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Coordination and synergy – increasing the width and depth of research in organic farming

SYNERGY

Proposal to the research programme in organic farming:
DARCOF II

June 2000

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Acronym: SYNERGY

Date: February 2000

1. Summary

The increasing interest for organic farming and agricultural sustainability in Denmark has resulted in increased research in organic farming. Since the mid 90's the main part of the Danish research in organic farming has been co-ordinated by DARCOF. In this period about 100 research scientists from 15 different Danish research institutions has been involved in 33 research projects under DARCOF.

DARCOF's co-ordination and organisation of the research has so far proved to be an effective tool in the developing of Danish research in organic farming. This has resulted in effective developments of the Danish research methodology in organic farming, international unique productive dialogue between discipline oriented agricultural research and more holistic organic farming research, and a favourable promotion of the interaction between users and researchers.

The SYNERGY project will secure the continued interdisciplinary development of Danish research in organic farming by way of co-ordination, synthesis of knowledge, development of methodology, and communication. In this way the many possibilities of synergy in DARCOF will be explored. This project will strengthen the role of the secretariat of DARCOF in the new DARCOF II programme by contributing to the further development of research in organic farming both at a national and international level.

This project is an indispensable aspect of DARCOF II that will secure the completion of the overall objectives of the programme; namely to contribute to increased production, and closer relationships between organic and inherent qualities in organic farming. Organic qualities are related to the production process, and inherent qualities are associated directly with the product. This overall objective will be fulfilled by developing production systems that build on a desire to raise the natural component of organic farming, improve animal health and welfare in organic production systems, and raise the quality of organic foods, etc.

2. Research group

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The SYNERGY project will also involve many researchers within and outside DARCOF, including foreign researchers, in the interdisciplinary activities.

3. Introduction

DARCOF is a "centre without walls", which is to say that the researchers remain in their own research environments but collaborate across institutes. The remit of DARCOF is to co-ordinate Danish R&D for organic farming, with a view to achieving optimum benefit from the allocated resources.

Its aim is to elucidate the ideas and problems faced in organic farming through the promotion of high quality research of international standard. This research is intended to ease the transition from conventional to organic farming, while encouraging a sustainable development of the economic, ecological and social aspects of agriculture.

In relation to these objectives, DARCOF's assignments are to:

- initiate and co-ordinate R&D in the areas of organic plant and animal production, examining the interactions between these two facets at the farm level as well as the associated accounting and management aspects
- generate information relating to the environmental, health and social implications of different types of ecological management.

- contribute to the education of research scientists involved in the projects
- assist in the further education of consultants and lecturers in primary production
- communicate the findings of R&D to the organic farming community

DARCOF is led by a board of directors, with representatives of the Danish Institute of Agricultural Sciences, the National Environmental Research Institute, The Royal Veterinary and Agricultural University, Risø National Laboratory, the Danish Institute for Agricultural and Fisheries Economics, and the Danish Veterinary Laboratory.

To ensure the relevance of its R&D activities, including contact with the various user groups, a user committee has been appointed with representatives from the Organic Foods Board, the Danish Association for Organic Farming, the Association for Biodynamic Agriculture, the Danish Family Farmers Association, the Consumer Council, the Danish Agricultural Advisory Centre, The Danish Association of Horticultural Producers, the Economic Council of the Labour Movement, and The Danish Farmers Union.

4. State of the art

Background

Interest in organic farming has grown appreciably over the last few years. Between 1988 and 2000, the proportion of Danish agricultural land devoted to this type of farming has increased from 0.2% to 6.4%.

In line with the expansion of organic farming, market analyses currently show a market increase in consumer demand for organic products in Europe. Organic farming has developed rapidly throughout western Europe, in response to the increasing consumer demands and Government policy initiatives. In the period from 1993 to 1998, the area of land devoted to organic production more than trebled, from 890,000 to 2.9 million ha (EU-Conference statement, 1999). However, there exists large variations in the development of organic farming between different European countries. In Austria and Switzerland the proportions of organic managed land were 9 and 5.4% respectively in 1996, while such countries as France and Great Britain only had under 0.5% organic cultivated land in 1996 (Lampkin, 1999).

Research in organic farming is conducted in many countries at different research institutions. According to Willer (1999) there are approximately 100 different institutions doing research in organic farming in 30 different countries. The level of activity in organic farming research is often very limited. But there exists a large growth potential for research in organic farming, and good opportunities for synergetic effects through collaboration between the different research environments.

Denmark has clearly defined research policies and funds for research in organic farming. In March 1995 *The action plan for promotion of the organic food production in Denmark* prepared by The Organic Agricultural Board was released by the Minister of Agriculture and Fisheries. The plan consisted of 65 recommendations spread on 5 different main points:

- make the conversion to organic production more attractive
- secure the demand for organic products
- strengthen research, development and education in organic production
- remove barriers for a sustainable organic development
- secure the implementation of the action plan for promotion of the organic food production in Denmark

In September 1995 the minister of Agriculture and Fishery announced a massive support of research in organic farming by given about 100 mill. DKK for the period 1996-1999. One of the major initiatives in this respect has been the establishing of the Danish Research Centre for Organic Farming (DARCOF) in 1996 aiming at initiating and co-ordinating Danish research in organic farming.

In February 1999 the *Action plan II – developments in organic farming* came out from The Organic Food Board by request of the Minister of Food, Agriculture, and Fisheries. In the action plan 79 recommendations for further research are given on a range of different areas:

- Consumption and marketing of organic products
- The organic primary production
- Quality and health
- Educational aspects
- Institutional use of organic products
- Export
- Regulations and laws
- Protection of environment and nature
- Animal welfare and health
- Research and development

Similarly, in April 1999, the *Danish Bichel Committee* published comprehensive reports from interdisciplinary analyses of phasing out the pesticides used in Danish agriculture and a total conversion to organic farming. The reports show the potential and need for further development of organic farming in Denmark.

In the summer of 1999 DARCOF was subject to an international evaluation. The evaluation led to the following overall statements:

- DARCOF is organised to promote an interaction between users and researchers, which is considered favourable for the present and future programmes.
- In DARCOF there seems to evolve and develop a productive dialogue between discipline oriented agricultural research and more holistic organic farming research principles. This development should be further supported in future research programmes. It seems unique, also in an international context.
- Though good results are presented in singular areas or niches, a more integrated research concept should be considered for future research. A new research paradigm must be established as part of a planned continuation of DARCOF.
- Relatively low participation of graduate students has been observed. An Organic Farming Graduate School is suggested.
- A continuation of DARCOF is recommended.

Research methodology

European agriculture is a very complex system, and in practice it is not possible to investigate all systems or all combinations of factors in their entirety. Analytic splitting up and reduction is, therefore, absolutely essential in every investigation process. The problem remains, however, that the reduction of systems can be carried out in many different ways, and this reduction depends on the methodology, points of view, values and interests involved. For this reason, an approach that is based on trans-disciplinary system theories and which includes international publication, communication and collaboration, is needed to succeed in the investigation of complex, inter-disciplinary and international problems.

Systems theory is a good theoretical basis on which to establish a common understanding and description of complex problems in organic agriculture, and to acquire operational knowledge. The objective is to understand the entirety from an understanding of constituent parts and processes. And because the understanding of the system involves a simplification and an abstraction, which can always be discussed, the heart of systems research is not only the end product in the form of system and model findings. Equally important is a clear awareness about the simplifications and delimitations involved, including the significance of the angle and viewpoint taken, the criteria on which the simplifications are based, and the specific aspects considered or not considered.

Organic farming is an agricultural practice, but the organic movement is also based on explicit principles and goals, and certain values are entailed in these principles and goals. Therefore value

inquiry and awareness of the interplay of values and facts are significant elements of systems research in organic farming. Important concepts in agricultural research, such as sustainability, precaution and animal welfare, incorporates both evaluative and normative aspects. Using such concepts in a scientific way presumes awareness and discussion of the evaluative and normative aspects involved. Only then can the correspondence between the research activities and the overall goals be evaluated.

While systems theory and value inquiry provide a basis for common understanding and operational perception of complex problems, systems theory in itself provides no new information about the specific system and the elements in it. Specific empirical knowledge must be acquired by use of classical analytical research methods within or across the traditional scientific disciplines. Both the natural and social sciences are relevant, since agriculture can be considered as both a production process (natural science perspective) and as a human activity system (social science perspective) (Kristensen and Halberg, 1997).

The construction and organisation of DARCOF as a “centre without walls” makes it especially suitable for making both analytical research and solving complex and interdisciplinary problems in organic farming.

By using the so-called knowledge synthesis method DARCOF already has succeeded in solving some complex problems in organic farming. The basic idea is to make a so-called expert group recruited from the different analytical disciplines, This group is then asked to identify the system and achieve a common understanding of the problem. Two knowledge synthesis projects have already been carried out: I) Nitrogen leaching and balances in conventional and organic production systems, and II) Health, welfare and use of medicines in the transition to organic milk production. The results of the first knowledge synthesis have both been presented at several conferences (Hansen, 1999; Hansen et al., 1999a; Hansen et al., 1999b), and published in a DARCOF report (Kristensen and Olesen, 1998), in popular papers (Hansen and Kristensen, 1998; Hansen et al., 1998, Eriksen et al., 1999), and in an international journal (Hansen et al., 2000b). The second knowledge synthesis project about ecological milk production is about to be published.

In addition, research development and communication in general has received special attention in DARCOF through the following activities:

- the discussion and development of research methods that are especially relevant to organic farming
- the initiation and conduct of analyses that improve the basis for evaluating organic research projects
- the promotion of Ph.D. education in the context of individual projects
- the holding of technical workshops covering different aspects of organic farming
- the publication of internal news letters relating to DARCOF's activities
- the promotion of international collaboration, the formation of EU-projects, networks, and other contacts
- the initiation of international workshops
- the publication of proceedings from international workshops
- technical investigations for use in official planning and policy initiatives
- the editing and preparation of inter-Nordic journals on organic farming
- the publication of review articles that assimilate the findings of research in organic farming
- the holding of theme days for research workers and advisors
- the holding of field walks, theme days etc. for farmers and other interested groups
- the publication of external news letters on organic farming R&D
- the preparation of information material on organic farming research
- the preparation of monthly articles in Danish farm journals on new developments in organic farming
- policy advice

The SYNERGY project will consolidated and further developed these activities.

5. Objectives and expected achievements

The overall objective of the programme is to contribute to increased production, and closer relationships between organic and inherent qualities.

The principal objectives of this project is thus to

- I) exploit a unique opportunity to synthesise and communicate relevant scientific information across traditional scientific boundaries and disciplines, and to
- II) improve both the width and depth of research in organic farming.

In order to accomplish these principal objective during the coming 5 years period, the project is divided into five work-packages. This structure is chosen in order to secure both the primary results of the research programme and the synergetic effects of the joint research effort:

WP1: Co-ordination, evaluation and management of the whole programme

WP2: Synthesis of knowledge

WP3: Systems research methodology and value inquiry

WP4: Education of postgraduate students (Ph.D.'s)

WP5: Communication and mediation

6. Description of workpackages including methods

Table 1: Workpackage list

Work-package No	Work package title	Responsible participant	Budget Mill. DKK	Start	End	Deliverable No
WP1	Co-ordination evaluation and management of the whole programme	ESK	1.9	2000	2004	D1-D2
WP2	Synthesis of knowledge	BGH	3.3	2000	2004	D3-D4
WP3	Systems research methodology and value inquiry	HFA	0.9	2000	2004	D5-D9
WP4	Education of postgraduate students (Ph.D.'s)	ESK	2.8	2000	2004	D10
WP5	Communication and mediation	CBA	2.4	2000	2004	D11-D31

Table 2: Description of workpackages

WP1: Co-ordination, evaluation and management of the whole programme

Workpackage number:	1
Start date or starting event:	April 2000
Responsible person:	ESK

Objectives

The objective of this project is to co-ordinate, evaluate and manage all research projects (see section B) in accordance with the overall objectives of the whole programme, to produce knowledge that can be promoted into increased production and closer relationships between organic and inherent qualities of organic foods.

Description of work

As the initiating and co-ordinating organ for Danish R&D in organic farming, DARCOF must first and foremost ensure that the research system focuses on the most relevant challenges, that the projects are undertaken in the most appropriate manner, and that the various target groups are regularly informed of the findings.

The remit of this work package is to co-ordinate a joint research effort in organic farming, which combines the knowledge and skills of the research groups and institutions participating in DARCOF II.

This will be done by means of the following:

1. Continuing dialogue with the project leaders in order to ensure that the individual projects are conducted according to plans, and if necessary ensure that plans are changed
2. Conducting a critical evaluation of annual status reports in dialogue with the project leaders
3. Motivating maximal publication and communication activity, partly through annual status report meetings (planning, follow up and adjustment) and partly through external meetings and information sessions (see 11. Below)
4. Avoiding unnecessary overlap between projects
5. Striving for the greatest possible synergy in the allocation of resources
6. Encouraging the review and evaluation of research findings in both national and international forums
7. Recalling / reallocating resources in cases where the returns do not live up to expectations
8. Synthesise information on complex and relevant problems in organic farming (WP 2)
9. Establish a general framework (research paradigm) for research in organic farming (WP 3)
10. Contribute to the education of Ph.D. students in research disciplines and areas relevant to organic agriculture (WP 4)
11. Communication and mediation (WP 5)

The principal objectives of the SYNERGY project are to enhance the results of the joint research effort through trans-disciplinary synthesis and communication of knowledge, and improving the width and depth of research in organic farming. These overall objectives are to be fulfilled through firstly the essential co-ordination, evaluation and management of the research projects, and secondly the promotion of the synergetic effects of the joint research effort:

Points 1 to 7 above will be conducted with a basis in annual status meetings, where the project leaders meet in relevant groups to discuss results and plans for the individual projects. These seven means are intended to ensure that the individual research projects produce results to the best of their potential. Apart from the primary outcomes of the individual projects there are many possibilities for synergetic effects in DARCOF II, which can contribute to the overall objectives of the programme. These synergetic effects are promoted through the four means listed in points 8 to 11 above, which are implemented as separate workpackages (WP 2-5). Each of these four workpackages are described in more detail below.

Deliverables

The deliverables of WP1 are the deliverables of the whole programme, and in addition:

D1: Holding annual status meetings in November each year

D2: The progress and results of DARCOF II will be described through annual status reports in relation to annual status meetings

Milestones

M1: 95% of the projects have been initiated as planned by December 2000

M2: The status reports have been accepted by Marts every year

WP2: Synthesis of knowledge

Workpackage number:	1
Start date or starting event:	April 2000
Responsible person:	BGH

Objectives

1. synthesise information on complex and relevant problems in organic farming in order to:
 - a) analyse different aspects of the transition from conventional to organic farming
 - b) identify areas where new research is most needed, and
 - c) clarify complex problems

Description of work

The line of attack in each knowledge synthesis project includes the following ingredients:

1. the choice of problem
2. the make-up of the team of experts
3. system identification (demarcations, structuring, achievement of a common understanding)
4. simplifications and modelling
5. the problem described in its entirety

Each of these ingredients will now be discussed:

1. *Choice of problem*

A problem is chosen partly because there is a big demand for information, and also because there is a lot of information at the sub-element level in many different research environments.

2. *Make-up of the team of experts*

Several scientists who have the relevant experience in the area of the chosen problem are nominated from amongst the DARCOF institutes. Regarding their motivation, as well as the economy, researchers already involved with DARCOF are preferred. However it is the level of expertise that counts, and also experts from other countries can be nominated. The nomination is approved in the relevant forums before the work is started.

3. *System identification (demarcations, structuring, achievement of a common understanding)*

The experts are collected in groups of 15 – 20 people. A form of workshop is held at which the individual experts present their views on the problem to their colleagues, according to a specific plan. The presentations are discussed until agreement is reached. A very important aspect of the process consists of achieving agreement on the starting point, i.e. the situation in conventional agriculture.

4. *Simplifications and modelling*

The criteria for simplifying the project are discussed and agreed. The simplifications and modelling are then undertaken.

5. *Problem described in its entirety*

The process is described. An attempt is made to present a common form of publication in which the contributions of individual researchers and their research findings are presented

The following knowledge synthesis projects are planned to be initiated:

1. Regional protection of groundwater with organic farming (**task 1**) (Jan. 2000-Oct. 2000)
2. Organic food and human health (**task 2**) (Jan. 2000-Jan. 2001)
3. Organic pig production – animal health and welfare (**task 3**) (**see appendix 2**) (Apr. 2000-Oct. 2000)
4. Nature quality in organic farming, on local and regional levels (**task 4**) (**see appendix 3**) (Apr. 2000-Oct. 2000)
5. Energy use in organic farming (**task 5**) (Nov. 2000-Mar. 2002)
6. Organic plant-breeding (**task 6**) (Nov. 2000- Mar. 2002)

Additional national as well as international knowledge synthesis projects will be initiated during the period of the programme according to the economy. This gives space for new issues determined by coming actual problems in organic farming. The concept of knowledge syntheses has proved to be a successful means of clarifying complex Danish problems in organic farming. Thus, WP2 will try to extend the use of the concept of knowledge syntheses to international problems in organic farming.

Deliverables

D3: A DARCOF report has been written in each project

D4: An International paper has been written in each project

Milestones

M1: Different aspects of the transition from conventional to organic farming has been analysed

M2: Areas where new research is most needed has been identified within the individual tasks

M3: Complex problems in organic farming have been clarify

WP3: Systems research methodology and value inquiry

Workpackage number:	3
Start date or starting event:	April 2000
Responsible person:	HFA

Objectives

To establish a general framework (a "research paradigm") for research in organic agriculture, involving systems research methodology and value inquiry, in order to

- a) promote co-ordination and collaboration between different research groups and disciplines (WP1)
- b) facilitate the elaboration of conceptual models for synthesis of knowledge (WP2) and communication (WP5)
- c) investigate and clarify the interplay of values and facts in research and practice

Description of work

The objectives of WP 3 are to be fulfilled through several different types of work: active participation in synthesis of knowledge projects and in other DARCOF projects, organising and contributing to workshops on methodological issues of common interest for researchers in organic farming, contributing to the internal and external dialogue in DARCOF, and writing Danish and international papers which incorporate substantial theoretical reflection in connection with actual problematic issues in DARCOF. The fulfilment of the objectives in WP3 presume a further development of expertise within systems research and value inquiry. This building of expertise will take place through collaboration and communication within DARCOF combined with more theoretical work in connection with the international communities in systems science and philosophy.

Many issues in DARCOF's research projects are more or less specific to the conditions of Danish organic farming. However, even where the specific problems are different, whether in relation to conventional agriculture or to organic farming in other countries, the methodological and theoretical aspects of DARCOF's research will be more widely applicable and offer wider opportunities for communication and collaboration. Recent examples of this can be found in the common framework of farming systems research in conventional and organic livestock farms (e.g. Kristensen & Halberg 1997) and in the European workshop on research methodology in organic farming (see Alrøe et al. 1998).

The workpackage will include the following interrelated tasks within the area of systems research methodology and value inquiry:

1. analysis and assessment of different systems theories for their use in connection with agricultural research
2. investigation and analysis of the role of values and criteria of quality for research in organic agriculture
3. analysis of evaluative and normative concepts in agriculture, such as sustainability, precaution, animal welfare and quality of nature
4. analysis of ethical issues in the development and regulation of agriculture and their relation to general theories of ethics

These tasks and the different types of work involved are elaborated below.

1. Systems theories in agricultural research (task 7)

Due to the complexity of agricultural systems it is necessary to make use of a systems theoretical approach as a framework for the elaboration of conceptual and mathematical models, in order to establish a common

understanding of the system as a whole. Systems theory can provide a scientific tool for communication and collaboration between research groups and disciplines, as well as for co-ordination and evaluation of research projects. However, different systems theories have been developed and applied in connection with different research disciplines. The systems theories of ecosystem modelling, for instance, are very different from the systems theories of sociology. Agricultural research involves both natural and social sciences, and the choice of systems theory is not a matter of course. One of the tasks in WP3 is therefore to analyse different systems theories and assess their utility in terms of establishing a general framework for research in organic agriculture, and in terms of elaborating conceptual models. This work includes theoretical review and analysis in close interaction with probing of the practical utility in knowledge syntheses (WP2), communication (WP5) and co-ordination (WP1).

2. Values and criteria of quality in research in organic agriculture (task 8)

The organic movement consists in a farming practice connected to a consumer movement, which is based on explicit principles and goals and, implicit in these, certain values and perceptions of the relationship between human and nature. The relevance of research in organic agriculture depends on the attendance to these values, perceptions and goals. Research that seeks actively to participate in the development of organic agriculture needs to be particularly aware of how and where values play, or should play, a role in research. In this perspective investigation and clarification of the role of values in agricultural research is a task of particular significance for research in organic agriculture. On the other hand, the clear importance of alternative values has been a problematic philosophical and practical issue for research in organic agriculture. This issue is illuminated by an on-going research project on criteria of quality and values in organic research, based on interviews with a number of researchers connected to DARCOF, which was initiated by DARCOF in 1999.

Research in organic agriculture is faced with the problem of how to acknowledge and incorporate the fundamental values of organic farming while preserving the conventional scientific standards of objectivity. This is a problem both in relation to the agricultural practice and in relation to the scientific community. The explicit and pervasive values in organic farming motivate philosophy of science type of work on possible additional criteria of quality that can be applied to research. Such work has been nurtured by DARCOF, for instance in form of a workshop on research methodology in organic farming (DARCOF 1998, Alrøe et al. 1998). The conventional criteria of quality for research are connected to the communication within the scientific community. These "internal" criteria focus on the reproducibility of scientific empirical results by way of documentation of methods and standards of objectivity, and on the falsifiability of scientific hypothesis and theories by way of experiments. Possible additional criteria of quality are thus connected to the external relations of research, such as the relevance of research in relation to the values of agricultural practice and the objectives of society. Examples of such "external" criteria can be the explicit description the role of values in research, the description of the range and limits of the knowledge obtained, and the description of how the results are related to a broader framework of understanding.

Further work on the role of values and the appropriate criteria of quality can help promote publishing of research in organic farming in scientific journals, increase collaboration with skilled researchers not presently involved with organic agriculture, as well as increase the relevance of research projects in relation to agricultural practice and society. The fulfilment of these objectives presumes a close co-operation with WP5. Furthermore this work task can contribute to the co-ordination and evaluation of research projects (WP1). The work will include review and analysis of relevant theoretical work in philosophy of science, combined with empirical investigations on the role of values and fundamental perceptions in research and participation in knowledge synthesis and research projects, where relevant. Furthermore one or more workshops on research methodology will be organised in co-operation with WP5, and other relevant means of promoting the critical reflection and development of research methodology in organic farming will be pursued. The work will include the writing of at least one international paper.

3. Evaluative and normative concepts (task 9)

Some important concepts in connection with agriculture, such as sustainability, precaution, animal welfare and quality of nature, are (in part) evaluative or normative concepts. This means that the concepts entail a "better or worse" - a value aspect which cannot be removed. Using such concepts in an open and clear way in research presumes knowledge of how and where values and norms enter into scientific concepts, and what the implications of these evaluative and normative aspects are. Analyses of evaluative and normative concepts can contribute to the elaboration of conceptual models suitable for research in organic agriculture, where the

value aspects of the concepts are in accordance with the basic principles and goals of the organic movement. This task will include participation in syntheses of knowledge such as the synthesis on quality of nature described in WP2 and appendix 3 (see also the recent synthesis on animal welfare in dairy farming, chapter 9 in Kristensen & Thamsborg 2000), and writing of one or more Danish and international papers (recent Danish papers are for example Alrøe & Kristensen 1998, and chapter 1 in Alrøe & Andreasen 1999).

4. Ethical issues in the development of agriculture (task 10)

The development and regulation of agriculture involves different ethical issues, for example in connection with sustainability, precaution and animal welfare. These ethical issues are relatively recent compared to the traditional humanistic issues of ethics. In view of that, it is not a matter of course to use ethics as a guiding line in the development of organic farming, or to use normative arguments in discussions concerning the regulation of agriculture. At the same time the on-going development of organic farming, connected with the increasing market and new productions, causes an increasing demand for reflection upon the values and norms of organic farming. It is therefore a separate task to analyse the relation between normative issues in agriculture, the principles and goals of organic farming, and theories of ethics. This task will include work on ethical issues related to the specific perspective of the organic movement, combining theoretical work and actual problematic issues encountered in DARCOF, and contributions to the internal and external dialogue in DARCOF, including the writing of Danish and international papers (see the initial steps towards this line of work in chapter 9 in Kristensen & Thamsborg 2000, and further references in this paper).

Deliverables

D5: Contributing to report on follow-up workshop on research methodology in organic farming

D6: Contributing to report on the knowledge synthesis "Quality of nature in organic farming"

D7: Writing and submitting one or more international papers each year

D8: Writing or contributing to Danish papers on DARCOF activities involving systems research methodology and value inquiry

D9: Establishing an international electronic forum for dialogue on systems research methodology and value inquiry in agricultural research

Milestones

M6: Presentation of a general framework (a "research paradigm") for research in organic agriculture

WP4: Education of postgraduate students (Ph.D.'s)

Workpackage number:	4
Start date or starting event:	April 2000
Responsible person:	ESK

Objectives

Contribute to the postgraduate education of researchers in the disciplines and research areas of greatest relevance to organic farming.

Description of work

WP4 is to initiate and contribute financially to postgraduate education in co-operation with relevant Danish research environments (**task 11**). DARCOF will finance selected Ph.D. scholarships with one third of the total costs. The budget corresponds roughly to eight scholarships (360.000 DKK per scholarship).

The scholarships will be described, publicly announced, and assigned in accordance with normal standards. Specific research areas and Ph.D. scholarships will be planned in continuation of the approval and initiation of research projects in the new DARCOF research programme. The descriptions of the scholarships will include suitable courses, and DARCOF will promote the initiation of relevant courses in this respect.

Deliverables

D10: Descriptions of Ph.D. scholarship

Milestones

M7: Announcement and assignment of Ph.D. scholarships

M8: Approval of Ph.D. degrees

WP5: Communication and mediation

Workpackage number:	5
Start date or starting event:	April 2000
Responsible person:	CBA

Objectives

1. To strengthen the quality of research through increased international collaboration on research in organic agriculture, and to contribute to the development of sustainable agriculture in Europe
2. To strengthen the interdisciplinary research and contribute to synergy through increased collaboration between research groups and institutes dealing with organic agriculture
3. To strengthen the relevance and the holistic perspectives through increased collaboration with the users of research in organic farming
4. To employ the synergy of research knowledge resource purposes etc. in both organic and sustainable agriculture

Description of work

In relation to the objectives mentioned, the following describes how increased communication will contribute to improved international collaboration, quality, relevance and interdisciplinarity in research. Finally, it is described how the research co-operation in DARCOF will contribute to technical investigations for Danish and European authorities.

1. International research communication (task 12)

A major remit in DARCOF is to strengthen the international collaboration within research in organic agriculture. On one hand, DARCOF has the possibility to contribute to the international research community. On the other hand, the quality of research within DARCOF will benefit from an increased international collaboration.

DARCOF will, therefore, seek to strengthen the international collaboration in the individual projects by supporting and encouraging to international publications, by holding and participating in international workshops, seminars etc. At centre level, DARCOF will enlarge the international communication by issuing annual reports on Danish research in organic agriculture, international newsletters, extended use of the Internet and through agreements about collaborations with selected institutes.

The emphasis is particularly on the European collaboration. By formalised collaboration it is possible to provide knowledge and results, which can be engaged when planning European policies on agriculture and environment.

2. Internal communication (task 13)

Contrary to the situation in many neighbouring countries, no Danish institutes specialise exclusively in organic farming research. Investigations of the relevance of organic farming can therefore be undertaken on many different locations and at many different institutes.

An efficient internal communication is therefore an important factor when ensuring interdisciplinarity, relevance, a holistic approach and collaboration between different research groups and institutes.

3. External communication and mediation (task 14)

DARCOF has proved to be a unique creation in both Danish and international research. In the centre different research groups and institutes collaborate through an interdisciplinary and holistic approach, to gain results which can be used in both organic and sustainable agriculture and by the society in general.

The institutes and researcher groups that take part in the DARCOF studies have different research backgrounds in organic farming. Likewise, institute traditions relating to the dissemination of information are very variable. As the co-ordinating centre, DARCOF is able to provide a more complete overview of the research and address a broader section of customer groups. Furthermore, DARCOF can offer participating institutes an opportunity to utilise the centre expertise and information channels.

Among other aspects, organic agriculture is characterised by being investigative. Production systems and methods, rules etc. are altered according to new knowledge and experience. Ideally, this development should take place in a dialogue between farmers, advisers, consumers, authorities – and researchers. In this context, an effective external communication and dissemination is essential to engage research results and perspectives in this dialogue.

DARCOF will thus instigate a number of activities, the objective of which is to strengthen the overall communication between research and the communities.

4. *Policy advice etc. (task 15)*

The organisation of DARCOF provides good opportunities to benefit from the expertise of different researcher groups. It may for instance, supply knowledge to national and European authorities in connection with policy making.

These possibilities have, for example, been exploited in the preparation of the Danish Action plan for Organic Agriculture and the report on “phasing out the pesticides used in Danish agriculture and a total conversion to organic farming” from the Bichel Committee.

Deliverables

D11: Promoting a higher frequency of publication in international scientific journals from the centre in general

D12: Promoting increased international collaboration, networks etc.

D13: Initiating and holding workshops, seminars, congresses etc.

D14: Issuing proceedings from workshops, seminars etc.

D15: Issuing an biannual report with an international focus on Danish research in organic agriculture

D16: Issuing a newsletter with an international focus on Danish research in organic agriculture

D17: Writing newsletter aimed at researchers, institutes and organisations participating in DARCOF activities.

D18: Holding internal workshops, seminars etc. aimed on development of research and collaboration between research groups

D19: Developing DARCOF’s Internet communication to support internal communication

D20: Publishing reports, which intend to synthesis and mediate research in organic agriculture

D21: Increasing information on new research results, new projects, new publications, meetings, workshops etc. through its external newsletter

D22: Initiating seminars etc. to give researchers, farmers, advisers etc. possibilities to discuss ongoing and future research

D23: Holding field demonstrations to present ongoing research activities to farmers, advisers etc.

D24: Editing monthly articles in Danish agricultural magazines about results from the research in organic agriculture

D25: Editing annual report giving an overall view on research in organic agriculture

D26: Writing information materials giving an introduction to the overall research and specific projects

D27: Increasing its activities on the Internet to improve possibilities for seeking information about research in organic agriculture

D28: Re-establishing DARCOF’s travelling exhibition in order to provide information about research in organic farming at agricultural shows, environmental congresses etc.

D29: Disseminating knowledge about organic agriculture in newspapers, electronic media etc.

D30: Offering participating institutes the opportunity to utilise its expertise and information channels in order to promote specific knowledge about organic agriculture

D31: Contributing to national and European investigations and distanglements in connection with the preparation of policies for agriculture and environment (policy advice)

Milestones

M9: The individual projects have mediated relevant information on results and perspectives

M10: Ongoing research activities have been demonstrated and discussed with research users

M11: The national and international research societies have discovered DARCOF as a significant centre for research development in organic agriculture

7. Implementation and time schedule**Table 3: Deliverables list**

Delive- Rable No	Deliverable title	Delive- ry date	Meeting¹	Nature²
D1	Holding annual status meetings in November each year	Nov.2000- Nov.2004	G1-G5	Oral
D2	The progress and results of DARCOF II will be described through annual status reports in relation to annual status meetings	Dec.2000- Dec.2004		Re
D3	A DARCOF report has been written in each knowledge synthesis project			Re
D4	A International paper has been written in each knowledge synthesis project			Pu
D5	Contributing to report on follow-up workshop on research methodology in organic farming			Re
D6	Contributing to report on the knowledge synthesis "Quality of nature in organic farming"			Re
D7	Writing and submitting one or more international papers each year in system research methodology and value inquiry			Pu
D8	Writing or contributing to Danish papers on DARCOF activities involving systems research methodology and value inquiry			Pop
D9	Establishing an international electronic forum for dialogue on systems research methodology and value inquiry in agricultural research			O
D10	Descriptions of Ph.D. scholarship			Re
D11	Promoting a higher frequency of publication in international scientific journals from the centre in general			Oral
D12	Promoting increased international collaboration, networks etc.			Oral, Re,O
D13	Initiating and holding workshops, seminars, congresses etc.			O
D14	Issuing proceedings from workshops, seminars etc.			Re
D15	Issuing an biannual report with an international focus on Danish research in organic agriculture			Re
D16	Issuing a newsletter with an international focus on Danish research in organic agriculture			Pop
D17	Writing newsletter aimed at researchers, institutes and organisations participating in DARCOF activities.			Pop
D18	Holding internal workshops, seminars etc. aimed on development of research and collaboration between research groups			Oral
D19	Developing DARCOF's Internet communication to support internal communication			O

D20	Publishing reports, which intend to synthesis and mediate research in organic agriculture			Re
D21	Increasing information on new research results, new projects, new publications, meetings, workshops etc. through its external newsletter			Re, Pop
D22	Initiating seminars etc. to give researchers, farmers, advisers etc. possibilities to discuss ongoing and future research			Oral
D23	Holding field demonstrations to present ongoing research activities to farmers, advisers etc.			Oral
D24	Editing monthly articles in Danish agricultural magazines about results from the research in organic agriculture			Pop
D25	Editing annual report giving an overall view on research in organic agriculture			Re
D26	Writing information materials giving an introduction to the overall research and specific projects			Pop
D27	Increasing its activities on the Internet to improve possibilities for seeking information about research in organic agriculture			O
D28	Re-establishing DARCOF's travelling exhibition in order to provide information about research in organic farming at agricultural shows, environmental congresses etc			Oral
D29	Disseminating knowledge about organic agriculture in newspapers, electronic media etc.			Pop, oral
D30	Offering participating institutes the opportunity to utilise its expertise and information channels in order to promote specific knowledge about organic agriculture			Pop, oral
D31	Contributing to national and European investigations and distanglements in connection with the preparation of policies for agriculture and environment (policy advice)			Re

¹**G1-G5**: general meetings to be hold Nov. each year from 2000-2004

¹**W1-WXX** workpackage meetings

²Please indicate the nature of the deliverable using one of the following codes:

Pu= International publications in books and journals

Re= Reports

Pro-in= Proceedings/abstracts at international symposia, conferences etc.

Pro-na= Proceedings/abstracts at national conferences etc.

Pop= Popular papers

Oral= Oral presentations, lectures etc.

Th= Theses

O= Others

8. Collaborative partners

Collaborative partners in the SYNERGY project will also involve many researchers within and outside DARCOF, including foreign researchers, in the interdisciplinary activities.

9. References

- Action plan II, 1999. Online at <http://www.strukdir.dk/system/frm/4frm.htm>
- Alrøe, H.F. & Andreasen, C.B. 1999. Natur, miljø og ressourcer i økologisk jordbrug. FØJO-rapport nr. 3, pp. 94.
- Alrøe, H.F. & Kristensen, E. Steen 1998. Bæredygtighed og økologisk jordbrug. Landbruksøkonomisk Forum nr. 3.
- Alrøe, H.F., Kristensen, E. Steen & Halberg, N. 1998. A systems approach to research in sustainability and organic farming. Presentation at the European Workshop on "Research Methodology in Organic Farming. Frick (CH) 30. sept.-3. okt. 1998.
- Danish EPA, 1999. The Bichel Committee, Report from the main Committee., Danish Environmental Protection Agency, Ministry of Environment and Energy, Copenhagen, Denmark. Online at <http://www.mst.dk/199909pubs/87-7909-445-7/default.htm>.
- DARCOF 1998. Forskningsmetodik i økologisk jordbrug [Proceedings from a workshop on research methodology in organic farming]. Forskningscenter for Økologisk Jordbrug.
- Eriksen, J., Olesen, J.E. og Hansen, B., 1999. Hvordan kan kvælstofudvaskningen reduceres. Effektivt Landbrug, 22, 47-49.
- EU-Conference Statement, 1999. Organic farming in the European Union - Perspectives for the 21st Century. 27 & 28 May 1999 - Baden, Austria.
- Hansen, B. & Kristensen, E.S. 1998. Kvælstofbalancer og –udvaskning i økologiske og konventionelle planteproduktionssystemer. I: Geologisk nyt, august 1998.
- Hansen, B., 1999. Organic farming and sustainable development of agriculture? Indlæg ved NJF congress, Ås, Norge, Juli, 1999.
- Hansen, B., Alrøe, H.F. and Kristensen, E.S., 1999a. Environmental impacts from organic farming. Proceeding to EU-conference May 27-28, Baden (AU), 1999.
- Hansen, B., Kristensen, E.S. & Mogensen, L. 1999b. Effects of specialisation of organic production systems on nitrogen leaching and nutrient balances. Poster ved konferensen: Organic agriculture faces its development the future issues, 12. Entretiens du Centre Jacques Cartier, Lyon, Frankrig, 6-8 december, 1999.
- Hansen, B., Kristensen, E.S. & Olesen, J.E. 1998. Kvælstofbalancer og –udvaskning i økologiske og konventionelle planteproduktionssystemer. I: Jord og Viden nr. 13. 1998.
- Hansen, B., Kristensen, E.S., Grant, R., Høgh-Jensen, H., Simmelgaard, S.E. og Olesen, J.E., 2000b. Nitrogen leaching from conventional versus organic farming systems – a modelling approach (submitted to European Journal of Agriculture).
- Kristensen, E.S. & Halberg, N. 1997. A systems approach for assessing sustainability in livestock farms. EAAP Publications No. 89, 16-30.
- Kristensen, E.S., and Olesen, J.E., 1998. (Eds) Kvælstofudvaskning og –balancer i konventionelle og økologisk produktionssystemer. FØJO-rapport nr. 2.
- Lampkin, N., Foster, C., and Padel, S., 1999. Organic Farming in Europe: Economics and Policy. The policy and regulatory environment for organic farming in Europe: Country reports, 2, 428 pp.
- Willer, H., 1999. Online at: www.soel.de/infos/adressen/research.html

Appendix V

CV's

Erik Steen Kristensen

Position: Chief Scientist

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Born: September 19, 1956

Education:

1981: *M.Sc. Agric.*, Royal Veterinary and Agricultural University, Copenhagen

1987: *Ph.D.*, Royal Veterinary and Agricultural University, Copenhagen

Professional career:

1996: *Chief Scientist* at DARCOF

1992: *Senior Scientist* at Danish Institute of Animal Science

1984-1986: *Candidate Scholarship* at Royal Veterinary and Agricultural University, Copenhagen.

1981: *Scientist* at Danish Institute of Animal Science

Occupation: ESK has since 1988 carried out research in organic farming systems. From 1988 to 1996 the projects have included different topics and research disciplines with a starting point in mixed farming systems with dairy production. In 1996 when ESK became the leader of DARCOF the research effort has mainly been in research methodology and the synthesis of knowledge. ESK has published approx. 100 titles of which a third part has been published internationally. ESK is a permanent visiting lecturer and censor at the Royal Veterinary and Agricultural University, Copenhagen.

Hugo Fjelsted Alrøe

Position: Research assistant

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Born: February 22, 1964

Education:

1989: *M.Sc. (horticulture)*, Royal Veterinary and Agricultural University, Denmark

Professional career:

1998-: *Research assistant*, Danish Research Centre for Organic Farming

1993: *Visiting Scholar*, Department of Statistics, University of Washington, Seattle

1992-1995: *Graduate scholarship*, Royal Veterinary and Agricultural University, Denmark

1991: *Research assistant*, Research Centre Foulum, Denmark

Research disciplines: Philosophy of science, agricultural systems research, environmental ethics

Fields of interest: Sustainable agriculture and organic farming, systems research methodology, the role of values and ethics in research, the philosophical background of systems research and value inquiry with special regard to pragmatism.

Projects: DARCOF project VI.1 Synthesis of knowledge and systems research methodology

Community service:

1999- : *Board of Editors* for Studies in Pragmatism and Values, a special series of the Value Inquiry Book Series published by Editions Rodopi.

Examples of publications:

Alrøe, H.F. and Kristensen, E.S. (1998): Bæredygtighed og økologisk jordbrug [Sustainability and organic farming]. *Landbruksøkonomisk Forum*, 15:5-14.

Alrøe, H.F. (1998): Forskningsmetodik i økologisk jordbrug. Kvalitet og sammenhæng. In: *Bilag til "Workshop om forskningsmetodik i økologisk jordbrug"* [Research methodology in organic farming.

- Quality and coherence. In: Proceedings from "Workshop on research Methodology in Organic Farming" Foulum, 27. Oct. 1998: p.7-11. Forskningscenter for Økologisk Jordbrug.
- Alrøe, H.F., Kristensen, E.S., and Halberg, N. (1998): A systems approach to research in sustainability and organic farming. Presentation at the *European Workshop on "Research Methodology in Organic Farming"*. 7pp. Frick (CH) 30. Sep. - 3. Oct. 1998 (Proceedings in press).
- Alrøe, H.F., Kristensen, E.S., and Hansen, B. (1998): *Danmarks samlede produktion og indsats af hjælpestoffer* [The overall Danish production and input of subsidiary resources]. Konsulentrapport A.1.1. vedrørende Økologiske Scenarier for Danmark til "Udvalget til vurdering af de samlede konsekvenser af en afvikling af pesticidanvendelse" (Bichel-udvalget), 11pp. Miljøstyrelsen, København.
- Alrøe, H.F., Kristensen, I.S., Mikkelsen, G., Tersbøl, M., and Jørgensen, L.N. (1998): *Sædskiftmodeller - vurdering af udbytteændringer i landbrugsafgrøderne* [Crop rotation models - assessment of changes in the production levels of agricultural crops]. Konsulentrapport A.1.2. vedrørende Økologiske Scenarier for Danmark til "Udvalget til vurdering af de samlede konsekvenser af en afvikling af pesticidanvendelse" (Bichel-udvalget), 12pp. Miljøstyrelsen, København.
- Alrøe, H.F. (1999): Afvikling af pesticider i Danmark [Phasing out pesticide use in Denmark]. *Forskningsnytt om økologisk landbrug i Norden*, 3:18-19.
- Alrøe, H.F. (1999): Økologisk jordbrug, natur og etik. In: *Natur, miljø og ressourcer i økologisk jordbrug* [Organic farming, nature and ethics. In: Nature, environment and resources in organic farming] (eds: H.F. Alrøe and C.B. Andreasen). FØJO-rapport nr. 3:9-15. Forskningscenter for Økologisk Jordbrug, Foulum.
- Alrøe, H.F. (2000): The ethics of responsible acting - a systemic perspective. Presentation at the *Fifth Humanity and the Cosmos Symposium: Spirituality, Science, Ethics*. Brock University, Ontario, 20.-22. Jan. 2000.
- Alrøe, H.F., Vaarst, M. and Kristensen, E.S. (2000): Er husdyrvelfærd i økologisk jordbrug noget særligt? In: *Vidensyntese om sundhed, velfærd og medicinanvendelse ved omlægning til økologisk mælkeproduktion* [Is there anything special about animal welfare in organic farming? In: Knowledge synthesis on health, welfare and use of medication in conversion to organic dairy production] (eds: E.S. Kristensen and S.M. Thamsborg). FØJO-rapport nr. X:Ch. 9. Forskningscenter for Økologisk Jordbrug, Foulum (in press).

Claus Bo Andreasen

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Professional career:

1998 - *Information officer and project associate* at DARCOF

1991 – 1998 *Information officer* at the Danish institute of Agricultural Science

1991 *Journalist* at the Danish Cooperative Magazine

1989 – 1991 *Secretary* at the information department at the Agricultural Council of Denmark

1986 – 1988 *Head of advisory service* at private seed company

1986 *Teacher* at Vejlbjby Agricultural College

Fields of interest: Communication between research, agriculture, society, consumer demands etc.

Examples of publications: Editor of external and internal newsletters etc., co-editor on DARCOF reports etc.

Birgitte Hansen**Position:** Postdoctoral scientist**Address:** Danish Research Centre for Organic Farming (DARCOF)

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Faculty of Natural Sciences, University of Aarhus, Denmark.

1993: *M.Sc.* (hydrology, hydrogeology and hydrogeochemistry)

Department of Earth Sciences, University of Aarhus, Denmark.

Professional career:1997- *Postdoctoral scientist*, Danish Research Centre for Organic Farming (DARCOF)1995-1996: *Associate*, Department of Land, Air and Water Resources, University of California, Davis.1994-1997: *Ph.D.-student*, Department of Earth Sciences, University of Aarhus, Denmark.1994: *Research assistant*, Department of Earth Sciences, University of Aarhus, Denmark1992: *Exchange student*, University Aix-en-Marseilles II, Aix-en-Provence, Institute de Géographie, France.1988-1993: *M.Sc.-student*, Department of Earth Sciences, University of Aarhus, Denmark**Research disciplines:** geology, hydrology, deposition, geo-chemistry, knowledge synthesis**Fields of interest:** Nutrient (especially nitrogen) cycling and processes in natural and agricultural ecosystems, quality and quantity of groundwater recharge, organic farming, environmental impact from agriculture**Examples of publications:**Hansen, B., 1995. The heath project: II. Calibration of passive flux samplers measuring horizontal atmospheric NH₃ fluxes. *Aarhus Geoscience*, 4, 93-96.Hansen, B., 1995. The heath project: III. Atmospheric nitrogen deposition to heathlands. *Aarhus Geoscience*, 4, 97-106.Hansen, B., Nørnberg, P., & Rasmussen, K.R., 1998. Atmospheric ammonia exchange on a heathland in Denmark. *Atmospheric Environment*, 32, 461-464.Hansen, B. and Nielsen, K.E., 1998. Comparison of acidic deposition to semi-natural ecosystems in Denmark – coastal heath, inland heath and oak wood. *Atmospheric Environment*, 32, 1075-1086.Holloway, J.M., Dahlgren, R.A., Hansen, B., & Casey, W.H., 1998. Bedrock contributes to high stream-water nitrate concentrations. *Nature*, 395, 785-788.Hansen, B., Nørnberg, P., & Ladekarl, U.L., 1999. Acidification of the sandy percolation zones under heathland and oak wood in Denmark. *Forest Ecology and Management*, 114, 137-150.Hansen, B., 1999. Weekly measurements over one year of ammonia concentrations and surface exchange fluxes at Danish heathland with passive wind-vane flux samplers in a micro-meteorological gradient configuration. *Water, Air and Soil Pollution*, 113, 357-370.Hansen, B., Wyers, P.G., Nørnberg, P., Nemitz, E., & Sutton, M.A., 1999. Intercalibration of a passive wind-vane flux sampler against a continuous-flow denuder for the measurement of atmospheric ammonia concentrations and surface-exchange fluxes. *Atmospheric Environment* 33, 4379-4388.Hansen, B., & Dahlgren, R.A., 1999. Geologic nitrogen – an overlooked nitrogen source in terrestrial ecosystems? (submitted to *Journal of Environmental Quality*).Hansen, B., Kristensen, E.S., Grant, R., Høgh-Jensen, H., Simmelgaard, S.E. og Olesen, J.E., 1999. Nitrogen leaching from conventional versus organic farming systems – a modelling approach (submitted to *European Journal of Agriculture*).Hansen, B., Alrøe, H.F. and Kristensen, E.S., 1999. Assessing the environmental impact from organic farming – with special attention to Denmark (submitted to *Agriculture, Ecosystem and Environment*).Nielsen, K.E., Hansen, B., Ladekarl, U.L. and Nørnberg, P., 2000. Ion leaching processes on Danish heathlands due to N-deposition. (In press, *Plant and Soil*)

Appendix 2

Synthesis of knowledge project

Organic pig production – animal health and welfare

1. Choice of problem

No convincing concept for organic pig production taking into account the basic organic ideas and the recent, agreed EU-regulations has yet been established.

The aim of this work is to analyse possibilities and limitations of different organic pig production systems expected to be relevant in future – considering productivity and environmental impact as well as animal health and welfare issues.

The work is divided into four subtasks, which are

- i : Technical and economic analysis of different systems
A range of systems representing different levels of extensification and integration of the pig production in the land use are considered. Calculations are carried out of expected investment needs, running costs, labour costs, level of production, possibilities for animal health management and environmental effect for the different systems. Based on these works the most promising overall systems will be identified.
- ii : Risk for animal health and food safety related to outdoor production systems
The free-range systems definitely introduce new risks related to animal health and food safety control. The risk factors related to wild fauna, airborne diseases and pathogens present in the outdoor areas are identified and the importance evaluated, also in relation to avoiding/limiting risks (the exposure).
- iii : ***Feeding related 'immunity' against endoparasites and bacterial infections in the digestive system***
While the organic system may increase the exposure of the pigs to pathogens, some feeding related factors may counterbalance the exposure. Focus will be directed towards feeding related factors increasing health of the digestive system in the period around weaning and in slaughter pigs (types of dietary fibres etc.).
- iv : Supply with essential nutrients (amino acids, vitamins and minerals)
There is a considerable lack of knowledge on how to feed the pigs the necessary nutrients in view of the limitations in feed choice brought about by the EU-regulations. This is going to be evaluated and, at the same time, an attempt will be made to get an indication of the importance of the different nutrients for the pigs to maintain good health, reproduction efficiency and product quality.

2. Team of experts

20 experts have been identified. Their experience covers animal science, veterinary science, economic science, systems development and pig production.

The experts have specific obligations within one of the specified topics, but also contribute to the synthesis in general. Overall responsibility for the synthesis is held by John E. Hermansen. Subtasks are divided as follows:

- | | |
|------------------------------|--|
| 1. Henrik Bækstrøm Lauritsen | The Federation of Danish Pig Producers and Slaughterhouses |
| Nikolaj Nørgård | Danish Institute of Agricultural and Fisheries Economics |
| Bent Hindrup Andersen | Department of Agricultural Engineering |
| Ib Sillebak Kristensen | Department of Agricultural Systems |
| Anne Grete Kongsted | Department of Agricultural Systems |
| Finn Møller | Department of Agricultural Engineering |
| Karin Hjelholt Jensen | Department of Animal Health and Welfare |
| Søren Bak | National Association of Organic Pig Producers |
| 2. Henning Leirs | Danish Pest Infestation Laboratory |
| Anne Feenstra | Danish Veterinary Laboratory |

Allan Roepstorff	Centre for Experimental Parasitology, RVAU
Jan Tind Sørensen	Department of Animal Health and Welfare
3. Knud E. Bach Knudsen	Department of Animal Nutrition and Physiology
Martin Tang Sørensen	Department of Animal Nutrition and Physiology
Ellen-Margrethe Vestergaard	Department of Animal Health and Welfare
4. Viggo Danielsen	Department of Animal Nutrition and Physiology
Hanne Damgaard Poulsen	Department of Animal Nutrition and Physiology
Søren Krog Jensen	Department of Animal Nutrition and Physiology
Christer Olsson	Department of Plant and Soil Science

3. Detailed working plan and time schedule

April 2000:	The group of experts meet to discuss the working plan and coordinate their efforts in the different subtasks.
May-June 2000:	The experts obligated to the different subtasks prepare a preliminary report on their respective issues (to be circulated within the entire group of experts).
August 2000:	The preliminary reports are discussed in a wider group representing also other researchers (those who have expressed an interest in carrying out projects with organic pig production) and representatives for the organic producers.

4. Conclusion and dissemination of results

A DARCOF report will be prepared including

- an introductory paper on the role of pig production in organic farming
- the above mentioned four reports
- an overall discussion of limitations for the development of organic pig production and priorities in research and development needs

5. Resources and deliverables

Budget:	A total of 12 man-months and travel costs amounting to DKK 350.000
Deliverables:	A DARCOF report, and preferable an international paper

Appendix 3

Synthesis of knowledge project

Nature quality in organic farming, on local and regional levels

1. Choice of problem

Organic farming is often associated with agricultural production systems having high-quality natural values. However, perceptions of what characterise nature and what should be included as natural values differ extensively. Nature quality in this context includes aspects of structures, elements and processes in nature and landscape. Nature quality seek to identify/characterise the natural components on local and regional levels with the aim of describing the actual natural conditions and setting up relevant targets for the desirable natural conditions. These natural components may differ between the various groups of interest, such as farmers, other citizens and future generations. Relevant nature values include hunting and other recreational aspects, aesthetic experiences, natural and cultural history, biological diversity, and the fertility of soils. Several of these elements are potentially altered by different farming systems, including organic farming, both on the farm and landscape level.

So far, a common understanding of the concept of nature quality has not been developed neither in conventional nor in organic farming. However, the general idea is that the concept of nature quality should include a range of aspects, which can eventually be weighted differently depending on the aims and interests specified. Thus, a synthesis of knowledge is needed to clarify the different aspects of nature quality relevant to be integrated into the use of this concept concerning organic farming.

There is also a need for reviewing relevant indicators of the aspects to be integrated into the nature quality concept. These indicators can describe actions or initiatives taken by the farmers to improve nature quality (action indicators) and the impacts of such actions identifying the actual or desirable condition (impact indicators). By following the development of generally accepted indicators organic farmers can verify the nature considerations forming an integrated part of their cultivation practice and the indicators may also prove a valuable supportive decision-making tool in the further development of organic farming.

2. The team of experts

The organisational structure of the project is made up by an overall responsible project leader, a team of experts, and a number of authors to write the final report. The team of experts should be relatively broad to ensure that all relevant viewpoints are represented in the discussions, and still at a manageable size for in-depth discussions. In each symposium the experts may choose to supplement their team with relevant external research scientists represented in the submitted projects. The following participants are invited to make up the permanent team of experts:

Jesper Fredshavn (project leader), Knud Tybirk, Rasmus Ejrnæs, Jørgen Axelsen, Pia Frederiksen (all National Environmental Research Institute, NERI), Niels Halberg (Danish Institute of Agricultural Sciences), Vibeke Langer (The Royal Veterinary and Agricultural University), Katrine Højring (Danish Forest and Landscape Research Centre), Erik Steen Kristensen and Hugo Fjelsted Alrøe (Danish Research Centre for Organic Farming)

3. Identification of themes to be discussed to achieve a common understanding

Four thematic meetings (symposia) will be held for clarification and discussion of major topics based on discussion papers prepared in writing by selected contributors. The following four themes have been identified, the first representing some overall aspects (such as scaling) that should be considered in the other three as well. Another general aspect to be taken into account in all four symposia is the farmers' possibility to impact the selected aspects of nature quality and the suggested indicators via

management. After each symposium the responsible author (names underlined below) will summarise the discussion papers and the discussions, cf. point 4.

A. Nature quality, indicators and spatial scale

Which indicator types are of relevance to nature quality in organic farming taking into account different values and interests? How is the conceptual background and which are the spatial scale demarcations? Can links between geographical studies of landscape structures and biological processes be identified?

Discussion papers presented by:

Pia Frederiksen, NERI; Niels Halberg, DIAS, Jesper Brandt, RUC, Chris Topping, NERI,

B. Nature quality and biological diversity

How do we define (and treat) biological diversity in an agricultural landscape? How may organic agriculture contribute (or may not contribute) to the biological diversity relating both to the vulnerable and endangered uncultivated nature and to the more common species in cultivated areas? How are the relations between general diversity and ecosystem function in cultivated areas? Is it possible to define criteria of nature quality characterising these natural components and which relevant indicators can be identified?

Discussion papers presented by:

Knud Tybirk and Rasmus Ejrnæs, NERI; Vibeke Langer, The Royal Veterinary and Agricultural University

C. Nature quality, hunting, recreational experiences and landscape aesthetics

How may organic agriculture contribute to recreational potentials and aesthetic experiences, including hunting and living conditions and habitats of game species, access facilities and recreational experiences and impression of the scenery. Is it possible to define criteria of nature quality characterising these natural components and which relevant indicators can be identified?

Discussion papers presented by:

Katrine Højring, DFLRI; Tommy Asferg, NERI; NN.

D. Nature quality and organic farming production

Which natural components contribute to the organic farming production, in particular beneficial insects and the soil fauna? Is it possible to define criteria of nature quality characterising these natural components and which relevant indicators can be identified?

Discussion papers presented by:

Jørgen Axelsen, NERI; Gabor Lowe, DIAS; NN (ecosystem functionality)

In addition to recommended criteria and indicators significant knowledge gaps should be identified for each topic. This will be needed in order to achieve a conceptual clarification of each individual aspect to improve future research assignments on the issues.

4. Conclusions and dissemination of results

Based on the discussions in each symposium the selected authors' compile the viewpoints and common understanding achieved by the team. The report should include recommendations for the possibilities of:

- 1) integrating the various aspects into the nature quality concept
- 2) identifying relevant indicators, and
- 3) proposing future research assignments

Based on the authors' compilation, the team of experts will hold a final symposium for making an overall assessment of the possibilities to define one common nature quality concept including relevant indicators. The group is also to prepare recommendations for future research initiatives regarding nature quality in organic farming.

The results will be compiled by the responsible project leader and presented in a workshop to be attended by other research scientists and various user groups such as farmers and regional authorities to ensure an optimal differentiation of the final recommendations. These recommendations will be included in the final report.

5. Resources, time schedule and deliverables.

250.000 DKK

Time schedule

The four thematic meetings will be held in April, May, June and August. The workshop will be held in September and the final publication will be ready in October 2000.

Deliverables

A FØJO report (in Danish), and preferable an international scientific paper.