



## Annual Status Report 2001 and Application for Continuation in 2002

For research projects financed by grants from  
The Directorate for Food, Fisheries and Agro Business  
under the Danish Ministry of Food, Agriculture and Fisheries

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### 1. Research program

Research in organic farming 2000-2005 (DARCOF II)

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### 2. Project title and number

II.1 Organic dairy production systems

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## 7. Start of project: 1.7 2000 End of project: 31.12.2004

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## 8. Annual report/Application for continuation in 2002

### A. Objectives and expected achievements (from application)

The overall perspective of the project is to increase the biological and economical efficiency in organic animal husbandry. The project aims at developing and assessing biologically and economically efficient organic dairy production systems, which are based on a high degree of feed self-sufficiency, and that implicate - under Danish conditions - a high proportion of clover-grass in the feeding ration.

The objective is, by means of modelling, experiments and farm studies, to investigate the effect of different feeding and reproduction regimes and feed rations to dairy cows based on 100% organic Danish grown feed. The more specific tasks are

- to determine the milk production potential and efficiency and the impact on animal health and well-being of different types of organic feed produced on a fixed size of area
  - to evaluate strategies to minimise excessive energy mobilisation and level of ketoses and reproduction problems
  - to investigate the effect of prolonged calving interval and reduced level of supplementation in dairy cows on the biological efficiency of milk production, milk production and persistency of milk production
  - to investigate mammary tissue proliferation, apoptosis and synthesis capacity, reproduction, health, live weight gain and constitution, and energy balance in dairy cows at different calving interval and level of supplementation
  - to investigate the effect of supplement feeding on grass intake and selection of herbage during grazing, and on grazing effectiveness and N-balance in a leader-follower rotational grazing system for dairy cows with heifers as followers
  - to investigate the influence feed ration used in organic milk production on the milk content of CLA
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- to investigate the genetic ranking of genotypes(individuals) in organic and traditional dairy farming systems
- to evaluate the effect at farm level in terms of overall biological efficiency, nutrient turnover, level of production and production economic
- to investigate the content of vitamins in organic feed to dairy cattle, and evaluate the concentration in milk and blood from animals at different stage of their productive life

## **B. Project summary (from application)**

The Danish organic farmers organisation has the declared goal to increase the amount of organic feed in the feeding of the dairy cows and in the latest version of the EU regulations of organic farming it is stated "that the production of organic milk within the next 5 years has to be based entirely on organically produced feed".

Compared to the present situation on a typical Danish organic dairy farm this will force some changes in feeding and land use. Feeding based entirely on organic feed will force the use of home-grown roughage. Such a changed feeding pattern can have an impact on the production in several ways. It will from a feeding point of view "stress" the cow and possibly influence the production level, milk content and quality as well as animal health and welfare. It will further increase the difference between organic and conventional production conditions and thereby create the need for a breeding program specifically designed for organic dairy cows.

In a situation with feeding based solely on home-grown organic feed, the feed ration and the resulting production will to a larger extent, be a result of the land use. It is therefore important to compare different feed ration based on the crop production from the same area (ha) of land.

Feeding experiment, planned from this concept, will be conducted during periods of four months on two private farms.

Prolonged lactation and reduced feeding level for cows are expected to increase the roughage proportion of the cow's diet, and thereby a higher degree of self-sufficiency in feed, and to increase the efficiency and sustainability in the dairy system. A two times two factorial experiment with prolonged or standard calving interval and standard supplementation or no supplementation to clover-grass grazing/silage will be carried out at the organic research station Rugballegaard.

The objective is, during modelling, experiments and farm studies, to investigate the effect of different lactation length, feeding regimes and feed rations to dairy cows based on 100% organic Danish grown feed. The more specific tasks are

- to determine the milk production potential and efficiency and the impact on animal health and well-being of different types of organic feed produced at an even area
- to evaluate strategies to minimise excessive energy mobilisation and level of ketoses and reproduction problems
- to investigate the effect of prolonged calving interval and reduced level of supplementation in dairy cows on the biological efficiency of milk production and persistency of milk production
- to investigate mammary tissue proliferation, apoptosis and synthesis capacity, reproduction, health, live weight gain and constitution, and energy balance in dairy cows at different calving interval and level of supplementation
- to investigate the effect of supplement feeding on grass intake and selection of herbage during grazing, and on grazing effectiveness and N-balance in a leader-follower rotational grazing system for dairy cows with heifers as followers
- to explore possible indicators for milk quality in relation to human nutrition and health and their relation to feeding
- to investigate the content of vitamins in organic feed, and evaluate the concentration in milk and blood from animals at different stage of their productive life
- to investigate the genetic ranking of genotypes(individuals) in organic and traditional dairy farming systems.

- to evaluate the effect at farm level in terms of overall biological efficiency, nutrient turnover, level of production and production economic

**Table 1: Work package list (from application)**

No.	Work package title	Participants*	Budget (1.000 DKr)	Start	End	Deliverable No:
WP1	Co-ordination	TKR	0.2	2000	2004	
WP2	Milk production based on home-grown feed	TKR	1.5	2000	2002	
WP3	Prolonged calving interval and reduced supplementation for dairy cows	JAS	3.8	2000	2004	
WP4	Subclinical health and reproduction	KLI	1.0	2000	2004	
WP5	Milk quality	KIS	0.4	2000	2003	
WP6	Grass intake and selection in dairy cows on reduced supplementation.	KAS	0.6	2001	2003	
WP7	Genetic improvement of dairy cows	ILM	0.5	2002	2004	
WP8	Farming systems	TKR	0.45	2003	2004	
WP9	Vitamin status	SKJ	0.60	2001	2001	

\* Responsible participants are underlined

## C. Progress

### C.1 Annual description (resume) of main results and conclusions

WP1: The project has initiated an activity with focus on the vitamin supply to organic feed dairy cattle. The activity is included in the project as WP9, with a budget for 2001 at 600.000 dkr. The project has also described an activity for the coming years within this area and applied for support to FØJO II, by an interesstilkendegivelse "Vitaminforsyningen i den økologiske husdyrproduktion".

WP2: Feeding experiments were conducted in the period from December 2000 to April 2001, at two private farms belonging to Erik Andersen and Bent Nielsen. The amount of concentrates (barley and rapeseed or rapeseed cakes), were given in amount corresponding to the expected yield, when grown organic in Denmark. The herd belonging to Erik was spilt into three groups, and three treatments was introduced 1) 5 kg barley, 2) 1 kg rapeseed cake 3) 1,4 kg barley and 1,6 kg rapeseed. All cows had ad lib access to the same silage. In the herd belonging to Bent was only treatment 1 and 3 introduced. Main production results are given in table 2.

**Table 2 Feeding experiment with barley and rape (seed or cake) to cows feed ad lib with silage.**

Farm	Erik Andersen			Bent Nielsen	
	Barley	Rapeseed cake	Barley and rapeseed	Barley	Barley and rapeseed
N	21	21	21	36	36
Milk, kg EKM	24,7	24,3	26,1	25,7	24,9
Fat, g	1047	1013	1085	1055	968
Fat, %	4,24	4,07	3,96	4,09	3,64
Protein, g	776	772	817	854	830
Protein, %	3,14	3,10	2,98	3,31	3,12

The data has to be analysed more into details, both with respect to production response and together with the results given in WP4. The conclusion so far is that rapeseed significantly depressed fat and protein content, but not the amount. The milk production was reduced by feeding rapeseed from an area corresponding to the area needed to grow barley, but the reduction was lower than expected, based on the energy intake and amount of protein (AAT/PBV) and fatty acid in the ration.

WP3: The planned reproduction strategies have been successfully implemented. The feeding strategies and the new grazing system (WP6) have also been implemented, but the feeding ration has not been as uniform as planned due to shortage of clover grass in the summer and clover grass silage during the winter. Actions have been taken in order to avoid variation in the coming year. Based on the limited number of data obtained so far the production responses are within expected limits.

WP4: In the herd at Rugballegaard (WP3) has blood been drawn from app. 60 milking cows every second week from calving until 16 weeks after calving if the interval coincided with the winter feeding (Mid December to Mid April). A milk sample has been stripped from one (healthy) teat concomitantly with the blood sample. Both blood and milk samples were instantly measured for its acetone content using a "head space" analyser. The rest of the samples (blood plasma and milk) were stored on ice until freezing could be practised "home" at the laboratory. The samples have not yet been analysed further for its content of metabolites. Nor has the obtained data been analysed statistically.

Blood has also been drawn from animals in the two private herds (WP2) every second week, alternating between the farms. Samples were taken in the interval from calving to 12 weeks into the lactation period, i.e. app. Mid December to Mid April. Milk samples were stripped from one (healthy) teat concomitantly with the blood sample. Both blood and milk samples were instantly measured for its acetone content using a "head space" analyser. The rest of the samples (blood plasma and milk) were stored on ice until freezing could be practised "home" at the laboratory. Milk and blood plasma samples have been analysed for its content of metabolites.

Planned feeding differences between groups caused significant differences in blood – and milk urea levels in the animals, presumably ascribable to the feeding strategy's effect on the protein balance levels in the rumen (PBV). Further, partly feeding the cows with rape seeds (vs. barley) clearly increased the blood level of triglycerides, -in this instance an on average 40 %'s increase. A slightly higher level of FFA (free fatty acids) in the blood of heifers compared to older cows in certain intervals of lactation may indicate a reduced capacity for feed intake in this group.

Based on this (still rather limited) material it's concluded, that the observed animals, considered as a group, is situated within the "expected" range of the observed metabolites, i.e. not obviously tilted towards imbalance during the present circumstances.

WP5: In late April, just before turn of on pasture was milk samples from 14-16 cows in 8 herds collected together with WP9. The samples have to be analysed for content of CLA and other fatty acids in order to investigate the variation between organic herds.

Variation during the year is investigated at samples collected individually from all cows (n=60) in the herd at Rugballegård (WP3) and from the cows (n=110) in the private herd belong to Erik Andersen (WP2). The sampling will continue every month until late summer 2002. Based on these samples it will be possible to analyse the content of fatty acids in milk in relation to proportion of pasture, silage and concentrates in the feed, general effect of season and effect of stage in lactation and parity.

The effect of more extreme feeding on the content of CLA is investigated based on the feeding experiment in WP2. Milk samples from all cows was collected once during the feeding experiment. The samples will be analysed for CLA and other fatty acids.

### *Results*

The samples are at present not analysed. Analyses and interpretation of the results will be done in corporation with a project founded by the dairy industry.

WP 6. A leader-follower rotational grazing system was introduced at Rugballegård in the start of the grazing season, and has been adjusted during the grazing season. The dairy cows at the two levels of supplement grazed separately in paddocks with relatively 90 percent area to the cows at high supple-

ment compared to the cows at low level. The group of leaders was at approximately 55 lactating cows and in the group of followers were xx heifers, average weight 333 kg. Routines have been developed for changes of paddocks, irrigation and topping. Grass intake at group level has been determined by the difference in herbage mass before and after grazing, and intake at individual level has been determined by n-alkane in both heifers and cows. The results are not completely analysed as this is done during the coming month will the concept for the leader-follower system for year 2002 be described in detail.

WP9. Samples of blood and milk from cattle as well as feed from 8 organic farms, was collected in April 2001 just before the grazing season. The samples has been frozen (roughage was freeze dried) and subsequent analysed for vitamin A, E and carotenoids. The samples were collected just before the grazing season because it was expected that vitamin content in the roughage would be at a minimum level at that time. Fourteen to sixteen cows and 6-8 of the youngest calves were selected from each farm. The cows were separated in first lactation cows and older cows, due to the fact that off-flavour from the milk and health problem, which are vitamin related, most often occur in young cows.

Six of the eight farms used supplemental vitamins, thus the levels measured in most cows is a result of the dietary vitamins provided by the feed and the dietary vitamins provided by the supplemental vitamin mixture.

The sampling was performed in a satisfactory way. All farms had more than 100 cows so it was easy to select the cows, all were of the Holstein-Friesian race. The selection criteria was:

- First lactation cows 1-3 month post partum,
- older cows in mid lactation,
- the 6-8 youngest calves

Besides a sample of each feed ingredient was taken (5-8 samples/farm).

At present all samples has been analysed for their content of vitamin A, E and carotenoids, and the introduction of a method for determination of vitamin D is in progress. A comprehensive survey through the litterature has also been performed in order to make sure that the most satisfactory method was chosen.

In connection to our vitamin research, a visiting Ph.D student from University of Barcelona has established a method which make it possible to distinguish between natural and synthetic vitamin E. The benefit of ths method in relation to quality assesments of organic produced products should not be neglected.

The analysed blood samples showed on average a satisfactory vitamin A and E level, however, around 10% of the investigated cows showed a relative low vitamin E level ( $< 3 \mu\text{g } \alpha\text{-tocopherol/ ml plasma}$ ), and the majority of these cows were from the two farms which did not use supplemental vitamins.

All investigated calves were low in both vitamin A and E (retinol:  $< 0.12$ ;  $\alpha\text{-tocopherol: } < 1.5 \mu\text{g/ml plasma}$ ), however, at present we do not have reliable reference values, so it is not possible to elucidate the importance of this finding.

All milk samples has been analysed, but they need to be standardized for variations in fat content, due to the sampling procedure, before comparisons between farms can be made.

The concentration of vitamin E and carotenoids in the roughage has not been evaluated yet, but the content of vitamin E in the freeze dried roughage showed variations from about 20 – 80 mg vitamin E per kg freeze dried material with an estimated average around 35 mg/kg. With respect to  $\beta\text{-caroten}$  the variation was from 0-40 mg/kg freeze dried material with an estimated average around 15 mg/kg.

## Conclusions

Thus, the level of both vitamin E and carotenes in the analysed roughage were lower than expected based on the values found in the literature. Likewise, especially the vitamin E content in cows fed without supplemental vitamins was in the lower range of the recommended level, though without showing severe deficiencies.

## C.2 Fulfilment of tasks and deadlines in individual work packages

(To be completed for each work package)

**Table 1.**

WP number and title	Time schedule according to application	Deviations, if any*
<b>WP1: Co-ordination</b>		
<i>Task</i>		
Project coordination ect.	July 2000 – Dec. 2004	
<i>Milestones</i>		
M1 Project meeting	Sept. 2000, May and Sept. 2001, 2002, 2003, and 2004	
M2 Annual report	Dec. 2000, 2001, 2002, 2003, and 2004	
<i>Deliverables</i>		
D1.1;D1.2: National meeting organic advisors	Oct. 2002 and Oct. 2004	
D1.3: Two general meetings each year		
D1.4: Annual status reports and a final report		
<b>WP2: Milkproduction</b>		
<i>Task</i>		
1 Experiments with type of concentrates and roughage	July 2000 – Nov. 2001	
2 Experiments with feeding strategy	May 2001 – Sept. 2002	
<i>Milestones</i>		
m1 Design of experiments for 2000/2001	July 2000 – August 2000	
m2 Contract with farms	August 2000 and May-June 2001	
m3 Study tour	September 2000	1)
m4 Design of experiments for 2001/2002	April 2001 – May 2001	
<i>Deliverables</i>		
D2.1: Thesis	Dec. 2001	1)
D2.2;D2.4: International papers	Dec. 2001 and Dec. 2002	1)
D1.1: National meeting and proceeding	Oct. 2002	2)
<b>WP3: Prolonged lactation</b>		
<i>Task</i>		
1 Design and planing	July-Sept. 2000 and April-May 2001	
2 Experiment, registration etc.	July 2000 – June 2004	
3 Evaluation of mamary biopsy etc.	Oct. 2002 – May 2004	
<i>Milestones</i>		
m1 Final plan for feeding and reproduction strategies	August 2000	
m2 Final plan for sampling of blood and biopsy etc.	July 2002	
m3 Evaluation of strategies and preliminary results	August 2001, 2002, 2003, and May 2004	
m4 Report	September 2004	
<i>Deliverables</i>		
D3.1;D3.2: International papers	Dec. 2004	
D3.3: National report	Oct. 2004	
D1.2: National meeting and proceeding	Oct. 2004	

<b>WP4: Health</b>		
<i>Task</i>		
1 Blood/milk and data sampling (Exp. 1-3 with type of concentrates/roughage and feeding strategies)	Nov. 2000 – March 2001 and Nov. 2001 – March 2002	
2 Blood/milk and data sampling (Experiment 1 with 100% roughage, Rugballegaard)	Nov. 2000 – May 2001, Nov. 2001 – May 2002, Nov. 2002 – May 2003, and Nov. 2003 – May 2004	
3 Laboratory analysis	Nov. 2000 – June 2001, Nov. 2001 – June 2002, Nov. 2002 – June 2003, and Nov. 2003 – June 2004	
<i>Milestones</i>		
m1 Sampling and laboratory analysis of samples finished for experiments 1 and 2	July – Sept. 2001	
m2 Sampling and laboratory analysis of samples finished for experiments 3	July – Sept. 2002	
m3 Sampling and laboratory analysis of samples finished for experiments 4	June – August 2004	
m4 Evaluation of different feeding strategies on cow health and reproduction	Oct. – Nov. 2001, Oct. – Nov. 2002, and August – December 2004	
<i>Deliverables</i>		
D4.1: M.Sc. thesis	Sept. 2001	
D4.2;D4.3: International paper	Oct. 2002 and Oct. 2004	
D1.1;D1.2: National meeting and proceeding	Oct. 2002 and Oct. 2004	
<b>WP5: Milk quality</b>		
<i>Task</i>		
1 Milk and data sampling (Exp with type of concentrates/roughage and feeding strategies)	Dec. 2000 – March 2001 and Dec. 2001 – March 2002	
2 Milk and data sampling (Exp with 100% roughage, Rugballegaard)	Dec. 2001 – March 2002	
3 Milk and data sampling (On-farm research)	May, July, Sept., Nov. 2001 and Jan., March, May 2002	
<i>Milestones</i>		
m1 Start collection of samples	Dec. 2000, May and Dec. 2001	
m2 Start of lab-analysis	May – June 2001 and May – June 2002	
m3 Evaluation of results and preparation of reports	Aug. – Sept. 2001 and Nov. – Dec. 2002	
<i>Deliverables</i>		
D5.1: International publication	May 2003	
D5.2: National report	Oct. 2003	
D1.1: National meeting and proceeding	Oct. 2002	

<b>WP6: Grass intake</b>		
<i>Task</i>		
1 Development of system	Jan. – Sept. 2001	
2 Data sampling	May – Oct. 2002 and May – Oct. 2003	
<i>Milestones</i>		
m1 Conclusions on the grazing method	April 2001	
m2 Evaluation of preliminary results	Dec. 2001 and Dec. 2002	
m3 Final report and publication	Dec. 2003	
<i>Deliverables</i>		
D6.1: International paper	April 2004	
D1.2: National meeting and proceeding	Oct. 2004	
D3.3: National report	Oct. 2004	
<b>WP7: Genetic improvement</b>		
<i>Task</i>		
1 Extraction and editing of data	July 2002 – April 2003	
2 Development of models and test on production data	Jan. – June 2003	
3 Application of models to non-production traits	Feb. 2003 – Oct. 2004	
<i>Milestones</i>		
m1 Establishment of data sets	Aug. – Sept. 2002 and March – April 2003	
m2 Models developed	March – April 2003	
m3 Models fitted on production data	March – April 2003	
m4 Models fitted on non-production data	Sept. – Oct. 2004	
<i>Deliverables</i>		
D7.1: National report	Oct. 2004	
D7.2: International paper	Oct. 2004	
D1.2: National meeting and proceeding	Oct. 2004	
<b>WP8: Farming systems</b>		
<i>Task</i>		
1 Biological efficiency	Jan. 2003 – May 2004	
2 Resource use and environmental impact	Jan. 2003 – May 2004	
3 Prototype of farmlevel	Aug. 2003 – Dec. 2004	
<i>Milestones</i>		
m1 Workshop	April 2003	
m2 Prototype of farmlevel	January 2003	
m3 Evaluation and final report	December 2004	
<i>Deliverables</i>		
D8.1: National report	Nov. 2004	
D1.2: National meeting and proceeding	Oct. 2004	
<b>WP9: Vitamin</b>		
<i>Task</i>		
1 Contact with farmers and sampling	April 2001	
<i>Milestones</i>		
m1 Sampling of feed, blood and milk completed	April 2001	
m2 Analysis for Vitamin A, E and D completed	Sept 2001	
m3 Evaluation and final report	December 2001	
<i>Deliverables</i>		
D9.1: National report	Nov. 2001	
D1.2: National meeting and proceeding	Oct. 2001	2)

Specific comments in relation to notes in the table

ad 1)

The study tour planned by Lisbeth Mogensen in WP2 had to be cancelled, due to long-term illness in connection with her pregnancy. The tour will be conducted later in the project period. The papers will be prepared in the coming year, by Lisbeth after she has return from "barselsorlov".

ad 2)

Results from the experiment in WP2 and WP9 were presented at a meeting for advisors and farmers arranged by DJF and FØJO. Material from the meeting is available at [www.fojo.dk](http://www.fojo.dk).

### **C.3 Discussion on the progress, incl. deviations and achievements in the project as a whole and in the individual work packages**

The experiments described in WP 2 and WP3, which is the base for most of the work in the project, has been planned and started in agreement with the initial plans.

WP 6 has been enlarged by grass intake measured by n-alkane in both heifers and cows. This has been possible as the project co-operated with two master student from KVL.

WP7 and WP8 has not started yet, in accordance with the timetable specified in the application.

### **D. Description of plans and future work in the project as a whole and in the work package (Including plans for publication and communication)**

WP1: Based on the present project an application for research funding has been submitted to NKJ together with partners in Sweden and Norway. The title of the applied project is "Økologisk mælkeproduktion i Norden - tilpasning under hensyn til bæredygtighed, husdyrsundhed og mælke kvalitet". The aim is to establishing a synergistic internordic cooperation on the development of organic milk production. The priorities of NKJ are expected in november 2001. The project will in cooperation with The Department of Animal Product Quality, DIAS, try to establish a masterproject on technological milk quality, as this is an important aspect, which has not been funded so far.

WP2: Feeding experiments is to be planned at one or two farms in the winter period 2001/02. Based on the results from the work in 2000/01 will the treatment focus either on the effect of protein and fatty acids in the ration on productivity or on strategies for level of supplementation during first part of lactation. The potential private farms have already changed to 100 percent organic feeding, which from the overall idea with this project is positive, but it gives some restriction on the possibility to make stringent treatments. By contact to the farmers and their advisors the plans will be made during the coming month.

WP3: It is planned to continue and maintain the feeding and reproduction strategies. The project is now coming to a fase where a significant number of cows will be at the prolonged lactation strategy. Especially the reproduction will be closely followed to keep up to the planned strategy. Actions have been taken to overcome the shortage of feed for the coming winther, cause by failure of establishing new clovergrass fields. A strategy have been made to increase the available area for grazing and cutting silage in the future. From October 2002 Rugballegaard have obtained a contract on milk delivery, which demands a 100 % organic feeding ration. As this is a general trend in danish organic dairy production, a pressure is expected on the feed market, and this might cause some restrictions on the supply to this project of especially concentrated and protein rich feeds. Rugballegaard has agreed to try and grow rape seeds to try to ensure the supply of heat treated rape seed cakes. Based on experiences from 2001, the new grazing system will be implemented in cooperation with WP6 during 2002. A master student (Sarah T. Meilbak) is working on determing feed intake during the grazing period by the alkane method, and a bachelor student (Hans Christian Christiansen) is doing a litterature review on prolonged lactation.

WP4: Its the intention in the year to come to follow the same herd of animals, in the same lactation stage and season of the year, while still subjected the schedules of WP2 and WP3. A strengthening of the metabolite profiles, analysing for specific liver enzymes in the blood, may be considered, as (fractions of) the present material indicated that it might be a reasonable expansion of the study.

WP 5: Collection of milk samples on cow level to account for variation related to season will be continued. Milk samples from a larger number of private farms (Studielandbrug) will be collected and used to illustrate the herd specific variation in CLA. Further will milk samples be collected from the feeding experiment planned and conducted in WP2. Major work will be given to analysing milk samples and publication in 2002.

WP 6. During the grazing season 2002 and 2003 the influence of supplement feeding on herbage intake, selection and grazing behaviour will be determined. Registration of herbage during grazing - herbage mass, botanical composition and frequency measurements of different heights - will be the basis for these determinations. Further the N-balance for the two levels of supplements during the grazing season will be calculated.

WP 7. Organic dairy farms participating in the official milk recording in Denmark will be identified. Based on characteristic such as size and locality, a matching traditional herd will be selected. Milk production data from these organic and matching herds will be extracted from the national milk recording database. This work will be initiated in the third quarter of 2002. For herds participating in the health recording, health data will also be extracted from the national database. Data validation and development of editing rules will be carried out in the fourth quarter of 2002.

#### *Plan for publication*

The plans for publication are not, at the present stage of the project, more specific than given under deliverables in table 1. In the coming year will more detail plans be made.

From WP9 there will be a national report (Forsknings Rapport, Husdyr, DJF), with a literature review and result from the organic farms.

## **E. Project publications**

### **1. Articles in international, scientific journals with review procedures**

Søgaard, K.; Sehested, J.; Danielsen, V. (2000): Mixed grazing with heifers and pregnant sows. *Grassland Science in Europe*, 5:359-361.

### **2. Presentations at congresses, symposiums etc.**

Jensen, S.K. 2001. Vitaminforsyningen hos økologiske kvæg. Bilag til Temadag om Økologisk Mælkeproduktion, 3. oktober, Forskningscenter Foulum, s. 35-37.

Mogensen, L.; Kristensen, T. 2001. Økologisk mælkeproduktion. Resultater fra forsøg med selvforsyning med økologisk foder. Bilag til Temadag om Økologisk Mælkeproduktion, 3. oktober, Forskningscenter Foulum, s. 9-12.

Sehested, J.; Kristensen, T. (2001): Økologisk mælkeproduktion - reduceret foderniveau og strategisk anvendelse af tilskudsfoder. Bilag til Temadag om Økologisk Mælkeproduktion, 3. oktober, Forskningscenter Foulum, s. 13-16.

Sehested, J.; Roepstorff, A.; Monrad, J.; Søgaard, K. Danielsen, V. (2000): Performance and parasitosis in heifers grazing together with sows. Oral presentation and Handout Book at the 51st Annual Meeting of the European Association for Animal Production, session M5.

### **3. Articles in agricultural journals etc.**

Kristensen, T. 2001. Koen som dynamo. Ændret produktionsstrategi for økologisk mælkeproduktion. *Økologisk Jordbrug*, nr 246, side 14.

Kristensen, T.; Sehested, J. (2001): Mange køer æder nu kun økologisk foder. *Landsbladet Kvæg*, nr 6, 31. maj, s. 34.

Sehested, J. (2000): Høj tilvækst med kvier og søer i samme fold. *Økologisk Jordbrug* nr. 216, 20. årgang, s. 14.

Sehested, J.; Kristensen, T. (2000): Køer og svin i samme sædskifte. Økologisk Jordbrug nr. 217, 20. årgang, s. 13.

Sehested, J.; Kristensen, T.; Søgaard, K.; Nielsen, J.H. (2000): Køerne klarer sig med mindre kraftfoder. Økologisk Jordbrug nr. 217, 20. årgang, s. 13

#### **4. Other presentations at meetings, field days etc.**

The project has been presented 7. august at a field day on Rugballegaard

### **F. Scientific education (ph.d. and post doc.), including visiting scientists and visits abroad**

The activities in WP2 and WP4 has been the back bone of a master project by Susanne Seested, expected to be submitted in November this year to the Royal Veterinary and Agricultural University, Copenhagen.

The activities and ideas behind WP2 and WP6 has been a major part of master projects by Per Meinerth and Sarah Meilbak, and bachelor project by Hans Christian Christiansen

Sinclair Mayne from Agricultural Research Institute of Northern Ireland has visited DJF and participated in a roundtable meeting with discussion about grazing and grazing systems.

### **G. National and international co-operation**

The project has participated in an application to NKJ, together with researchers from Norway and Sweden. The project is closely co-ordinated with this project and one of the main ideas has been to set up registration in Norway and Sweden that can be analysed together with the data from our Danish project. The status of the application is not known at present.

There is contact to Jean-Lois Peraud, INRA-Rennes, France about the activities in WP6.

Hanne H. Hansen, KVL has been closely involved in the activities about use of n-alkanes to estimate feedintake (WP3).

A project "Protein feeds to milk and meat production" (2002-2004) founded by the Danish farmers union, will be closely co-ordinated with this project.

The project (WP9) has made contact to Elisabet Nadeau from SLU in Skara, Sweden and it has been agreed that we shall analyse around 150 roughage samples for them in 2002 for their content of vitamin E and carotenoids. These samples show variations with respect to botanical composition, harvest time, harvest conditions and storage.