Midterm Status Report 2003 and Application for Continuation in 2004

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The Directorate for Food, Fisheries and Agro Business
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1. Research program

Research in organic farming 2000-2005 (DARCOF II)

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2. Project title and number

Pig feeding under organic farming conditions with emphasis on nutrient utilisation, product quality and health (II.7)

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6. Project period (month, year)

Start of project: April 2001
End of project: June 2005

7. Midterm description of the project, its results and progress, and application for continuation in 2004

A. Project summary

A knowledge synthesis initiated by DARCOF revealed that some topics in relation to feeding of pigs under organic farming conditions need to be studied. Thus the overall goal of this project is to provide new insight that can be applied in the formulation of feeding strategies and diets in organic pig production.

The demand for self-sufficiency in feed is increasing, and at the same time the feed sources must contain sufficient nutrients (amino acids, vitamins and minerals) to meet the demands of the pigs. Alternative feed crops and feed ingredients therefore have to be studied. With this background, a series of experiments will be conducted with lupine as a substitute for more conventional protein sources. In this connection, a reduction in protein requirements would make it easier to formulate adequate diets. Thus, it is investigated whether organic, out-door pigs, that use relatively more energy for physical activities, have a lower requirement for amino acids than those used for conventionally housed pigs.

Roughage can be a realistic alternative to pigs if feed uptake is not limiting for the production. This is the case for pregnant sows. Thus, the grass uptake of pregnant sows on pasture is investigated during the summer, and clover grass silage uptake is investigated during the winter. It is also investigated whether the requirements for essential nutrients are met (amino acids, vitamins and minerals).

In organic pig production the restrictive use of medicine increases the incitement of applying feed sources and feeding strategies that may prevent infections. This aspect is investigated with regard to reducing weaning diarrhoea and infection with intestinal worms.

Finally the effect of the feeds is investigated with regard to carcass and meat quality, e.g. the effect of lupine on the meat content of skatole.

The work is conducted in three work packages involving experiments with pregnant sows, weaned piglets and growing-finishing pigs. The expected achievements comprise:

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

No.	Work package title	Partici-pants*	Budget (1.000 DKr)	Start	End	Deliverable No:
-	Co-ordination	MTS	248.500	01.04. 2001	30.6 2005	
1	Adequate supply of dietary protein, vitamins and minerals to sows and growing-finishing pigs.	JAF	1.900.000	01.07. 2001	31.12. 2004	D1.2-D1.10
2	Feeding strategies for weaned and growing-finishing pigs with	KEBK	1.900.000	01.07. 2001	30.06. 2005	D2.1-D2.5

	emphasis on gut health.					
3	Effects of nutrient supply for growing-finishing pigs on product quality.	CCM	951.500	01.01. 2002	31.12.2004	D3.1-D3.3
Total			5.000.000			

* Responsible participant

B. Objectives and expected achievements

The overall objective of the project is to obtain new knowledge, that can support the recommendation of suitable dietary composition and feeding strategies for organic pig production. The emphasis will be placed on feedstuffs of organic farmed origin and the nutritional requirements for performance, carcass quality, meat quality and health of the pigs will be studied. Expected achievements comprise:

- Directions on how to increase self-sufficiency in the feed supply
- Increased knowledge with regard to the requirements for essential amino acids in organic pig production
- Increased knowledge with regard to the requirements for vitamins and minerals in organic pig production
- Development of feeding strategies to decrease weaning diarrhoea in organic pig production
- Development of feeding strategies to decrease the risk of infection with intestinal worms in organic pig production
- Description of the effects of selected feed sources and feeding strategies on carcass and meat quality

C. Midterm results and progress

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

WP 1. Adequate supply of dietary protein, vitamins and minerals to sows and growing-finishing pigs

Task 1.1. Production experiments with growing pigs

The experiments concerning effects of reduced dietary protein and different levels of lupines are in progress. Six replications out of 8 planned have been carried out so far. The six replications consisted of 150 pigs (75 female and 75 barrows) reared in pens of 5 pigs each. Preliminary results are presented in the table below:

Performance results (average) of pigs (30-105 kg) fed different levels of lupine and 2 levels of dietary crude protein

Crude Protein, % of standard	**100**		**85**		
Lupine, % in diet	**0**	**25**	**0**	**12,5**	**25**
Feed consumed, kg/day	**2,41**	**2,49**	**2,56**	**2,48**	**2,35**

Growth gain, g/day	**1007**	**964**	**991**	**984**	**917**
Feed/gain, FEs/kg	**2,59**	**2,77**	**2,79**	**2,72**	**2,77**

The results obtained so far indicates that organic produced slaughter pigs can be fed lower levels of amino acids relative to conventional recommendations, without serious detrimental effect on production. In addition, lupine seed and triticale seem to be suitable feedstuffs for organic pig production.
The last batch of pigs (replication 7 and 8 equal to 50 pigs) will be initialised as planned primo November 2003. The experiment is expected to be concluded around the end of February 2004.

Task 1.2. Digestibility and balance experiments
Digestibility and balance studies have been planned in details and conducted. Four of the diets used in the production experiments (i.e. diets with 0 or 25 % lupine, see table above) and a batch of organic produced oats respectively lupine have been assayed. The experiments with the four diets and with the organic outs were performed according to the plan. However, pigs given diets containing lupine diluted with sugar (40/60) refused to eat completely. Different trials with different diluting substances (cereal starch and the like) failed to overcome the problem. Finally, the experiment was accomplished by imposing a severe feed restriction. This part of the project is therefore delayed a couple of months. The analytical work is in progress at this moment.

Task 1.3. Production experiments with pregnant sows
The experiments concerning pregnant sows on pasture have for the present been conducted in five turns. Preliminary results from one turn in 2001 and three turns in 2002/2003 have revealed that sows during pregnancy are able to cover up to 60-65% of their daily net energy requirements by grazing. These results have been obtained by rotational grazing, where three paddocks for each group of sows were in use. Results on feeding of clover grass silage ad libitum to pregnant sows during the wintertime have demonstrated nutritional value in the same proportions as by grazing.
In relation to sows on pasture several measurements of herbage mass and botanical composition of the paddocks have been taken. Furthermore vitamins- and mineral status of the sows are monitored in samples of blood and milk.
The preliminary results indicate that pregnant sows are able to obtain a substantial nutrient supplement from grass or silage. Nutrient content of the supplemental concentrate (dietary protein, vitamins and minerals) can therefore be adjusted accordingly.

WP 2. Feeding strategies for weaned and growing-finishing pigs with emphasis on gut health

Task 2.1. Gut challenge and diet screening
The experience from a project where we have established a gut challenge *E. coli* model for piglets weaned at 4 weeks of age has been modified to piglets weaned at 7 weeks of age simulating organic conditions. All sows in the herd at Foulum Research Centre have been tested for susceptibility to the antigenic attachment factor (F4-fimbrieae adhesion receptor of *E. coli* O 149 in the intestines). Only piglets from mono-zygotic susceptible sows were subsequently used in the challenge experiments. Initially a dose-response experiment was conducted, where three different doses of the *E. coli* O 149 (10^6; 10^8; and 10^{10}) were applied to piglets by stomach tube daily on days 2-4 after weaning. Clinical recordings, assessment of diarrhoea and

bacteriological recovery levels of *E. coli* O 149 showed that a dose of 10^8 was more suitable than the two other doses. Thus in the four diet screening experiments a dose of 10^8 was used.

Each of the screening experiments consisted of 32 piglets from 4 sows. The design was 2 x 2 factorial with type of diet and *E. coli* O 149 challenge as the two factors each at two levels. The experimental period lasted for 10 days from weaning. The daily recordings included feed and water intake, growth, faces scoring (from 1=firm and solid to 6=yellow and watery) and clinical observations. Faces was sampled on days 2-5 and tested for *E. coli* strains. The diets tested were:

1. Ad libitum versus restricted feed rations
2. Standard versus low protein level in ad libitum fed piglets
3. Lupine versus soya as protein source in ad libitum fed piglets
4. Control (approx. 60 I.E.) E-vitamin/kg feed versus extra (200 I.E.) E-vitamin/kg feed for ad libitum fed piglets.

In the experiment with E-vitamin, samples were taken from the small intestine, gall bladder and liver for subsequent analysis of immunological responses including IgA and IgM, intestinal antibodies against *E. coli* O 149, activity of macrophages, and histological examination of the gut morphology.

We are currently evaluating the data. Initial evaluation suggest that 1) ad libitum feeding may have detrimental effects in infected piglets 2) protein restriction may have detrimental effects in infected piglets 3) no clear effects of lupine and 4) despite no clear effects on performance, E-vitamin status of the piglets seems to be affected by E-vitamin supplementation.

Task 2.2. Effect of dietary factors on weaning diarrhoea

Based on results from task 2.1 as well as practical possibilities, E-vitamin supplementation is selected as the dietary factor to be tested in organic farmed piglets. This experiment is conducted in the fall 2003/winter 2004 on two commercial organic farms.

Task 2.3. Effect of diets varying in digestible and non-digestible carbohydrates on Trichuris suis infection

Two diets with contrasting digestibility have been formulated - the diet containing resistant carbohydrates (Diet 1) is based on triticale, barley, rapeseed cake and silage as the main ingredients while the diet with fermentable carbohydrates (Diet 2) is based on triticale, barley, blue lupines and chicory roots. Assuming that the pigs will consume approximately 7 % of the dry matter from silage and 15 % from chicory roots, the content of feed units for pigs (FEs) will be 0.96 and 1.09 FEs in Diets 1 and 2, respectively. The two types of diets are fed to four groups of 8 animals:

- Group 1, Diet 1, no infection
- Group 2, Diet 1, infected
- Group 3, Diet 2, no infection
- Group 4, Diet 2, infected.

The pigs were adapted for two weeks to the diets and then infected with 2000 infective eggs of T. suis. Faecal egg samples were taken twice weekly to determine the number of parasite eggs excreted. All the pigs were slaughtered 12 weeks post infection (pi). The large intestine was divided into caecum and 5 colon sections. pH was measured in each section and samples were taken for chemical examinations. The remaining intestinal contents were collected to

determine the worm burden. The weight gain on the pigs receiving Diet 1 was lower than on Diet 2 presumably reflecting a lower energy intake, primarily because of less consumption of the silage as expected but there was difference between infected and non-infected pigs. The infected group receiving Diet 1 had higher faecal egg counts compared to the infected pigs receiving Diet 2 until 9 weeks pi, after which the two groups had similar mean egg counts until slaughter. However, the variation in faecal egg counts was substantial. No significant difference was found in the number of worms between the two groups. The samples taken from the gastrointestinal tract are currently being analysed for the chemical constituents and the results expected to be ready by the end of 2003.

Task 2.4. Effect of diets varying in carbohydrate composition on establishment of dual infection with Trichuris suis and Brachyspira hyodysenteriae.

After thorough investigation and discussions with Danish Veterinary Institute, it was decided to use *B. hyodysenteriae* rather than *B. pilosicoli*. A pilot study with *B. hyodysenteriae* will be carried out during August and September as briefly described in the following.

A total of 38 pigs (Landrace/Yorkshire) tested negative for swine dysentery with an average weight of 23 kg will be divided randomly into 4 groups. The groups will be given three different diets as follows:

Group 1, Diet 1 (10 pigs)
Group 2, Diet 2 (10 pigs)
Group 3, standard diet in pellets (10 pigs)
Group 4, standard diet in pellets (8 pigs).

The pigs will be fed normal ratio according to weight. After two weeks adaptation to the diets pigs, in groups 1, 2, and 3 will be challenged with $1x10^9$ colony-forming units of *B. hyodysenteriae* on three consecutive days. Group 4 will remain as an uninfected control group. The pigs will be monitored daily for clinical symptoms. If pigs have severe clinical symptoms being either apathetic or lying down, they will be treated with antibiotics. It is assumed that treatment will not eliminate the infection, and the treated pigs will therefore remain in the groups. Infection will be monitored by collecting faecal samples twice a week. The samples will be cultured selectively for the presence of *B. hyodysenteriae* as well as scored according to consistency (normal, loose, watery/mucoid, and bloody diarrhoea). All the pigs will be slaughtered 4 weeks post infection and a macroscopic pathological examination of each pig will be performed. pH will be measured in caecum and colon and samples will be taken from the intestinal contents to determine the concentration of short chain fatty acids in caecum and colon.

A study with dual infection with *T. suis* and *B. hyodysenteriae* will be carried out from October 2003 to January 2004. The aim is to study the effect of diets varying in digestible and non-digestible carbohydrates on the interaction between parasite and bacteria. Six groups of pigs (Landrace/Yorkshire) tested negative for *T. suis* and *B. hyodysenteriae* will be infected and fed as follows:

Group 1, *T. suis* and *B. hyodysenteriae*, Diet 1
Group 2, *T. suis* and *B. hyodysenteriae*, Diet 2
Group 3. *B. hyodysenteriae*, Diet 1
Group 4, *B. hyodysenteriae*, Diet 2
Group 5, *T. suis*, Diet 1
Group 6, *T. suis*, Diet 2.

The pigs will be fed normal ratio according to weight. After two weeks adaptation to the di-

ets, pigs in groups 1, 2, 3, and 4 will be challenged with $1x10^9$ colony-forming units of *B. hyodysenteriae* on three consecutive days. Pigs in groups 1, 2, 5, and 6 will be inoculated with 2000 infective *T. suis* eggs each. The pigs will be monitored daily for clinical symptoms. *B. hyodysenteriae* infection will be monitored by collecting faecal samples twice a week. The samples will be cultured selectively for the presence of *B. hyodysenteriae* as well as scored according to consistency (normal, loose, watery/mucoid, and bloody diarrhoea). When the *T. suis* infection is potent, the excretion of parasite eggs will be determined twice a week until slaughter. The pigs will be slaughtered when they are not excreting *B. hyodysenteriae* any longer between 4-6 weeks pi. At slaughter the pigs will undergo a macroscopic pathological examination. The large intestine will be divided into caecum and 5 colon section. pH will be measured in each section and samples will be taken for chemical, microbiological, and parasitological examinations.

WP 3. Effects of nutrients for growing-finishing pigs on product quality

Task 3.1

The activities are combined with the activities in WP 1, task 1.1 on dietary protein level and inclusion of lupines. Meat samples have been collected from 3 (of the 4) replicates of 40 pigs (20 gilts and 20 male castrates) = 120 carcasses reared in four of the treatments in task 1.1 (2 levels of protein x 2 levels of lupine (0 and 25%)).

Some of the meat quality traits have been analysed for the first two of the planed four replicates. There was no difference in weight at slaughter between treatments. However, a tendency to lower warm carcass weight was seen at the "low-level protein and high-level lupine" treatment. No differences were found between treatments in the case of the following variables: Drip loss, pH in M. long. dorsi 24 hours after slaughter, temperature in M. long. dorsi 24 hours after slaughter. The pigs fed high-level lupine had higher percent lean meat (60.1) than the pigs fed no lupine (58.9). There was no difference in percent lean meat for the two levels of protein. Gilts had higher percent lean meat (60.0) than castrates (58.9). The pigs fed high-level lupine had lower concentrations of skatole in backfat (0.02 ppm) compared with the pigs fed no lupine (0.05 ppm). As expected there was no difference between gender in concentrations of skatole in backfat.

Data from sensory analysis and analysis of fatty acid composition, pigment, IMF and shear force are presently being analysed.

C.2 Fulfilment of deliverables and milestones (up to Quarter 4 2003)

(To be completed for each work package)

WP number and title: **WP1: Adequate supply of dietary protein, vitamin and minerals to pregnant sows and growing-finishing pigs**	Time schedule according to application	Deviations, if any*
Deliverables:		
D 1.1. Protocol for experiments with pregnant sows, 1 replicate	Quarter 3 – 2001	√
D 1.2. Protocol for digestibility experiments	Quarter 3 - 2001	√
D 1.3. Protocol for experiments with slaughter pigs, 1. replicate	Quarter 3 - 2001	√
D 1.4. Progress report	Quarter 4 - 2001	√
D 1.5. Progress report	Quarter 4 - 2002	√
D 1.6. Progress report including the results of digestibility and balance experiments	Quarter 4 - 2003	√
Milestones:		

M 1.1. Formulation of recommendations for organic pig production with respect to the usage of lupin under conderation of: overall performance of pigs impact on the environment of N and P output	Quarter 4 2003	

WP number and title: **WP2: Feeding strategies for weaned and growing-finishing pigs with emphasis on gut health**	Time schedule according to application	Deviations, if any*
Deliverables:		
Milestones:		
M 2.1. Preliminary evaluation of the procedure for gut chal lenge and diet screening	Quarter 3 - 2002	√
M 2.2. Final evaluation of the procedure for gut challenge and diet screening	Quarter 3 - 2002	√
M 2.3. Evaluation of dietary factors on weaning diarrhoea	Quarter 4 - 2003	

WP number and title: **WP3: Effects of nutrient supply for growing-finishing pigs on product quality**	Time schedule according to application	Deviations, if any*
Deliverables:		
D 3.1. Protocol for collecting and analysing meat samples	Quarter 3 - 2002	√
D 3.2. Progress report	Quarter 3 - 2003	√
Milestones:		

** Deviations are to be further discussed in D*

D. Description of deviations and subsequent adjustments of plans

Because pigs given diets with large amounts of lupine refused to eat completely, the digestibility trials were delayed a couple of months. Therefore results of digestibility and balance experiments (deliverable D 1.6) are not complete.

E. Project publications and other products

1. Articles in international, scientific journals with review procedures

2. Papers presented at congresses, symposiums, etc.

3. Reports, articles in agricultural journals, etc.

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

At the workshop April 24-25, 2003 at Horsens, Denmark, on "Organic Pig Production" three oral presentations were made. The titles were:

- The supply of protein, vitamins and minerals for sows and finishing pigs
- An *E. coli* infection model to study weaning diarrhoea
- Effects of carbohydrates on establishment of infection with *T suis*

F. Scientific education

By collaboration with the Danish Centre for Experimental Parasitology, KVL and the Danish Veterinary Laboratory a joint Ph.D. student funded by the Research School for Animal Production will use the data generated from tasks 2.3 and 2.4 in WP2 as parts of her Ph.D. thesis. Collaboration with professor Jens Peter Nielsen, KVL about the the challenge model with *E. coli* O 149 to be used in tasks 2.1 and 2.2. is supposed to be implemented as a result of the Ph.D. project – "The influence of feed intake during lactation on piglets susceptibility to post-weaning diarrhoea", which is funded within the framework of the Research School for Animal Production.

G. National and international cooperation

This project has strong links to the recently appointed EU project QLRT 30162 "Sustainability in the production of pork with improved nutritional and eating quality using strategic feeding in out-door production" (SUSPORKQUAL) through the project co-ordinator Dr. Anders Hans Karlsson, Head of Research Unit for Muscle Biology and Meat Quality at the Danish Institute of Agricultural Sciences. Furthermore, the co-ordinator of WP1 in this project (JAF) is also the co-ordinator of WP1 (Sustainable Pig Production) in the EU project. The two projects, although with different goals, will complement each other. The ultimate goal of SUSPORKQUAL is to improve the nutritional value, increase eating quality (tenderness), shell life and technological quality of pork. This will be achieved by combining strategic feeding resulting in compensatory (accelerated) growth in the time up to slaughter, with known feeding strategies (enrichment with E-vitamin, PUFA etc.) that gives rise to improved nutritional value of the out-coming pork.

This project is also linked to the DARCOF II project I.5: "Grain legumes and cereals – new production methods for increased protein supply in organic farming systems", which is co-ordinated

by Erik Steen Jensen, professor at KVL and in which Knud Erik Bach Knudsen is partner. KEBK is further collaborating with the Danish Centre for Experimental Parasitology, KVL (Allan Roepstorff) and the Danish Veterinary Laboratory (Kristian Møller). Ellen-Margrethe Vestergaard is collaborating with professor Jens Peter Nielsen, KVL about the the challenge model with *E. coli* O 149 to be used in tasks 2.1 and 2.2.

The project in question has links to two other DARCOF projects on organic pig production: II.9 ”Resource use, environmental impact and economy in organic pig production systems”, co-ordinated by John E. Hermansen and II.8 ”Management in relation to health and health safety in organic pig production co-ordinated by Jan Tind Sørensen. Both projects are parts of the same DARCOF research programme as this project. The three projects are complementary, but also synergetic, why the collaboration is relevant for the total output.

The project has also links to the project: “Organic production of steers and bioactive forages for grazing livestock”. The links are through the project co-ordinator Stig Milan Thamsborg and one of the tasks of the project “Influence of bioactive forages on animal health with emphasis on parasitic infections and effects on meat and eating quality” in steers and pigs. There are links to the organic project “Effect of organic pig production on meat and eating quality” too, project co-ordinator Henrik J. Andersen.

Furthermore, the project has links to lupine testing project “Lupinforsøg, Undersøgelser vedrørende kød- og spisekvalitet” by Danske Slagterier (Hanne Maribo).

H. Critical reflection on the project

As a whole, the plan for the project is followed and the progress has been satisfactory. Two modification of the experimental design has been implemented.

In task 1.1 the number of treatment groups was reduced from six to five (two levels of lupine at normal dietary protein and three levels of lupine at reduced dietary protein). Given the barn facilities at Rugballegård this modification was necessary to meet the time schedule. This modification has no consequences for task 3.1 concerning evaluation of product quality.

In task 2.4 it was decided to use *B. hyodysenteriae* rather than *B. pilosicoli*. This modification was implemented after thorough investigation and discussions with Danish Veterinary Institute.

Beyond this, there has not been any reasons for changing plans or goals of the project.

8. Budget

A. Account for any change in budgets

Total costs in 2002 were 150 thousand DKK below budget. This amount is transferred to 2003. In addition, 26 thousand DKK is transferred from 2004 to 2003.

B. Budget for the whole project (1.000 DKK)

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

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	16,7	13,2	14,9	4	48,8
Technical personnel	10,1	12,3	9,7		32,1

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	651,6	615,4	662,7	176,0	2105,7
Technical personnel	262,6	348,9	290,4		901,9
Other operational costs	363	471,1	295	30	1159,1
Equipment					
Others (please specify)					
Direct costs	1277,2	1435,4	1248,1	206	4166,7
Indirect costs (20% of direct costs)	255,5	287,1	249,7	41	833,3
Total	1532,7	1722,5	1497,8	247,0	5000,0

Comments:

9. Signatures and stamps

Name	Institute	Date	Signature
Head of project Martin Tang Sørensen	Danish Institute of Agricultural Sciences	September 30, 2003	

Appendix I. Detailed budget

A. Budget for each participating institute (1.000 DKr)

Name of Institute: Danish Institute of Agricultural Science

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	16	12	13,5	4	45,5
Technical personnel	10	10,5	8		28,5

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	615	541	574,5	176	1906,5
Technical personnel	259	284	224		767,0
Other operational costs	357	406	239	30	1032,0
Equipment					
Others (please specify)					
Direct costs	1231,0	1231,0	1037,5	206,0	3705,5
Indirect costs (20% of direct costs)	246,2	246,2	207,6	41,0	741,0
Total	1477,2	1477,2	1245,1	247,0	4446,5

Comments:

Appendix I. Detailed budget

A. Budget for each participating institute (1.000 DKr)

Name of Institute: Danish Meat Research Institute

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	0,7	1,2	1,4		3,3
Technical personnel	0,1	1,8	1,7		3,6

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	36,6	74,4	88,2		199,2
Technical personnel	3,6	64,9	66,4		134,9
Other operational costs	6,0	65,1	56,0		127,1
Equipment					
Others (please specify)					
Direct costs	46,2	204,4	210,6		461,2
Indirect costs (20% of direct costs)	9,3	40,9	42,1		92,3
Total	55,5	245,3	252,7		553,5

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: Danish Institute of Agricultural Science, Department of Animal Nutrition and Physiology

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	11,5	8	10	2,5	32
Technical personnel	7	8	7		22

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	438	328	425	110	1301,0
Technical personnel	182	216	196		594,0
Other operational costs	259,7	366,0	179,5	19,8	825,0
Equipment					
Others (please specify)					
Direct costs	879,7	910,0	800,5	129,8	2720,0
Indirect costs (20% of direct costs)	175,9	182,0	160,1	26,0	544,0
Total	1055,6	1092,0	960,6	155,8	3264,0

Comments: Due to reorganisation at DJF, i.e. closing Dept. of Analytical Chemistry where many chemical analyses previously were bought, some of "Other operational costs" will be converted to "salaries".

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: Danish Institute of Agricultural Science, Department of Animal Health and Welfare

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	2,5	2	2	1,5	8
Technical personnel	2	1			3

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	98	82	85	66	331
Technical personnel	51	27			78
Other operational costs	51	39	36	10	136
Equipment					
Others (please specify)					
Direct costs	200	148	121	76	545
Indirect costs (20% of direct costs)	40,0	29,6	24,2	15,2	109,0
Total	240,0	177,6	145,2	91,2	654,0

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: Danish Institute of Agricultural Science, Department of Animal Product Quality

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	1	1	1,5		3,5
Technical personnel		1,5	1		2,5

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	40	41	64		145
Technical personnel		41	28		69
Other operational costs	45	50	24		119
Equipment					
Others (please specify)					
Direct costs	85	132	116		333
Indirect costs (20% of direct costs)	17,0	26,4	23,2		66,6
Total	102,0	158,4	139,2		399,6

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: Danish Institute of Agricultural Science, Department of Crop Physiology and Soil Science

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months					
Scientific personnel	1	1			2
Technical personnel	1				1

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	40	41			81
Technical personnel	26				26
Other operational costs					
Equipment					
Others (please specify)					
Direct costs	66	41			107
Indirect costs (20% of direct costs)	13,2	8,2			21,4
Total	79,2	49,2			128,4

Comments:

C. Budget for co-financing from each participating institute (1.000 DKK)

Name of Institute:

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months Scientific personnel Technical personnel					

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries Scientific personnel Technical personnel					
Other operational costs					
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)					
Total					

Comments: