food systems is financed by the Swedish Research Council for Environment, Agricultural Sciences and Spatial planning (Formas). It is coordinated by the Centre for Sustainable Agriculture (CUL), offering researchers and doctoral students a forum for seminars, workshops and communication support. CUL organises annual planning meetings as well as seminars and workshops for researchers and doctoral students. CUL is responsible for managing the research school "Swedish Research School for Organic Farming and Food Systems", SwOFF I and SwOFF II, which is open for doctoral students in the Formas financed projects.

3 Mapping research programmes

3.1 Introduction

National public funding of organic research is conducted in three different programmes through

(a) the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas, the Swedish partner in CORE Organic),

(b) the Swedish Board of Agriculture (SJV, research and development related to organic farming) and

(c) the Swedish University of Agricultural Sciences (SLU, the Ekoforsk Programme).

Apart from this, public funding of research is also directed directly to the National Food Administration, (SLV) and The National veterinary Institute (SVA).

Since 2001, Formas has funded two national programmes, on organic agricultural and horticultural research (Formas I and Formas II). The Swedish Board of Agriculture (SJV) is financing yearly programmes with applied research experiments and development projects related to organic farming and animal health, animal husbandry, horticulture and crop production science. The Swedish University of Agricultural Sciences (SLU) has also allocated funding for applied research in organic primary production systems (Ekoforsk I and Ekoforsk II).

Apart from the national programmes for funding organic farming research, private funding of research is carried out mainly by two actors: the Swedish Farmers' Foundation for Agricultural Research (SLF) and the Ekhaga Foundation.

3.2 Formas I: 2001 to 2003

In the spring of 2001 Formas received 69 million SEK[3] (=€ 7.6 million) from the government for a three-year research programme on organic agricultural and horticultural production. The programme ran from 2001 to 2003. Funds were distributed for 23 projects in the key action organic production.

[3] SEK = Swedish Krona

Key figures for Formas I

- *Title of programme:* Formas research programme regarding organic agricultural and horticultural production (Formas I)
- *Duration:* 2001–2003
- *Financing:* € 7.6 million in total over a three-year period
- *Number of participating universities, sector research institutes and private institutes:* 7
- *Number of projects:* 23

Participating universities and sector research institutes

- Halmstad University
- Linköping University
- Lund University
- Swedish University of Agricultural Sciences
- Uppsala University

Participating private institutes

- Svalöf Weibull AB
- Swedish Institute of Agricultural and Environmental Engineering

Financing

Table 1 Yearly average financing for Formas I over the period 2001 to 2003 divided into subject areas

Subject area	Projects	Amount 1 000 EUR	Amount 1 000 SEK
I Faming systems	–	–	–
II Animal husbandry	1–7	744.3	6 766
III Crop husbandry	8–15	883.2	8 029
IV Soil	16–21	387.5	3 523
V Environmental aspects	22	220.0	2 000
VI Food systems	-	–	–
VII Values, standards and certification	–	–	–
VIII Knowledge management	23	55.0	500
Total		2 290.0	20 818

Project numbers refer to the numbers in Annex 1; 1 SEK = 0.11 EUR

3.3 Formas II: 2004 to 2007

The programme is running from 1st July 2004 until 1st July 2007. As for Formas I, the Government set off funds for a three-year research programme regarding organic agricultural and horticultural production. The funds were distributed by Formas to 27 projects in the key action organic production.

Key figures for Formas II

- *Title of programme:* Formas research programme regarding organic agricultural and horticultural production (Formas II)
- *Duration:* 2004 to 2007 (a three-year period from 1 July 2004 to 1 July 2007)
- *Financing:* € 7 million in total over the period
- *Number of participating universities, sector research institutes and private institute: s*6
- *Number of projects:* 27

Participating universities and sector research institutes

- Göteborg University
- National Veterinary Institute
- Stockholm University
- Swedish University of Agricultural Sciences
- Uppsala University

Participating private institutes

- Svalöf Weibull AB

Financing

Table 2: Yearly average financing for Formas II over the period 2004 to 2007 divided into subject areas

Subject area	Projects	Amount 1 000 EUR	Amount 1 000 SEK
I Faming systems	1	69.3	630
II Animal husbandry	2–8	599.9	5 453
III Crop husbandry	9–18	886.3	8 056
IV Soil	19 –22	358	3 254
V Environmental aspects	23–25	281.5	2 559
VI Food systems	–	–	–
VII Values, standards and certification	–	–	–
VIII Knowledge management	26–27	141.1	1 283
Total		2 336.1	21 235

Project numbers refer to the numbers in Annex II, 1 SEK = 0.11 EUR

3.4 Programme of the Swedish Board of Agriculture (SJV): SJV 2000, 2001, 2002, 2003, 2004 and 2005

Each year the Swedish Board of Agriculture (SJV) distributes about € 1.4 million (13 million SEK) to applied research and development projects related to organic farming as well as animal health, animal husbandry, horticulture and crop production science. Projects within the yearly programmes can go on for several years but are funded one year at a time.

Key figures for the Programme of the Swedish Board of Agriculture (SJV)

- *Title of programme:* SJV (research and development related to organic farming)
- *Duration:* Yearly programme
- *Financing:* about € 1.4 million /year
- *Number of participating universities, sector research institutes and private institutes:* year 2000:7, year 2001:6, year 2002:5, year 2003:7, year 2004:9, year 2005:9
- *Number of projects:* year 2000:39, year 2001:30, year 2002:22, year 2003:37, year: 2004:37, year 2005:41

Table 3: Participating universities, sector research institutes and private institutes in research programmes financed by the Swedish Board of Agriculture (SJV) 2000–2005

	Participating universities and sector research institutes	**Participating private institutes**
SJV 2000	National Veterinary Institute Swedish Animal Health Service Swedish University of Agricultural Sciences	Svalöf Weibull AB Sweden's County Administration in Västmanland Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Jönköping, Kristianstad and Örebro
SJV 2001	National Veterinary Institute Swedish Animal Health Service Swedish University of Agricultural Sciences	Sweden's County Administration in Västmanland Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Jönköping, Kristianstad and Örebro
SJV 2002	National Veterinary Institute Swedish University of Agricultural Sciences	Sweden's County Administration in Västmanland Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Jönköping, Kristianstad and Örebro
SJV 2003	Halmstad University National Veterinary Institute Stockholm University Swedish University of Agricultural Sciences	Sweden's County Administration in Västmanland Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Jönköping, Kristianstad, Värmland, Örebro, Östergötland, and Landsbygdskonsult AB (AB is the ebbreviation of shareholding companies)
SJV 2004	Halmstad University National Veterinary Institute Stockholm University Swedish Animal Health Service Swedish University of Agricultural Sciences	Sweden's County Administration in Västmanland Swedish Dairy Association Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Jönköping, Kristianstad, Värmland, Örebro, Östergötland, and Landsbygdskonsult AB
SJV 2005	Halmstad University National Veterinary Institute Stockholm University Swedish Animal Health Service Swedish University of Agricultural Sciences	Sweden's County Administration in Västmanland Swedish Dairy Association Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Jönköping, Kristianstad, Värmland, Örebro, Östergötland, and Landsbygdskonsult AB

Financing

Table 4: Financing per year, divided into the two subject areas that are supported by the SJV programme

Subject area	SJV 2000		SJV 2001		SJV 2002		SJV 2003		SJV 2004		SJV 2005	
	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK
II Animal husbandry	910	8 270	412	3 745	346	3 146	240	2 181	308	2 803	281	2 551
Number of projects in area II	12		9		7		7		10		12	
III Crop husbandry	869	7 902	935	8 504	860	7 819	1 083	9 848	1 117	10 154	1 132	10 292
Number of projects in area III	27		21		15		30		27		29	
Total number of projects	39		30		22		37		37		41	
Total sum	**1 779**	**16 172**	**1 347**	**12 249**	**1 206**	**10 965**	**1 323**	**12 029**	**1 425**	**12 957**	**1 413**	**12 843**

1 SEK = 0.11 EUR

3.5 Ekoforsk I: 2002 to 2004

The Swedish University of Agricultural Sciences (SLU) funds the programme Ekoforsk, which deals with applied research in organic primary production systems. The programme supports researchers at the Swedish University of Agricultural Sciences with projects in organic farming. Cooperation with researchers and advisors outside SLU is, however, promoted and occurring. Ekoforsk I was initiated by SLU in 2002, and the goal was to increase the organic arable land in Sweden. The first programme finished in 2004.

Key figures for Ekoforsk I

- *Title of programme*: Ekoforsk I
- *Duration*: 2002–2004
- *Financing:* approximately € 0.9 million per year
- *Number of participating universities, sector research institutes and private institutes*: mainly 1 (SLU)
- *Number of projects:* 21

Participating universities and sector research institutes

Primarily the Swedish University of Agricultural Sciences (SLU) participates in this project, however cooperation with external researchers or other partners is promoted and occurs.

Financing

Table 5: Budget for Ekoforsk I presented in yearly average over the period 2002–2004 divided into subject areas

Subject area	Projects	Amount 1 000 EUR	Amount 1 000 SEK
I Faming systems	1–2	94.8	861
II Animal husbandry	3–4	46.4	422
III Crop husbandry	5–17	462.9	4 207
IV Soil	18	43.6	396
V Environmental aspects	–	–	–
VI Food systems	–	–	–
VII Values, standards and certification	–	–	–
VIII Knowledge management	19–21	209.4	1 904
Total		857.1	7 790

Project numbers refer to the numbers in Annex III; 1 SEK = 0.11 EUR

3.6 Ekoforsk II: 2005 to 2007

Ekoforsk II is the second programme funded by the Swedish University of Agricultural Sciences (SLU). The programme mainly supports researchers at the Swedish University of Agricultural Sciences with projects in organic farming. The programme deals with applied research in organic primary production systems and is running from 2005 to 2007.

Key figures for Ekoforsk II

- *Title of programme:* Ekoforsk II
- *Duration*: 2005–2007
- *Financing*: approximately € 0.8 million /year
- *Number of participating universities, sector research institutes and private institute*s: mainly 1 (SLU)
- *Number of projects*: 17

Participating universities and sector research institutes

Primarily the Swedish University of Agricultural Sciences participates in this programme, however cooperation with external researchers or other partners is promoted and occurs.

Financing

Table 6: Budget for Ekoforsk II presented in yearly average over the period 2005–2007 divided into subject areas

Subject area	Projects	Amount 1 000 EUR	Amount 1 000 SEK
I Faming systems	1	45.2	411
II Animal husbandry	2–5	251.2	2 283
III Crop husbandry	6–14	432.5	3 931
IV Soil	15–17	79.3	720
V Environmental aspects	–	–	–
VI Food systems	–	–	–
VII Values, standards and certification	–	–	–
VIII Knowledge management	–	–	–
Total		808.2	7 345

Project numbers refer to the numbers in Annex IV; 1 SEK = 0.11 EUR

3.7 Private funders – SLF 2000 to 2005

The Swedish Farmers' Foundation for Agricultural Research (SLF) funds different branches of agricultural research. Funds originate from tariffs placed on the selling price of agricultural products in different branches, plus taxes on nitrogen, P-fertiliser, cadmium and pesticides. They are allocated to research in the respective branches. The SLF funds research in 15 different areas: plant breeding, soil and plant science, horticulture, nutrient management and plant protection, potato production, sugar beet production, forage production, dairy production, meat production, poultry production, horse research, bioenergy, food market research, economic growth and business as well as occupational health and safety. There is no specific programme for organic farming, but substantial funds are distributed to research in organic farming according to the frame programme in the 15 different areas. Most of the projects deal with applied research in organic primary production systems.

Key figures for SLF (Private funding*)*

- *Title of programme:* SLF
- *Duration*: 2000 to 2005
- *Financing*: approximately € 1.5 million per year
- *Number of participating universities, sector research institutes and private institutes*: 9, but mainly 1 (SLU)
- *Number of projects*: 41

Participating universities and sector research institutes

Primarily the Swedish University of Agricultural Sciences participates in this programme; however other universities, sector research institutes and private institutes are involved (Table 7).

Table 7: Participating universities, sector research institutes and private institutes in research programmes financed by the Swedish Farmers' Foundation for Agricultural Research (SLF) 2000 to 2005

	Participating universities and sector research institutes	Participating private institutes
SLF **2000–2005**	Swedish University of Agricultural Sciences Halmstad University Göteborg University National Veterinary Institute	Swedish Institute of Agricultural and Environmental Engineering The Rural Economy and Agricultural Societies in: Skara and Örebro Swedish Dairy Association Swedish Beet Research

Financing

Table 8. Budget for SLF presented in yearly average over the period 2000–2005 divided into subject areas

Subject area	Projects	Amount 1 000 EUR	Amount 1 000 SEK
I Faming systems	1–5	187.0	1 700
II Animal husbandry	6–10	121.6	1 105
III Crop husbandry	11–32	927.7	8 432
IV Soil	–	–	–
V Environmental aspects	–	–	–
VI Food systems	33–38	162.3	1 475
VII Values, standards and certification	–	–	–
VIII Knowledge management	39–41	80.9	735.
Total		1 479.5	13 447

Project numbers refer to the numbers in Annex V , 1 SEK = 0.11 EUR

3.8 Private funders – Ekhaga Foundation

The private Ekhaga Foundation has financed organic farming research since 1944 with different amounts of funding. There is no specific programme formulated but the financing is according to the intentions of the founder of the foundation and strategic discussions in the evaluation committee.

Key figures for Ekhaga foundation

- *Title of programme:* Ekhaga foundation
- *Duration:* Yearly financing, private funding
- *Financing:* varies from € 165,000 to 445,000 per year
- *Number of participating universities, sector research institutes and private institutes:* year 2000:2, year 2001:4, year 2002:3, year 2003:2, year 2004:3, year 2005:2
- *Number of projects:* year 2000:14, year 2001:16, year 2002:7, year 2003:8, year: 2004:6, year 2005:5

Table 9. Participating universities, sector research institutes and private institutes in the research projects financed by the Ekhaga foundation 2000–2005

	Participating universities and sector research institutes	Participating private institutes
Ekhaga foundation 2000	Swedish University of Agricultural Sciences The Royal Veterinary and Agricultural University (Denmark)	–
Ekhaga foundation 2001	Swedish University of Agricultural Sciences	The Swedish Ecological Farmers Sweden's County Administration in Stockholm Applied Nutrition at the Stockholm County Council The Rural Economy and Agricultural Societies
Ekhaga foundation 2002	Swedish University of Agricultural Sciences	Biodynamic Research Association The Swedish Ecological Farmers
Ekhaga foundation 2003	Swedish University of Agricultural Sciences	The Swedish Ecological Farmers
Ekhaga foundation 2004	Swedish University of Agricultural Sciences The Royal Academy of Agriculture and Forestry	The Biodynamic Research Institute
Ekhaga foundation 2005	Swedish University of Agricultural Sciences The Royal Academy of Agriculture and Forestry	–

Table 10. Budget, presented in yearly average, and number of projects for the Ekhaga foundation over the period 2000–2005 divided into subject areas

Subject area	Ekhaga foundation 2000		Ekhaga foundation 2001		Ekhaga foundation 2002		Ekhaga foundation 2003		Ekhaga foundation 2004		Ekhaga foundation 2005	
	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK	Amount 1000 EUR	Amount 1000 SEK
I Farming systems	**67.4**	**613**	66	**600**	**60.5**	550	**74.8**	680	**55**	500	–	
Number of projects in area I	**3**		**3**		2		2		1		–	
II Animal husbandry	**43.3**	**394**	77	**700**	**55**	500	–		**33**	300	**71.5**	650
Number of projects in area II	**2**		**3**		1		–		1		2	
III Crop husbandry	166.1	**1°510**	195.3	**1°775.3**	**22**	200	**141.9**	1°290	**126.5**	1°150	**33**	300
Number of projects in area III	**6**		**6**		1		4		3		1	
IV Soil	–		–		–		–		–		**44**	400
Number of projects in area IV	–		–		–		–		–		1	
V Environmental aspects	–		77	**700**	**38.5**	**350**	–		–		–	

Number of projects in area V	–		**2**		**1**		–		–		–	
VI Food systems	14.5	**132**	5.5	**50**	**55**	**500**	–		**33**	300	–	
Number of projects in area VI	**1**		**1**		**1**		–		1		–	
VII Values, standards and certification	–		–		–		–		–		–	
Number of projects in area VII	–		–		–		–		–		–	
VIII Knowledge management	11.4	**104**	24.2	**220**	**14.3**	**130**	37.4	340	–		**16.5**	150
Number of projects in area VIII	**2**		**1**		**1**		2		–		1	
Total number of projects	**14**		**16**		**7**		7		6		5	
Total sum	302.7	**2 753**	445	**4 045.3**	245.3	**2 230**	**254.1**	2 310	**247.5**	2 250	**165**	1 500

1 SEK = 0.11 EUR

4 Financing

The main National Research Programme amounts to € 2.5 million per year. It is administrated by Formas and operates in accordance with government regulations and annual budget documents that regulate and establish the activities and budget for the coming year.

This is also true for the National Applied Research and Development Programme in Ecological Production. This programme has € 1.4 million per year, administrated by the Swedish Board of Agriculture (SJV). The Ekoforsk Programme at SLU, amounting to € 0.8 million per year, is regulated by the Swedish government through the annual budget document to SLU that regulates and establishes the activities and budget at the University. The document states the amount of funding that SLU should spend on the Ekoforsk Programme. The annual budget document also states that SLU should finance the activities of coordination, development and communication at CUL with € 0.5 million per year.

Table 11. Estimated annual funding for research and coordination in organic food and farming 1998–2005, Million Euro (million SEK).

	1998–2000	**2001–2003**	**2004**	**2005**
SJFR/Formas	1.6 (15)	2.3 (21)	2.2(20)	2.2(20)
SJV, Experimentation & development	1.8 (16)	1.3 (12)	1.4 (13)	1.4 (13)
SLU, Ekoforsk	-	0.9 (8)	0.9 (8)	0.8 (7)
SLU, CUL, Coordination & communication	-	0.5 (5)	0.5 (5)	0.5 (5)
SLV		0.2 (2)	0.2 (2)	0.2 (2)
SVA		0.5 (5)	0.2 (2)	0.2 (2)
Ekhaga Foundation (private)	0.3 (3)*	0.3 (3)	0.2 (2)	0.2 (2)
SLF, Swedish Farmers' Foundation for Agricultural Research (private)	1.5 (13)*	1.5 (13)	1.5 (13)	1.5 (13)
Total ca	5.2 (47)	7.6 (69)	7.4 (67)	7.3 (66)

*refers only to 2000. For distribution on subjects see chapter on Mapping research programmes)

Research according to institutions is presented below for the National Research Programme financed by Formas 2004 to 2007 with € 2.5 million per year, and for the National Research Experiments and Development Programme financed by The Swedish Board of Agriculture, SJV, with € 1.4 million per year. Research in the national Ekoforsk Programme administrated by the Swedish University of Agricultural Sciences (SLU) is always hosted by a SLU institution but cooperation with advisors and researchers mainly from private and public extension service institutions and organisations are promoted.

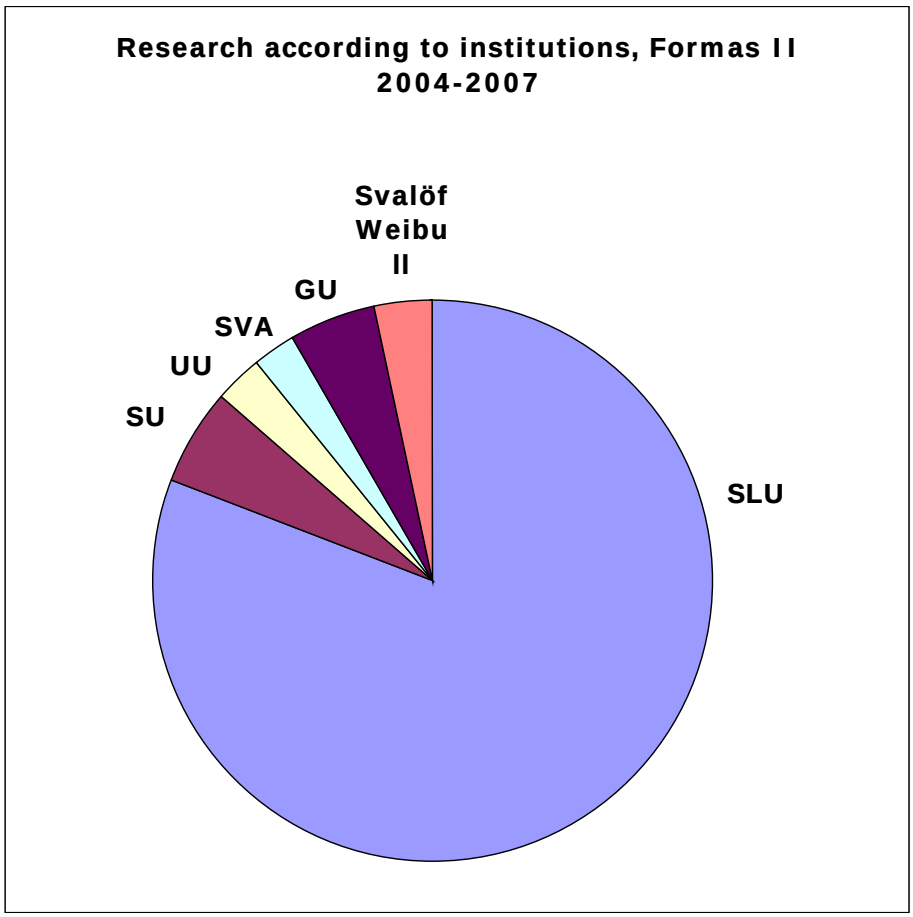

Figure 2. Research funding according to institutions in the Formas II national programme

For abbreviations see acronym list

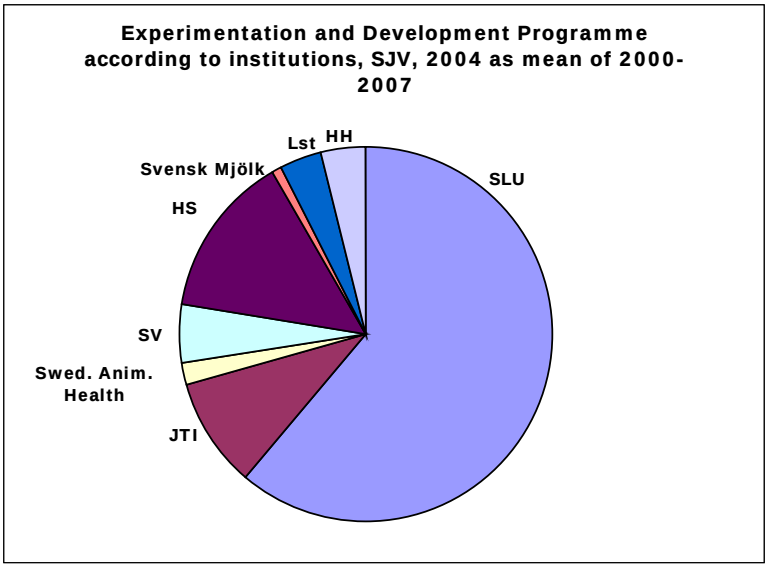

Figure 3. Research funding according to institutions in the SJV's national programme

For abbreviations see acronym list

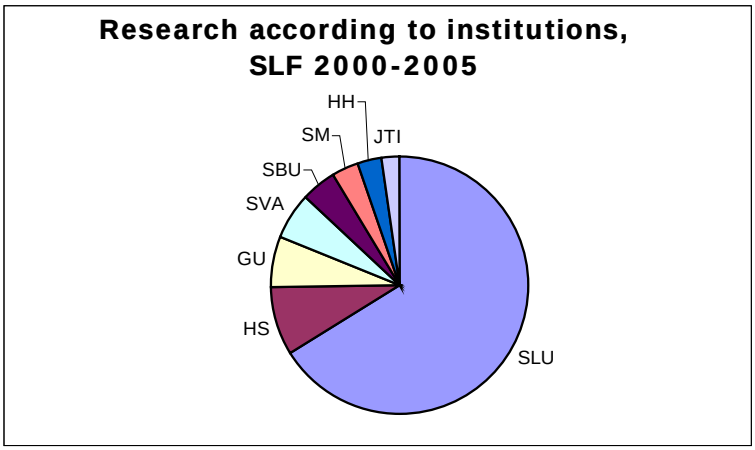

Figure 4. Research funding by the Swedish Farmers' Foundation for Agricultural Research SLF according to institutions (private funding)

For abbreviations see acronym list

Research facilities with all or parts of the farm converted to organic farming are mainly financed through research commissions.

5 Research facilities

5.1 Research farms

There are 16 experimental farms or agricultural colleges that host research, development projects, or long-term experiments related to organic farming in Sweden. The following research farms have been defined as organic as they host complete organic production systems i.e. cropping or animal production systems. These presented below – from the southern to the northern parts of Sweden.

Hillshög is located at Österlen in Scania in the lowlands. The farm has crop production (barley, white clover seed breeding, oats, wheat, peas, lupines, sugar beats) without any animals and consists of 28.5 hectares all organic farming. It was converted to organic farming between 1996 and1998, and the Rural Economy and Agricultural Societies (HS) in Kristianstad runs it. The farm has a fruitful cooperation with the conventional farm, Sandby farm, which is located near by.

Bollerup, Önnestad and Östra Ljungby are three agricultural colleges located in Scania. The schools have systems with and without ruminants. The organic part of the farming systems consists of approximately 1.7 hectares. The long-term experiment "Environmentally Sustainable Crop Rotations" has been running at the schools since 1986. The goal is to find connections between plant breeding, nutrient supply and food quality. Rural Economy and Agricultural Societies (HS) in Kristianstad coordinates the long-term experiment.

Alnarps experimental farm is located in the lowlands south of Lomma in the southwestern part of Scania. The farm has crop production (ley, sugar beats, vegetables, cereals) without animals. 20 hectares of the 350 hectares are organic since 1992. A long-term experiment on biogas production in crop rotation in Scania is running on the farm. The Department of Crop Production Ecology at the Swedish University of Agricultural Sciences runs the farm.

Lilla Böslid is located near Halmstad in Halland, it has crop production (on the clay soil: winter and spring grain, field bean, alfalfa, red clover and on the sandy soil: cereals, green manure, red beets, winter rape) and consists of 98 hectares of which 76 hectares is organic. The arable land was converted between 1989 and1994. HS in Kristianstad runs the farm.

Stenstugu is located on the Swedish island Gotland about 14 km from Visby. It has crop production (cereals, sugar beats, winter rape and peas). The farm consists of 175 hectares of which 10 hectares are approved by the Swedish certifier KRAV. The 10 hectares were converted in 1997. HS Gotland runs the farm experiments. The Swedish University of Agricultural Sciences owns the farm. A long-term conversion experiment has been going on since 1986.

Rådde farm is situated in Västergötland about 25 km from Borås. The farm has meat production with about 50 suckler cows + replacement and crop production with ley and fodder grains. The first parts of the 55 hectares of arable organic land were converted in 1989, whereas some parts have been converted as late as 2001. The whole farm is of 78 hectares arable land. A major part of the experiments in forage production in Sweden are carried out at Rådde experimental farm. Experiments combining cropping and feeding cattle have also been conducted. HS in Sjuhärad runs the farm.

Klostergården is situated about 10 km north of Linköping in Östergötland. The farm has crop production (winter and spring wheat, rye and peas). The farm consists of 97 hectares of which 45 hectares are organic. The farm has no regular long-term experiments, but since the conversion between 1996 to1999, yearly recordings of the amount of weeds and pests, as well as soil analysis has been performed in specific checkpoints in the fields. HS in Östergötland runs the farm.

Logården is situated about 2 km from Grästorp in Västergötland. The farm has crop production (field bean, spring wheat, oats, green manure, winter rape, winter wheat, rye). The farm has hectares of which 22 hectares are under organic management. , 28 hectares are integrated and 10 hectares conventional production. The farm was converted in 1991, and since then a long-term experiment to develop environmentally sound and productive farming systems has been going on –

the experiment focuses on three different productive systems: organic, integrated and conventional farming. HS in Skaraborg runs the farm.

Lanna experimental farm is situated 20 km from Skara in Västergötland. The farm has crop production (winter wheat, barley, oats, rape seed). The main part of the farm is run conventionally, 10 hectares of the total of 155 hectares is organically produced. The organic parts were converted in 1996 and 2003. The farm is situated in lowland. Two long-term experiments are going on at Lanna. These are focusing on nutrient losses and nitrogen turn over on farms with and without animals on loamy soils in Västergötland. The Swedish University of Agricultural Sciences runs the farm.

Tingvall is situated 20 km east of Tanumshede in Bohuslän. The farm has milk production with facilities for 65 cows and fodder production. The farm consists of 130 hectares – everything is organically produced according to standards set by the Swedish certification organisation KRAV. The farm was converted in 1989–1992. Since 1990 changes in the weed flora, soil nutrition levels and the botanical composition of the ley harvests have been surveyed and mapped. Research on organic dairy production has been performed from the start on the farm. HS in western Sweden runs the farm.

The agricultural college Dingle is located 30 km north of Uddevalla in Bohuslän. The farm has milk production with about 70 cows and replacing heifers, piglet production with about 20 sows, 10 suckler cows and crop production (mainly fodder). The farm has 225 hectares arable land of which 150 hectares are organic and approved by KRAV. Since 1999 a crop rotation experiment has been going on at the farm. Parts of the farm have been converted since 1981 until 2002. Sweden's County Administration in western Götaland runs the farm.

Skilleby farm is located 12 km south of Södertälje in Sörmland. The farm has milk production (0.6 animal units per hectare) and crop production (ley, cereals and some vegetable production; 2 ha hectares). The farm has 40 hectares. The farm has been run bio-dynamically since the middle of the 1960s. Since 1991 a green manure experiment has been going on at the farm. The neighbouring farm Yttereneby runs the experimental farm.

Kvinnersta is located 10 km north of Örebro in Närke. The school has conventional milk production with about 80 cows and replacing heifers as well as crop production (fodder, cereals and leguminous plants). The school consists of 280 hectares of which 140 hectares are organic. The farm was mainly converted in 1989 and between 1996 and 2002. A long-term experiment comparing organic and conventional farming systems (mainly ley and wheat production) has been going on since 1992. In 2004 a long-term experiment dealing with sustainable leguminous plants in leys was started. Örebro district and the agricultural college Kvinnersta run the farm.

Riis Lillerud is located 15 km west of Karlstad in Värmland. The school has crop production (cereals and ley) and also conventional milk production with about 60 cows and pig production with about 100 sows. The school has 250 hectares of which 70 hectares are organic. The unit called Riis consists of 25 hectares and is the part of the school that has research and development projects. The unit was mainly converted in 1986, even though some parts were converted earlier. The school is situated in lowland. Since 1998 a crop rotation experiment has been going on at Riis. Lilleruds gymnasium runs the farm.

Ekhaga experimental farm is situated about 7 km east of Uppsala in Uppland. The experimental farm has two different farming systems operating – one with animals and one without (oats, ley, winter wheat, peas and potatoes). The total area of farmland is 24 ha. The farm was converted in 1988. The type of animals and production depend on the experiments that are going on. The Swedish University of Agricultural Sciences runs the farm.

Öjebyn is situated 5 km north of Piteå in Norrbotten. The farm has fodder production (cereals and ley). The acreage is 160 hectares of which 140 hectares are organic. Crop rotation experiments have been going on for more than 30 years. Variety testing programmes of cereals and herbage plants are done. In 1990 55 hectares were converted and in 2003 another 85 hectares. The estate office and

the north experimental district at the Swedish University of Agricultural Sciences (SLU) run the farm.

5.2 Experimental fields

For information of the crops and farm animals see under description of each farm in the text above

- *Hillshög*, 28.5 hectares organic, converted in 1996-1998
- *Bollerup, Önnestad and Östra Ljungby,* 1.7 hectares organic, conversion year 1986
- *Alnarps experimental farm,* 20 hectares organic, main conversion in 1992
- *Lilla Böslid,* 76 hectares organic, conversion years 1989-1994
- *Stenstugu,* 10 *hectares* organic, converted in 1997
- *Rådde farm,* 55 *hectares* organic, converted in stages in 1989 to 2001
- *Klostergården*, 45 hectares organic, converted in 1996-1999
- *Logården,* 22 hectares organic, converted in 1991
- *Lanna experimental farm,* 10 *hectares* organic, converted in 1996 and 2003
- *Tingvall,* 130 *hectares* organic, conversion years 1989-1992
- *The agricultural college Dingle,* 150 *hectares* organic, conversion 1981 to 2002
- *Skilleby farm,* 40 hectares organic, converted biodynamic in the mid 1960s
- *Kvinnersta,* 140 hectares organic, converted in 1989 and 1996 to 2002
- *Riis Lillerud,* 70 hectares organic, main conversion in 1986
- *Ekhaga experimental farm,* 24 hectares organic, converted in 1998.
- *Öjebyn,* 140 *hectares* organic, conversion years 1990 (55 hectares) and 2003(85 hectares)

5.3 Animal research facilities

Facilities with integrated animal and crop production

Tingvall Organic Dairy Farm. A loose-housing system with two experimental groups of dairy cows. Useful for whole-lactation dairy cow experiments. A total of 70 dairy cows and integrated organic fodder production, all organically certified. Research on organic dairy production has been performed from the start on the farm.

Rådde Organic Beef Research Farm. The farm has organic meat production with about 50 suckler cows and replacing heifers as well as integrated crop production with ley and fodder grains, all organically certified. The experimental farm also has 50 hectares of semi-natural grasslands, one third of this being extraordinary flora. There are great possibilities for grouping animals in grazing experiments. A loose-housing system with 8 pens and 8 animals per pen in an uninsulated barn with a deep litter system makes group feeding possible. There are possibilities for individual animal weighing and dry matter measurement of fodder.

Facilities for animal research

Odarslöv Organic Pig Research Farm, SLU Alnarp (Department of Agricultural Biosystems and Technology). An insulated pig house for experiments with growing-finishing pigs in association with grazing paddocks contains eight pens with 16 pigs per pen; four pens with deep litter system and four pens with straw flow system.

Lövsta Pig Research Station, SLU Uppsala (Department of Animal Nutrition and Management). Twelve insulated huts for outdoor farrowing. Four pig houses for groups of four grazing sows and piglets per house. Six sun shelters, experimental material for outdoor feeders and paddocks. Cameras and tape recorders are available for behaviourial studies. In addition, one uninsulated building for experiments, especially during the winter.

Kungsängen Research Centre, SLU Uppsala (Department of Animal Nutrition and Management). The research facility consists of an insulated barn with 46 individual stalls for dairy cows and 54 dairy cows in a loose-housing system with an automatic milking system (AMS). The amount of milk and milk composition could be recorded at each milking. Approx. 8–10 cows are fistulated. There are 60 cubicles for grouped growing cattle in a loose-housing system and 4 pens with 14 calves per pen and artificial milk feeders. In addition, there are 20 individual stalls for growing cattle. All cubicles and pens are available for behaviour studies. The cows are individually fed with both forage and concentrate. The calves are individually fed and the growing cattle are group fed. A total of eight different concentrates and four different forages could be fed at the same time without extra work. The quality of milk and meat produced, and the feed used are possible to investigate further on in nearby located laboratories.

Röbäcksdalen Dairy and Sheep Research Centre, SLU Umeå (Department of Agricultural Research for Northern Sweden). The dairy research facility consists of a dairy barn with 120 cows and 100 replacement heifers in a loose-housing system with cubicles. Half the barn is insulated and half is uninsulated. Sixty of the cows could be individually fed by automatic weighing troughs. The other 60 cows and all replacement heifers could be group fed. The amount of forage consumed will be automatically registered and at the same time the eating pattern of the cows will be registered. All cows will be weighed at each milking. The amount of milk and milk composition could be recorded at each milking. There are 22 bunker silos of different size available. Rumen fistulated animals are available if needed. Good possibilities also exist to conduct studies in animal welfare and behaviour. The quality of milk and meat produced, and the feed used are possible to investigate further on in nearby located laboratories.

At Röbäcksdalen, there also exists a sheep flock of 60 ewes. They are kept in an uninsulated building on bedded straw. They are normally group fed, but the size of the group could vary a lot.

Götala Beef Research Station, SLU Skara (Department of Animal Environment and Health). Insulated barn, 16 pens with slatted floors and up to five animals per pen, a total of 80 animals. Uninsulated barn, 12 pens with scraped floor and straw bedding, six animals per pen, a total of 72 animals. Insulated barn with eight individual stalls with rubber mat flooring for intensive studies. IGER chewing equipment for cattle.

Funbo-Lövsta Poultry Research Centre, SLU Uppsala (Department of Animal Nutrition and Management). One poultry house with 12 replicates with individual fodder/egg/production data in big cages, outdoor keeping is available in the same individual groups (approximately 100 animals per group). Pneumatic automatic computerised feeding system. Organic chicken production in two poultry houses with automatic feeding system and outdoor keeping. The group size can be varied, a total of 5 000 animals. An own small slaughter house is used for the chickens. Indoor floor feeding in small groups of different organic feed can be studied, a total of 60 groups.

Alnarp Experimental Cattle Farm Mellangård, SLU Alnarp (Department of Agricultural Biosystems and Technology). The aim is to investigate the influence of different floor systems, lying surfaces fittings and fixtures on the health, behaviour, milk quality and milk yield of the diary cow. Especially, the hoof health is of interest. The whole attached building complex has a cubicle barn, a milking parlour compartment, tie stalls, calving compartment and feed storage. The cubicle barn has in total 180 cubicles. At present, the reconstructed part accommodates 80 heads and is divided in four compartments. These have the same layout with the exception of with and without feedstalls and different floor system. The compartments are constructed with a “double floor” in order to have the option to change the layout and the top floor easily. The rest of the cubicle barn can be use as a control group.

5.4 Leaching fields

Leaching fields where drainage and surface runoff is collected and measured can be found at *Lanna* and *Logården*. Systems of tiled drains have been installed allowing for separate samplings from each experimental plot/field.

5.5 Long-term experiments

- *Bollerup, Önnestad and Östra Ljungby*. The long-term experiment "Experiments with environmentally sustainable crop rotations" of 2.9 hectares has been running at the schools since 1986. The goal is to find connections between plant breeding, nutrient supply and food quality.
- *Alnarps experimental farm*. A long-term experiment on biogas production and the use of the digested residue in the crop rotation is running on the farm.
- *Stenstugu*. A long-term conversion experiment has been going on since 1986.
- *Klostergården*. The farm has no regular long-term experiments, but since the conversion in between 1996 and1999, yearly recordings of the amount of weeds and pest, as well as soil analysis has been performed at specific checkpoints in the fields.
- *Logården*. Since 1991 a long-term experiment to develop environmentally and productive farming systems has been going on – the experiment focuses on three different productive systems: organic, integrated and conventional farming.
- *Lanna experimental farm*. Two long-term experiments are going on at Lanna. These are focusing on nutrient losses and nitrogen turn over on farms with and without animals on loamy soils in Västergötland.
- *The agricultural college Dingle*. Since 1999 a crop rotation experiment has been going on at the farm.
- *Skilleby farm*. Since 1991 a green manure experiment has been going on at the farm.
- *Kvinnersta*. A long-term experiment comparing organic and conventional farming systems (mainly ley and wheat production) has been going on since 1992. In 2004 a long-term experiment dealing with sustainable leguminous plants in ley was started.
- *Riis Lillerud*. Since 1998 a crop rotation experiment has been going on at Riis.
- *Öjebyn*. Crop rotation experiments have been going on for more than 30 years.

5.6 Networks

Several private farms, besides the research farms presented above, are also communicating with each other and/or conduct research at their own farms. There are around 15 active participatory research groups in Sweden today. These groups normally consist of a number of farmers, an advisor and a researcher. One person also functions as a facilitator. The farmers learn to improve their own problem solving but also to do research together with scientists. Network building as well as documentation and communication of the working process and the research results are also part of the learning process. Some groups started their work as early as 1998 whereas some groups just have been formed. Each group consists of between 7 to 16 farms and works with a specific topic for example: biodiversity on a farm scale, organic dairy production, organic crop production, organic ley crop seed production organic greenhouse tomato production, vegetables production outdoors, weeds, potatoes and cropping systems.

5.7 On farm studies

Some organic farmers make their farms available for research in relation to different projects. Such projects are for example performed in collaboration with advisors at the Rural Economy and Agricultural Societies, the Swedish Ecological Farmers Association, the Federation of Swedish Farmers,

Sweden's County Administration and with researchers at the Swedish University of Agricultural Sciences. The activities are commonly funded by national research programmes or by a specific training programme in organic farming (KULM) administrated by the Swedish Board of Agriculture (SJV).

6 Initiation of research and stakeholder engagement

The Centre of Sustainable Agriculture (CUL) coordinates the formulation of a National Research Framework programme on a triennial basis, involving different stakeholders in the identification and prioritisation process. The first Framework Programme was published in 2001 and the second in 2003. In 2003 a revision of the first Framework Programme was conducted, and a number of stakeholder representatives were sent the current Research Framework Programme as a basis for internal discussions on renewal and proposals. After this, two rounds of proposals were sent out for revision to different stakeholder representatives, and the points of view were integrated, valued against each other and incorporated. Before the last round of revision a workshop was held to discuss the frame programme proposal with a "national advisory group" coordinated by CUL for the follow up of financing of organic farming research and development in Sweden. The group and the coordination by CUL are appointed in the Swedish National Action Plan for the fulfilment of the political goals of organic farming. The national advisory group consists of public and private financing agencies in the organic food and farming system, authorities of food, consumer, environment and agricultural issues (including national advisory service in organic farming), primary producer organisations and representatives of the organic food chain. Researchers are not represented in the national advisory group.

Principles of organic farming and different perspectives (i.e. farmer, consumer, civil) on an organic food and farming system are presented in the Research Framework Programme. Participatory approaches such as the use of focus groups and participatory learning and action research are described and suggested for different areas in the programme.

National research needs in Swedish organic production and consumption are currently:

- Optimisation of animal production systems
- Ecology and crop protection in organic cropping systems
- Plant nutrient turnover and nutrient recycling
- Multifunctional agricultural systems
- Food – quality – health
- Large-scale conversion to organic production – driving forces, obstacles and consequences for the market
- Resource dependency of the food systems
- Experimental farms and smaller innovative projects

A third research frame programme is planned for autumn 2006 with stakeholder involvement in a workshop, discussing a proposed national programme and a second round of comments on a proposed document on a written basis, during autumn 2005 and spring 2006. It is suggested that the coordinated frame programme could be used directly by Formas, as well as other funding agencies for call descriptions.

7 Use of the Research Programme

The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) has in different ways used the Research Frame Programme. In the research programme call for the period 2001 to 2003 Formas formulated a programme description based on the frame programme coordinated by CUL. For the period 2004 to 2006, Formas presented headlines similar to the ones in the frame programme coordinated by CUL. Hence there was no full programme description in the Formas call:

- Integration of animal and crop production systems
- Weed and pest management without chemical pesticides
- Plant nutrient turnover and losses
- Biological manifold and landscape ecosystem services
- Vulnerability of cropping systems, resource dependence
- Multifunctional agricultural systems
- Driving forces, barriers and tools in the conversion process
- Institutional frameworks, organisation and market
- Food quality and health effects

The Swedish Board of Agriculture (SJV) has a programme description on applied research and development in organic production, based on both the Research Framework Programme and the identifications of bottlenecks by researchers. Identified research needs in 2005 in organic farming are:

- Animal welfare
- Animal production (pigs and ruminant feed)
- Horticultural production
- Crop production (specific crops production, weed management)

The Swedish University of Agricultural Sciences (SLU) administrating the "Ekoforsk" programme uses specific parts of the coordinated research frame programme, with focus on applied research solving bottlenecks in primary production.

The National Food Administration (SLV) and the National Veterinary Institute (SVA) have taken active part in the formulation of the coordinated research frame programme and use the programme in the implementation of research.

8 Selection criteria and evaluation procedures

The three different funding agencies of publicly funded research in organic farming and food systems have different selection and evaluation procedures as well as different criteria.

8.1 Formas

The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas), funds research in organic farming and food systems that are hosted by a Swedish University or other Swedish researching institute of authority. Project applications are rated and ranked by an external expert panel of eight to ten persons, including researchers (minimum qualification is associate professor) as well as one to two experts of relevance. Between 30 to 50 percent of the experts are recruited from outside Sweden. All experts read and evaluate all applications. The expert panel is working under guidelines formulated by the Formas board and administrative staff. Each expert

is responsible for presenting and formulating a written judgement on up to ten applications at the panel meeting.

Criteria for the rating of applications are:

1) Problem statement (objective, theory, hypothesis, news value) (grading 1–10)
2) Material, method and work plan (grading 1–10)
3) Competence of applicant (publication frequency) (grading 1–6)
4) Relevance (sector and societal) (grading 1–6)

Criteria 1–3 are weighed together to a scientific value of the application. Depending on the rating according all criteria applications are ranked in three groups; A (high priority, acceptance recommended), B (acceptance recommended but less priority) and C (not recommended). Changes on costs are suggested for the final decision. The Formas board takes the final decision on research financing of projects up to three years. All applicants receive a written judgement on their application. Progress of the research project is not followed during the financing period and reporting (costs and results) is only carried out once, finalising the project.

8.2 SJV - The Swedish Board of Agriculture

The Swedish Board of Agriculture (SJV) funds applied research and development in organic production. Applicants can be research institutions as well as private advisory services as well as other organisations and individuals. The selection procedure is first carried out by an internal group of selected persons from the Regional Animal Husbandry and Crop Production Advisory Service plus other personnel at SJV. Following a list of criteria the group commonly rates and ranks the applications. In a second stage the applications and rankings are discussed in an external advisory reference group consisting of representatives from:

- The Swedish Ecological Farmers Association
- Association of Swedish Growers (GRO)
- Federation of Swedish Farmers (LRF)
- The Swedish Federation of Rural Economy and Agricultural Societies (HS)
- Swedish Animal Health Service
- Swedish County Administrations
- Swedish University of Agricultural Sciences (SLU)

In a third stage there is a possible communication between SJV and certain applicants to discuss costs and activities in projects of potential funding. The final decision is made by SJV. Annual progress reports are required and evaluated before funding.

8.3 SLU – Ekoforsk

The Swedish University of Agricultural Sciences (SLU) uses a two-step selection procedure for the Ekoforsk Programme, under which projects of one to three years are funded. The main applicant must be a SLU researcher, but funding researchers outside SLU is possible and promoted. In a first step a short summary (two pages) of the project idea is presented with a brief description of the idea, a problem statement, the method, literature review and a rough budget. The project ideas are firstly ranked by relevance by advisors at regional level responsible for development of organic primary production. Secondly, an expert panel (scientists, advisors and organic farmer association representative) appointed by SLU rate and rank the project ideas based on the evaluation of methodology and on scientific quality.

In a second step of the selection procedure, based on this ranking a number of project ideas (twice the number for which funding is actually available) are invited to submit a full application. These

applications are rated by a panel of national and international scientists (two specialists per application) based on a questionnaire with criteria. The expert panel rates and ranks the projects and suggests project budget adjustments of the applications. This judgement is based the experts' own ranking and specialist rating. Rating is based on relevance, methodology and scientific quality. Ranking is performed with reference to rating but also to an even distribution on prioritised areas. Participatory research methodologies are promoted. The final decision of funding is taken by the rector at SLU. Annual progress reports are required.

9 Utilisation of research

In a participatory perspective there is a range of approaches for the utilisation of research by end users. In participatory learning and action research farmers, advisers and researchers work together and the use and evaluation of research results are part of the research process. The Centre for Sustainable Agriculture (CUL) at SLU is responsible for communication and for informing the stakeholders of the organic sector. Seminars and workshops are organised at regional and national level. The funding agencies Formas, SJV and Ekoforsk at SLU have their own communication and information activities, some of which are carried out in cooperation with CUL. The Ecological Forum, administrated by the Royal Academy of Agriculture and Forestry, organises workshops and seminars on hot topics in the organic food chain. Most activities of the responsible agencies are planned and conducted in collaboration with broad reference groups.

The concept of distance learning is used for further education of farmers and advisors. These courses consist of three to four national central meetings in combination with the study of current literature and individual project work. The meetings arranged at SLU give opportunities for close dialogues between researchers, advisors, lecturers and farmers. Lectures are combined with discussion sessions. Farmers with a long experience of organic farming interact with farmers who are less experienced or beginners. The concept of this course, given since 1995, has attracted big interest over the years.

Table 12. Activities for utilisation of research in organic food and farming, participants and responsibility

Activity	Participating	Responsible parts
Participatory Learning and Action research	Farmers, advisors, researchers	Facilitation support by CUL, financial support by the Swedish Board of Agriculture (SJV)
Workshops in Ekoforsk programme	Researchers, advisors and farmers	Ekoforsk administration and CUL
Further education by distance learning courses with central lecture and discussion meetings	Farmers, lecturers, advisors and researchers	CUL, SJV
Open seminars and workshops on hot topics	Researchers, stakeholders in the organic food chain, politicians	Ecological Forum (Royal Academy of Agriculture and Forestry), CUL
National biannual organic congress	Researchers, stakeholders in the organic food chain, politicians, farmers	CUL, financial support by SJV
Part -time national consultants in crop production systems, vegetable production and animal production systems	Three university researchers in communication with researchers and regional advisors	CUL

KULM-programme	Courses, consulting and information material focused on farmer competence development	SJV
Seminars and workshops on development of organic markets	Stakeholder involvement for development of organic markets	Centre for organic markets (EMC)
Homepages	Publication of research reports and communication activities. Internet addresses: www.cul.slu.se, www.evp.slu.se/ekoforsk/, www.sjv.se, www.formas.se	CUL, Ekoforsk, SJV, Formas
Project databases: CUL database Växteko Organic Eprints	Internet access to organic farming research projects and publications Internet addresses: www.cul.slu.se/english/research/index.html/sll.bibul.slu.se/, www.orgprints.org/	CUL, SJV/SLU, Formas/ CORE Organic
Nordic publication on resent organic farming research, Forskningsnytt, 4 issues/yr	Researchers in the Nordic countries	CUL (responsible editor), national collaborating editors in DK, NO, FI and IS
Synthesis, state of the arts, reports on hot topics	Researchers and sometimes different stakeholders	CUL

10 Scientific education & research schools

10.1 Pedagogical approach

CUL finances the Swedish participation in the Nordic network AGROASIS (Nordic School of Agroecology/Ecological Agriculture, which is currently developing a common MSc in agroecology. The objectives are among other things to promote the development of ecological and sustainable food systems and to emphasize the multifunctional role of agriculture. The educational programme is based on agroecology with a clear interdisciplinary approach including e.g. producers, consumers or citizens. The curriculum has been organised around the principles of experimental or action education. Learning is seen as experience, reflection, action and reflection both within courses as well as in the order of courses.

Distance learning is one way of creating a forum for dialogue with different perspectives and different kinds of knowledge, i.e. scientific and experimental. This is a fruitful pedagogical approach: literature studies and project work are carried out at a home university or home region combined with intensive common activities such as lectures, seminars and workshops, at which literature and research issues are discussed. At the Swedish University of Agricultural Sciences (SLU) the approach has been used in national PhD courses as well as in further education with farmers, lecturers, advisors and researchers (see also chapter on Utilisation of research).

10.2 MSc level

Courses are given at the Swedish University of Agricultural Sciences (SLU). Many disciplinary courses at MSc-level are very general about biological and ecological principles that have possible application in many different production systems. Some of these courses are of more direct interest for organic agriculture, e.g. courses in biological pest control (offered by the Faculty of Landscape Planning Horticulture and Agricultural Science, at the campus in Alnarp). SLU does not offer any

specified production courses in organic farming at MSc-level. SLU offers courses, though, which have been designed to fit a general Nordic MSc programme structure in Agroecology (with different profiles in the different Nordic agricultural universities). These courses (e.g. "Adaptive Management[4] – Theory Course", "Adaptive Management – Project Course", and "Qualitative Methods". These and the planned new courses in "Environment Valuation" and "Emergy Synthesis") are meant for an interdisciplinary theoretical and methodological basis in Agroecology which seen as an interdisciplinary subject for designing and evaluating sustainable agriculture systems.

10.3 PhD level

The Centre for Sustainable Agriculture (CUL) at SLU hosts the Research School SwOFF (Swedish Research School in Organic Farming and Food Systems), which organizes *ad hoc* courses in different areas of organic farming. Some of these courses are designed in cooperation with other Nordic universities and especially with the Danish research school SOAR.

Examples of course titles that have been offered are: "Agroecology, with emphasis on horticultural cropping systems", "Biodiversity in cultivation systems", "Introduction to emergy synthesis – tools to analyse society and environment", "Local and regional dynamics", "Multifunctional animal husbandry", "What does a systems approach in research mean?"

10.4 Methodological education

Researchers have some access to distance courses arranged for advisors. These courses cover participatory learning and action research. They are arranged by CUL and financed by the Swedish Board of Agriculture (SJV).

The Unit of Applied Field Research at SLU gives courses in experimental design and statistical planning according to research area and issue. Currently these courses are not specific for organic farming research or research with a systems or systemic approach. In the future, however the Unit will be responsible for applied field research issues also in the area of organic farming.

11 Acronyms

FOR – Swedish Organisation of Leisure Gardening Societies

Formas – The Swedish Research Council for Environment, Agricultural Sciences and Spatial planning

GRO – Association of Swedish Growers

GU – Göteborg University

HH – University of Halmstad

HS – The Swedish Federation of Rural Economy and Agricultural Societies

JTI – Swedish Institute of Agricultural and Environmental Engineering

KULM – Competence programme of farmers concerning environmental issues

LRF – Federation of Swedish Farmers

LsT – Swedens County Administration

NV – Swedish Environmental Protection Agency

[4] This course will change name to "Sustainable Natural Resource Management"

SBU – Swedish Beet Research

SJV – Swedish Board of Agriculture

SLU – Swedish University of Agricultural Sciences

SLV – National Food Administration

SM – Swedish Dairy Association

SU – Stockholm University

SVA – The National Veterinary Institute

SwOFF - Swedish Research School in Organic Farming and Food Systems

UU – Uppsala University

12 Literature

Geber, U.; Ivarsson, K. and Källander, I. (2005) The Swedish challenge – interdisciplinarity, collaboration and integration for research and development in organic farming. Paper presented at Researching Sustainable Systems - International Scientific Conference on Organic Agriculture, Adelaide, Australia, September 21-23, 2005. http://orgprints.org/4227/

Annex

Annex 1. Yearly financing average for projects within Formas I over the period 2001–2003

II	**Animal husbandry**	**Amount 1000 EUR**	**Amount 1000 SEK**
1	Organic pig production – Investment in uncertain conditions in an oligopolitic market	32.5	295
2	Ecopig – an interdisciplinary research programme within ecological pig production	440.0	4 000
3	Milk production from legume-rich silage, root crops and potatoes	16.0	145
4	Lungworm in cattle in organic production	38.2	347
5	System for free range slaughter pigs in organic agriculture – animal environment, management of plant nutrients and working environment	110.0	1 000
6	The significance of animal material in egg production under organic conditions	60.1	546
7	Rotation of grazing between cattle and poultry	47.6	433
III	**Crop husbandry**		
8	Interaction between pests and their natural enemies in organic apples	71.5	650
9	Green manure crops as a multifunctional tool in vegetable growing	440.0	4 000
10	Automation of mechanical weed control	38.2	347
11	Production of digestion residue of high ammonium content	56.8	516
12	Introduction of nitrogen effectiveness, competition by weeds and allelopathy in the breeding material of barley and wheat	60.5	550
13	Germination and early growth of annual weeds	93.0	845
14	Development of locally adapted cereal varieties for organic farming through participatory research	30.4	276
15	Monitoring and long-term control of the carrot psyllid – Organic production and safe infant food	93.0	845
IV	**Soil**		
16	Microbial interactions in the mycorrhizosphere and their significance for sustainable - low input – agriculture	133.0	1 209
17	The effect of cuttings on nitrogen fixation, rhizodeposition, plant material quality and decomposition of legumes	42.9	390
18	The effect of organic residues on the genetic and metabolic diversity of soil micro organisms in the nitrogen cycle	61.1	555
19	Surface characterisation of phosphorus contents on soil particles by photoelectron spectroscopy (ESCA) of soils in different agricultural systems	21.9	199
20	Carbon balances in organic agriculture	57.2	520
21	Quantification of the contribution of mineral weathering to the supply of potassium to plants on different types of agricultural land	71.5	650
V	Environmental aspects		
22	Landscape ecology of organic production – plant protection and biodiversity	220.0	2 000
VIII	**Knowledge management**		
23	Swedish Research School in Organic Farming and Food Systems	55.0	500

(1 SEK = 0.11 EUR)

Annex 2. Yearly financing average for projects within Formas II over the period 2004–2007

		Amount 1000 EUR	Amount 1000 SEK
I	**Farming systems**		
1	Green tractor – bio-based fuels for use in organic farming in long term perspective	69.3	630
II	**Animal husbandry**		
2	Optimization of organic broiler production	178.2	1 620
3	Animal health in organic dairy farms	89.1	810
4	Development of protection against lungworm – analysis of the parasites genetic diversity and antigen variation	74.3	675
5	What is natural behaviour in a domestic animal? Philosophical analysis of a central concept in organic agriculture	49.5	450
6	Dairy cows adapted for organic production	52.0	473
7	Optimization of nutritional balances in Swedish organic egg and poultry meat production	118.8	1 080
8	Non chemical control of nematode parasites in sheep by the controlled release of the nematode destroying fungus *Duddingtonia flagrans*	38.0	345
III	**Crop husbandry**		
9	Genetic diversification as a tool for reducing pest damage in organic vegetable production	133.7	1 215
10	Organic milk – Growth, N dynamics and changes in nutritional quality in mixed leys with red clover, birdsfoot trefoil and grass for organic milk production	81.7	743
11	Protein enrichment of feed grain with microfungi	74.3	675
12	The effects of the preceding crop on plant disease dynamics, control of nutrients and quality, in malting barley	96.6	878
13	Selection of genotypes with high N-use efficiency, weed competition and allelopathy in breeding materials of wheat and barley for organic farming	81.7	743
14	Cultivation and feeding value of narrow-leafed lupine – a comparison with peas	89.1	810
15	Isolation and identification of weed suppressing factors secreted by barley	64.4	585
16	Weed control in organic farming – a study of sow-thistle (Sonchus arvensis L)	89.1	810
17	Allelobiosis and aphid control in organic farming	56.9	517
18	Relay cropping for increased sustainability in organic farming	118.8	1 080
IV	**Soil**		
19	The sulphur availability to arable crops – the role of farmyard manure, soil organic matter and mineral fertilizers in conventional and organic farming systems	104.0	945
20	K-dynamics in agricultural soils – quantifying sources and sinks and identifying soils (areas) in need of K-supplementation	111.4	1 013
21	Nitrogen fixation in green manure leys – quantification of total below- and above-ground N	104.0	945
22	Different legume-rhizobia symbioses and their N_2 fixation in field	38.6	351
	Nitrous oxide emissions from organic farming driven by nitrogen use efficiency		
V	**Environmental aspects**		
23	Landscape ecology of organic production – plant protection and biodiversity	103.2	938
24	Food webs, landscapes and natural enemy efficacy in organic production systems	52.0	473
25	Nitrous oxide emissions from organic farming driven by nitrogen use efficiency	126.3	1148
VIII	**Knowledge management**		
26	Learning in Local distribution systems – a driving force for sustainable development in agriculture?	81.7	743
27	Swedish research school in organic farming and food systems	59.4	540

(1 SEK = 0.11 EUR)

Annex 3. Budget for projects in Ekoforsk I presented in yearly average over the period 2002–2004

		Amount 1000 EUR	Amount 1000 SEK
I	**Farming Systems**		
1	Nutrition strategies in organic plant husbandry	59.0	536
2	The ecology of the cultivation system - Green manure as a multifunctional "tool" in vegetable production	35.8	325
II	**Animal husbandry**		
3	Ecopig - a multidisciplinary research programme within organic pig production	44.0	400
4	Dry matter intake of birdsfoot trefoil and white clover in growing heifers	2.4	22
III	**Crop husbandry**		
5	Field bean (*Vicia faba* L.) intercropped with spring wheat as whole crop silage - yield and fodder quality	27.4	249
6	High-protein fodder for grazing or whole crop silage	48.6	442
7	Intercropping of narrow-leafed lupine and field bean with cereals for grazing or whole crop silage	40.9	372
8	Regulation of legumes by mixing different varieties of ryegrass with white clover for silage and grazing	17.3	157
9	Management of quackgrass (*Elymus repens*) by utilizing plant competition and cutting	39.2	356
10	Physical weed control in row-grown vegetable crops	48.4	440
11	Soil cover with plastic in connection to sowing of row-cultivated crops	15.3	139
12	The dynamics of potassium in organic crop production – with emphasis on leys	23.5	214
13	Tuber growth and tuber yield in three different potato cultivars	50.5	459
14	Organic production of quality wheat	63.7	579
15	Organic production of winter oilseed rape	24.9	226
16	Organic seed crops of timothy, meadow fescue and red clover	41.6	378
17	The breaking of soil crust by spring harrowing in autumn-sown cereals	21.6	196
IV	**Soil**		
18	Evaluation of soil mixtures for organic production of horticultural seedlings	43.6	396
VIII	**Knowledge management**		
19	Documentation of research stations/parks or farms with land under organic cultivation	133.4	1 213
20	Implementation and coordination	54.0	491
21	Documentation and participatory learning on organic farms	22.0	200

(1 SEK = 0.11 EUR)

Annex 4. Budget for projects in Ekoforsk II presented in yearly average over the period 2005–2007

		Amount 1000 EUR	Amount 1000 SEK
I	**Farming systems**		
1	Cultivation systems on organic arable farms – improvement of plant nutrient management	45.2	411
II	**Animal husbandry**		
2	Silage of faba beans/spring wheat to dairy cows	17.4	158
3	Optimization of diets in organic poultry production	55.0	500
4	Locally produced protein feeds and vitamin supply for dairy cows	79.8	725
5	Tanniferous forage for improved nitrogen efficiency in organic dairy production	99.0	900
III	**Crop husbandry**		
6	Protein quality and fatty acids in seeds of hemp	8.9	81
7	Nitrogen supply to organic winter oilseed rape - nitrogen sources, time of application and incorporation	63.0	572
8	Development of organic ley seed production using participatory methods	36.0	327
9	Influence of application technology on the effect of oil and/or soap when used against pests in production of fruit and berry	63.5	577
10	Establishment and weed management in organic seed-growing of white clover, red clover and grass	55.9	508
11	The use of compost to control corky-root (*Pyrenochaeta lycopersici*) of tomato in organic production	55.0	500
12	Weed control in organic farming – a study of Perennial Sow-thistle	34.1	310
13	Investigation of new pre-sprouting techniques to achieve faster emergence and tuber development in organic potato farming	57.4	522
14	Winter oilseed rape established in living mulch of white clover	58.7	534
IV	**Soil**		
15	Residual effects of various systems for the use of green manure crops	2.0	18
16	Symbiotic nitrogen fixation in clover-rich leys - quantification of nitrogen in the entire plant and in rhizodeposits	53.5	486
17	Course of nitrogen mineralization after fertilization with organic fertilizers at different times of the year	23.8	216

(1 SEK = 0.11 EUR)

Annex 5. Yearly financing average for projects within SLF over the period 2000–2005

		Amount 1000 EUR	Amount 1000 SEK
I	**Farming systems**		
1	The Öjebyn project – organic production of food	22.0	200
2	Developing sustainable and productive cropping systems - characterisation of clay soil	44.0	400
3	Outdoor pig systems in organic agriculture – animal environment. plant nutrient management and working environment	33.0	300
4	Development of integrated organic and conventional crop production	49.5	450
5	The contribution of multifunctional farms to rural development and possibilities for collaboration with local communities	38.5	350
II	**Animal husbandry**		
6	Stimulation of the immune defence of the cow with ginseng for prevention and treatment of mastitis	35.8	325
7	Integrated pest management of the poultry red mite	41.8	380
8	Control of worm parasites in sheep by the use of nematode-destroying fungi	11.0	100
9	Different systems for calf rearing	11.0	100
10	Organic pig production – a possibility for growth for smaller producers? An economic comparison of production according to KRAV or EU-rules	22.0	200
III	**Crop husbandry**		
11	Mould and yeast inhibitory lactic acid bacteria for biopreservation of silage and other animal feeds	49.5	450
12	*Paenibacillus polymyxa* as plant-growth promoting and stress-tolerance inducing bacteria	43.5	395
13	Biological control – genetic analysis of mechanisms	55.0	500
14	Weed biocontrol by microorganisms	33.0	300
15	Plant disease control using mycorrhiza	44.0	400
16	Biological control of plant diseases by systematic induced resistance	23.7	215
17	Biological possibilities for the control of mycotoxin producing	35.8	325
18	Biological control – genetic analysis of mechanisms	38.5	350
19	Mixed cultivars and barley induced resistance	28.9	263
20	Sustainable forage legumes towards environmental and cost efficient milk production	35.8	325
21	Cadmium content in spring wheat as affected by legumes in the crop rotation	18.3	167
22	Robust and cost-effective automation of mechanical weed control for the cultivation of organically grown sugar-beets	46.8	425
23	Biofumigation for control of soilborne fungi in sugar beets	62.3	567
24	Odours for control of aphids in glasshouse production	38.5	350
25	Non-chemical weed control in orchards	19.8	180
26	The seed treatment agents in cereals and their effects	22.0	200
27	Preventive measures against with disease in oilseed rape based on introducing antagonistic micro-organism	55.0	500
28	Vitamins in organically grown forage legumes and grasses	46.8	425
29	Influence of application technology on the effect of oil and/or soap when used against pests in production of fruit and berry	42.4	385
30	Evaluation of biocontrol agents for control of root diseases in closed hydroponic systems	100.1	910
31	Bioinsecticides – biological control of pest insects with insect pathogenic fungi	33.0	300
32	Developing alternative control measures against potato late blight	55.0	500
VI	**Food systems**		
33	Characterization of raw milk from sustainable production systems	18.1	165
34	Effect on milk quality as a consequence of the legislation against use of synthetic vitamins in organic dairy production	17.1	155
35	Impact or grown conditions on quality of vegetables regarding concentration of health-promoting and toxic secondary metabolites	33.0	300

36	Vitamins in milk from organic conventional dairy farms	18.2	165
37	Development of a research programme for the study of local and regional food	20.9	190
38	Factors of success for regional foods	55.0	500
VIII	**Knowledge management**		
39	Environmental performance indicators for the dairy farm	49.5	450
40	Exploring the theory and practice of participatory research in Swedish agriculture	6.6	60
41	Development of indicators for biodiversity and energy on farms with ecological and integrated production	24.8	225

(1 SEK = 0.11 EUR)