



**Midterm Status Report 2002 and
Application for Continuation in 2003**

For research projects financed by grants from
The Directorate for Food, Fisheries and Agro Business
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1. Research program

Research in organic farming 2000-2005 (DARCOF II)

2. Project title and number

I18 Management in relation to health and food safety in organic pig production
(MANORPIG)

3. Head of project

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Dept. of Animal Health and Welfare
Danish institute of Agricultural Sciences

4. Participating institutes

Danish institute of Agricultural Sciences
Royal Veterinary and Agricultural University
Danish Pest infestation Laboratory

5. Other project staff

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6. Project period (month, year)

Start of project:	May 2001
End of project:	Dec 2004

7. Midterm description of the project, its results and progress, and application for continuation in 2003

A. Project summary

Organic pig production is a relatively new production concept with promising possibilities for growth. A major challenge in organic pig production is to maintain and in some areas to improve animal health and food safety without compromising animal welfare. It is assumed that many problems concerning diseases, zoonoses and animal welfare can be reduced by improved management in organic pig production systems. The purpose with this project is to develop management strategies for controlling diseases, zoonoses and animal welfare problems.

Parasites are a major problem for animal health and welfare in many organic pig production systems. Knowledge relevant for parasite control in organic pig production is scarce. In an experiment in this project the parasite transmission rate in piglets is described and the long term infectivity of naturally contaminated pastures are measured. Also the effect of ploughing and reestablishing of the grass is examined.

Rodents are assumed to be an important risk factor for diseases and zoonoses in organic pig production systems. Traditional rodent control with application of rodenticides is not desirable in organic pig production. It is therefore necessary to develop organically acceptable and efficient rodent control strategies for organic pig production. Since knowledge on pest supporting factors in Danish out door pig production systems is lacking, a survey identifying these factors will be carried out. The ecology of the pest problem is investigated in organic pig farm cases and strategies for controlling the most important pest problems will be developed.

The development of strategies preventing health and food safety problems needs to acknowledge the complex interaction between diseases/zoonoses, production systems and management which prevail in organic pig production. It is also important that strategies for controlling diseases and zoonoses do not compromise animal welfare. Hazard-Analysis-Critical-Control-Point (HACCP) is a risk analysis concept, which in recent years have been described for applications at the livestock farm level. A HACCP concept for application in an organic pig farm is developed in this project focussing on CCP's for diseases, zoonoses and animal welfare problems.

Organic pig production is a relatively new production form and most stockmen are inexperienced and need to develop suitable management routines. A concept for operational management for inexperienced farmers or for farmer with present management problems has been developed and is called Systematic Operation Programmes (SOP). In this project a SOP focussing on the control of diseases, zoonoses and animal welfare problems is developed and evaluated. In the development phase experience from researchers, advisors and farmers are elicited in an expert opinion study.

Table A.1: Work package list (from application)

WP No	WP title	Responsible participant	Budget	Start	End	Deliverable, No
1	Non-medical parasite control in piglets	AR	850.000 kr.	May 2001	July 2004	D1-D4
2	Development of a HACCP and systematic operation programme for control of diseases, zoonoses and animal welfare problems	JTS	925.000 kr.	Jan 2002	Sept 2004	D5-D10
3	Development of strategies for pest management	HL	500.000 kr.	June 2001	May 2004	D11-D13
4	Project co-ordination and organisation of an international workshop	JTS	225.000 kr	May 2001	Dec 2004	D14

B. Objectives and expected achievements

Parasites are unavoidable in organic pig production but need to be controlled at an acceptable level. In order to develop non-medical strategies for controlling parasites in organic pig production it is urgent to obtain specific answers to some of the most frequent questions from organic farmers and practising veterinarians: When and to which extent do piglets obtain helminth infections from the environment? How long time should the pastures remain free of pigs before the infectivity is so low that pigs can return? What is the effect of ploughing the pasture? These questions are addressed in WP1.

Risk factors for parasites, diseases, zoonoses and welfare problems can be identified based on existing knowledge. However we need to quantify these risks and further to identify critical control points for on-farm use in order to establish a monitoring system for controlling these risks at farm level. Researchers, advisors and experienced farmers have important knowledge on operational management. This knowledge can be systematised and described in systematic operation programmes and can be elicited in an expert opinion study. However, before a systematic operation programme is proven useful for organic pig farmers it needs to be evaluated for on farm use. These tasks are carried out in WP2.

Wild rodents such as rats will always be present in organic pig production. However, since rats are assumed to be an important risk factor for diseases and zoonoses, it is necessary to develop efficient rodent control strategies for organic pig production without use of rodenticides. Knowledge on pest supporting factors in Danish out door pig production systems is lacking, and a survey identifying these factors is therefore a necessary part of developing such strategies. This work are carried out in WP3.

Existing knowledge combined with results obtained in WP1 and WP 3 provide a basis for relevant management strategies for organic pig production developed in WP2.

Valuable knowledge relevant for this project will be produced in other national and international projects. To promote efficient communication for the benefit of this pro-

ject a scientific workshop will be organised focussing on diseases, zoonoses and welfare problems in organic pig production. This task will be carried out in WP4.

The project is expected to produce:

- Strategies for non-medical parasite control in piglets
- Hazard analysis and critical control points for measuring risks for leg problems and weaning diarrhoea, *Salmonella* and animal welfare problems
- Effective rodent management strategies
- Systematic operation programmes for preventing and treating leg problems in sows, weaning diarrhoea, *Salmonella* and animal welfare problems

C. Midterm results and progress

C.1 Description (summary) of main results and conclusions

WP1

Six farrowing pastures were contaminated with the swine round worm (*Ascaris suum*), whipworm (*Trichuris suis*) and nodular worm (*Oesophagostomum dentatum*) in the spring 2001. In the beginning of July one litter of piglets was born on each pasture. The transmission pattern of each parasite was then followed until week 19 after farrowing. In brief, the results showed that a large number of round worm eggs became infective during the summer and this resulted in an overall high transmission rate, very high worm burdens and a prevalence of 80 %. This confirms previous findings that neonatal exposure to the round worm may result in higher infection levels compared to exposure that occurs later in life. The data also shows that if infective parasites stages are present on the pastures, piglets will ingest them very early in life due to their natural foraging behaviour. Transmission of the whip worm was negligible as only few eggs developed to infectivity during the experimental period. This is due to the very slow embryonation of these eggs. Normally, the majority of whip worm eggs do not become infective until the second season after contamination. The nodular worm is transmitted as free-living larvae that are sensitive to desiccation. Survival of the larvae was poor and consequently, overall transmission was very low and worms accumulated very slowly in the pigs.

The study on long-term infectivity of parasites on contaminated pastures (Task 2) is still ongoing. Approximately one year after the farrowing pastures used in task 1 were contaminated with parasites, only two of the three initial parasites had survived on the pastures. All samples collected in May 2002 indicate that the pastures are no longer contaminated with the nodular worm. However, eggs of the large round worm are still present in large numbers and a larger proportion of the eggs are now infective. The same is true for the whip worm although overall pasture infectivity is much lower. The difference between the two parasites reflects that initial contamination levels in 2001 were very different.

Task 3 has not yet been completed but the preliminary results are promising. It seems that although ploughing do not prevent transmission, it can reduce the transmission considerably of at least one of the surviving parasites, namely the round worm.

WP2: No results or conclusions yet

WP3

When one visits outdoor pig systems, rats are often seen in, around and below food and water trays. Some farmers feed the pigs on the bare ground. Therefore it might seem reasonable to expect more rats (and mice) and more severe problems with the rodent pests in outdoor pig systems with open food trays or the food being offered to the pigs on the bare ground. A preliminary analysis of the questionnaire responses does not support this thought as also farmers using feeding stations with difficult access for the rats do have rat problems. Judged by the responses there seem to be no clear differences between occurrence of rats (and mice) in outdoor systems with open food trays and those with feeding stations.

In November 2001 two farms (named H and G respectively) in Zealand were found suitable for the field study with regular trappings of rodents. Rodents are trapped at intervals of about eight weeks. On both farms the following rodent species have been trapped: Norway rat (*Rattus norvegicus*), House mouse (*Mus musculus*), Yellow-necked mouse (*Apodemus flavicollis*), Wood mouse (*Apodemus sylvaticus*), Harvest mouse (*Micromys minutus*), Field vole (*Microtus agrestis*) and Bank vole (*Clethrionomys glareolus*). In addition to the rodents the Common shrew (*Sorex araneus*) has also been trapped on both farms. The number of rodents trapped in the spring and early summer 2002 has been at a lower level than in December 2001 and September 2002 and this is considered a normal situation. A common characteristic of both farms after five trapping sessions is few rats and higher numbers of mice or voles. No rats have been trapped on farm H in June and September 2002 and the same was the case on farm G in April and July 2002.

The telemetry study was initiated in May 2002 on farm H. Seven rats (2 ad. and 5 juv.) were equipped with transmitters but unfortunately at least six of the rats died during the observation period. The young rats moved around very close to the trapping points in a barn. One of the adult rats moved around several hundred meters and during the tracking period it was seen visiting a neighbour farm and after some time it returned and died. The other adult rat moved around in a limited area and may still be alive.

C.2 Fulfilment of deliverables and milestones

WP1 Non-medical parasite control in piglets	Time schedule according to application	Deviations, if any*
Task		
1. Parasites in piglets on contaminated farrowing pastures	May 2001- Dec. 2001	
2. Long-term infectivity on naturally contaminated pastures	Nov 2001- Mar 2004	
3. Comparison of longterm infectivity of continuous grass and on ploughed/new grass	Nov 2001- Mar 2004	
Deliverables		
D1. International journal paper on neonatal helminth infections	June 30 2002	May 2003
D2. Informative publication on neonatal helminth infections	Aug 31 2002	Feb. 2003
D3. International journal paper on long-term helminth infectivity of continuous and ploughed pastures	April 2004	
D4 Informative publication with recommendations for organic farmers on pasture management in non-medical control of helminth infections	Feb 28 2004	
Milestones		
M1 Experiment on helminth infections in piglets on contaminated pastures completed	Dec. 2001	
M2 Experiment on long-term survival of infective helminth stages on continuous and ploughed pastures completed	Dec. 2003	

* *Deviations are to be further discussed at D*

WP2 Development of a HACCP and a systematic operation programme for control of diseases, zoonoses and animal welfare problems	Time schedule according to application	Deviations, if any*
Task		
4. Development of a protocol for critical control points	Jan – Oct 2002	2 month delay
5. Development of a systematic operation programme (SOP)	May – Oct 2002	2 month delay
6. Application of a CCP-protocol and a SOP on organic pig farms	Nov 2002- Oct 2003	2 month delay
7. Evaluation of a CCP report as a decision support system	Nov 2003- Sep 2004	2 month delay
8. Evaluation of a SOP as a decision support system	Nov 2003 – Dec 2004	2 month delay
Deliverables		
D5 .A report on risks of leg problems, weaning diarrhoea, <i>Salmonella</i> during one year	June 2004	
D6. A report on welfare problems on 6-8 organic pig farms during a year	June 2004	
D7. A scientific journal paper on the relationship between diseases, animal behaviour problems, and production at sow level	May 2004	
D8. A report on a HACCP for leg problems, weaning diarrhoea, <i>Salmonella</i> , and animal welfare problems on an organic pig farm.	Aug 2004	
D9. A report on how the farmers have perceived a SOP as a management tool.	Sep. 2004	
D10. A Systematic operation programmes is described on the Internet including a procedure for how to apply the programme	Dec. 2004	
Milestones		
M3. A CCP monitor protocol is available	Nov 2002	Jan 2003
M4. A prototype of CCP report focussing on risks for leg problems, weaning diarrhoea, <i>Salmonella</i> , and animal welfare problems is available	Jan. 2004	Feb. 2004
M5. An evaluation of the HACCP-report as a decision support tool	Sept 2004	Oct 2004
M6. A final version of a SOP-manual is completed on paper	Oct. 2004	

WP3 Development of strategies for pest management in selected production systems	Time schedule according to application	Deviations, if any*
Task		
9. Identification of pest-supporting factors	Jun-Nov 2001	
10. Ecology of pest problems	Oct 2001- Mar 2004	
11. Identification of pest control tools	Apr-Jun 2004	
Deliverables		
D11. A list of factors which are known to increase pest problems in open air pig farms to be incorporated in risk analysis and decision support systems	Feb 28 2004	
D12. An annotated list of non-pesticide-based pest control tools for use in outdoor pig systems	May 31 2004	
D13. An international journal paper on the ecology of wild rodents in outdoor pig farm systems	May 31 2004	
Milestones		
M7. Questionnaire results analysed	Nov 2002	
M8. Ecology field work finalised	Jan. 2004	
M9. Potential control techniques listed	Sept 2004	

WP number and title WP4 Project co-ordination and organisation of an international workshop	Time schedule according to application	Deviations, if any*
Task		
12.Organisation of a advisory workshop	Jan-Dec. 2002	1 month delay
13.Co-ordination	May 2001- Dec 2004	
Deliverables		
D14. A workshop report	Jan 2003	1 month delay
Milestones		
M10. An advisory workshop	Dec 2002	1 month delay

D. Description of deviations and subsequent adjustments of plans

D1 will be delayed until May 2003 when the manuscript on neonatal helminth infections will be submitted to an international scientific journal. Actual publication will then take place after approximately a year when the journal has processed the manuscript. The delay is a result of the very large number of samples that has to be processed in the laboratory. Some procedures have proved to be very time consuming and until now it has not been possible to produce the antigens needed for the immunological analysis. Consequently, the informative publication (D2) on neonatal infections will also be delayed until February 2003.

Initiation of task 4 and 5 has been delayed two month and will therefore be finalised two month later than initial planned. As a consequence task 6, 7 and 8 will also be delayed. Milestone 3 scheduled to November 2002 will be delayed two month due to a delay in task 4. Milestone 4 scheduled January 2004 will be delayed one month due to a delay in on-farm application (task 6). The scientific workshop (milestone M10) is now linked to the expert panel development of CCP (task 4). The workshop scheduled to December 2002 is now planned to be in Jan/Feb 2003.

E. Project publications and other products

1. Articles in international, scientific journals with review procedures

2. Papers presented at congresses, symposiums, etc.

Roepstorff, A. & Mejer, H. (2001). Strategies for parasite control in organic pigs. Invited presentation at the 5th NAHWOA workshop, November 11-13, 2001, Rødding, Denmark.

Mejer, H., Roepstorff, A. & Eriksen, L. Epidemiology of helminth infections in pigs born and raised on contaminated pastures. Proceedings of the American Association of Veterinary Parasitologists, 47th Annual Meeting, July 13-16, 2002, Nashville, TN, USA, p 51.

3. Reports, articles in agricultural journals, etc.

4. Oral presentations, public meetings, field days, etc.

Mejer, H., Roepstorff, A. & Eriksen, E. Transmission af parasitter i grise som er født og opvokset på friland. Markvandring på KVL's forsøgsgårde, 6 juni 2002.

Roepstorff, A. "Parasitter i lange baner: Parasitter i moderne husdyrproduktion". Foredrag ved KVL's Kandidatkonference 2002, 23 august 2002.

Lodal, J. Økologiske frilandsgrise plages af skadedyr. Externt Forum, Ministry of Agriculture, Fisheries and Food, week 35, 2001

F. Scientific education

Helena Mejer has initiated the Ph.D. project "Management and alternative crops as means of reducing the parasite loads in organic swine production systems" by July 1, 2001, funded by the DARCOF projects MANORPIG and PROSBIO, as well as co-financed by DARCOF.

G. National and international cooperation

Dr. Eva Frontera, Universidad de Extremadura, Cáceres, Spain, has participated in the project on neonatal helminth infections (WP1).

H. Critical reflection on the project

In the project application we have chosen to focus on leg disorders, weaning diarrhoea and selected welfare problems. However, since planning of the project, new information and experience on animal health and welfare problems in organic sow production has emerged. Piglet mortality may be a major health/animal welfare problem, which may be included in task 4 and 5. A thorough analysis on the justification in selection of health problems is carried out in autumn 2002. These considerations have as a consequence that the aggregated activities in task 4 and 5 are increased and the activities in task 6 have consequently been decreased. We will try to maintain the impact of task 6 through international collaboration on herd health recordings in organic sow herds.

During the process of analysing the questionnaire responses and through contact with the organic farmers, it has been possible to identify three groups of farmers regarding their views on pest control. One group uses pesticides if these are allowed in organic farming while a second group does not use pesticides and if they need control pests they prefer traps and other non-chemical methods. A third group denies killing wild animals whether they are pests or not. These different groups have to be born in mind when the issue is how to control pest animals in organic farming.

Rats are often in focus as transmitters of diseases and this is justified by the highly commensal life style of the rats. As found during the trapping sessions other rodents do occur in the same environment as the pigs in outdoor pig systems. These other rodent species may play an equally important role as disease transmitters as the rats. Based on these assumptions and the few rats occurring on the experimental farms, it seems reasonable to consider a change in the project from radio tracking rats only to tracking other rodent species as well.

In task 4 and 5 it has been decided to develop CCP and SOP using expert panel with Danish/Scandinavian advisors as experts. The expert panel analysis would benefit from a final workshop discussion with the experts on the result from the anonymous expert panel questionnaires. The objectives of the workshop in terms of WP2 have therefore been specified. In order to fully fill as a part of the expert panel analysis it has been necessary to postpone the workshop from Dec. 2002 to Jan/Feb 2003.

8. Budget

I. A. Account for any change in budgets

B. Budget for the whole project (1.000 DKr)

Total consumption of funds from DARCOF and expected consumption this year and coming years

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months						
Scientific personnel	4,5	14	17	8		43,5
Technical personnel	2,5	3,5	4,5			10,5

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries						
Scientific personnel	128	432	545	266		1371
Technical personnel	54	77	100			231
Other operational costs	118	142	217	35		512
Equipment						
Others (please specify)						
Direct costs	300	651	862	301		2114
Indirect costs (20% of direct costs)	48	114	164	60		386
Total	348	765	866	361		2500

C. Budget for each participating institute (1.000 DKK)

Name of Institute: Danish Institute of Agricultural Science, Dept. of Animal health and welfare

Year:	Con- sumption before 2002	Expected consump- tion 2002	200 3	2004	2005	Total
Man-months						
Scientific personnel		6	10	4		19
Technical personnel		1	2	0		5

Year:	Con- sumption before 2002	Ex- pected con- sumption 2002	2003	2004	2005	Total
Salaries						
Scientific personnel		204	347	147		695
Technical personnel		22	45	0		80
Other operational costs		27	142	25		184
Equipment						
Others (please spec- ify)						
Direct costs		256	531	172		959
Indirect costs (20% of direct costs)		51	106	34		191
Total		304	640	206		1150

Comments: The expected consumption in 2002 is decreased by 160.000 DKK (82.000 DKK in salary, 52.000 DKK in operational costs and 26.000 DKK in indirect costs). The budget for 2003 is accordingly increased by 160.000 DKK. The change in the budget is primarily caused by a delay in tasks 4-8 and furthers a delay in task 12. Across 2002 and 2003 the expected consumption in scientific personnel is increased by one month and the expected consumption in technical personnel is decreased by 2 man-months. These changes are due to changes in activities in task 4 and task 6 (see also 8H).

Name of Institute: Royal Veterinary and Agricultural University, Danish Centre for Experimental Parasitology

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months						
Scientific personnel	3	6	6	3		18
Technical personnel	2	1	1	0		4

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries						
Scientific personnel	77	159	163	84		483
Technical personnel	44	23	23	0		90
Other operational costs	59	33	33	10		135
Equipment						
Others (please specify)						
Direct costs	180	215	219	94		708
Indirect costs (20% of direct costs)	36	43	44	19		142
Total	216	258	263	113		850

Name of Institute: Danish Pest Infestation Laboratory, Dept of Mammals

Year:	Con- sump- tion be- fore 2002	Ex- pected con- sump- tion 2002	2003	2004	2005	Total
Man-months						
Scientific personnel	1,5	2	1	1		5,5
Technical personnel	0,5	1,5	1,5	0		3,5

Year:	Con- sump- tion be- fore 2002	Ex- pected con- sump- tion 2002	2003	2004	2005	Total
Salaries						
Scientific personnel	51	69	35	35		190
Technical personnel	10	32	32	0		74
Other operational costs	59	82	42	0		183
Equipment						
Others (please spec- ify)						
Direct costs	120	183	109	35		447
Indirect costs (20% of direct costs)	12	20	14	7		53
Total	132	203	123	42		500

9. Signatures and stamps

Name	Institute	Date	Signature
Head of project			