



## 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  
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.6 Poultry Production Systems- Health and Welfare

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## 6. Project period (month, year)

Start of project: December 2000

End of project: November 2004

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

### A. Project summary

The organic table egg production in Denmark has over the past 5-6 years increased from nought to 12% of the marked egg, while the table chicken production is at its beginning.

Farmer's that want to produce organic table eggs is faced with several problems.

1. In free-range flocks, including organic systems, it has often been observed that the flock has started to perform feather pecking that ended with an unacceptable high rate of cannibalism.
2. Mortality due to infectious diseases might be high in organic production systems as the free range does not allow a biosecurity program that is known in e.g. the cage system and lack of knowledge on management and good farm practice in this new farm system is obvious

Basic research on organic table egg production was performed in the previous research program under DARCOF, which resulted in the Darcof report No. 11 from 2001. In this report a number of advises on how to rear the chickens are given, some thought on infectious diseases and some experiences from nutrition experiment is given as well. Comparison of a non-commercial breed with the ISA Brown was performed under short term condition in experimental condition showing large differences in production level in favour of the commercial breeds, but also they showed an unacceptable high cannibalistic performance that resulted in a mortality rate of 15% within 7 month. (The wording Breed is used in this report, but often it will be a cross of 2-4 lines/breeds why breeds or breed combination is sometimes seen in the literature)

The breeding stock used for table egg production have, through many generations, been selected for high performance based on their production capacity measured in individual cages. Little attention has been paid to their genetically based ability to behave well in large flocks of hens. The result of such a breeding policy is a high yielding hen, but she appears to have lost some of her ability to have suitable social relations when kept in large flocks.

The breed combination currently used in organic table egg production systems in Denmark is the ISA Brown, which is laying eggs with brown shells, has a high laying capacity and is available on the market as day old as well as pullets ready to lay. The drawback in using this breed for organic table egg production is the increasing evidence of feather pecking in larger flocks. Thus the question is: are there breeds available that are more suitable for organic production?

The Random Sample Test (RST) is the system used to compare the various breeding materials. The benefits of the RST is that the egg producers get the comparison of available breeds and could make their choice among these. Most RST-stations were supported by public funds, and managed by research institutes. As poultry breeding became more and more commercialised this arrangement was given up and the RST stations, have been closed one by another. This has followed the other major trend in world wide poultry breeding that the numbers of breeding companies have decreased and those left has becoming world wide which means that they show little interest for supplying breeding material specifically adapted to a comparatively small market for organic table production in Northern Europe. Recently at the 11<sup>th</sup> Poultry Conference in Bremen September 2002 some of the 4 transnational breeding companies admitted that they was starting to including the free range aspect into their breeding programme.

A small scale Danish Hatchery "Hellevad" has bred a New Hampshire line ever since 1960 under floor condition and with a mild selection pressure on laying traits. The Hellevad Hatchery also

breed the female White Leghorn line from the former “Skalborg” breeding centre, which was known to perform well in floor systems. In Uppsala in Sweden the “Blommahønen” is under test for laying, and in the Czech Republic the breeding company Dominant have strains of poultry which may be suitable for organic table egg production as they until recently were bred under floor condition.

Among the behaviour traits giving rise to particular welfare problems for the hen in organic production systems are feather pecking and cannibalism. We found and reported that the heritability for tendency to feather pecking, observed in 20-30 min. on each bird in standardised condition, had a size which was promising for use in a breeding programme.

Diseases constitute an enormous problem in organic farming systems. According to the annual report from The Danish Poultry Council (Anonymous, 1999) 4.8 and 9.4% died in a production period of 1 year in traditional battery cage or deep litter production systems respectively. However, in free-range organic production systems the mortality rate has been 14.9 % and has even been reported to be as high 50% in individual flocks. To date there has been no systematic studies on the reasons for this high mortality. Reports have indicated that a range of diseases are present in these systems, i.e., *Pasteurella multocida*, egg drop syndrome (Adenovirus), *E. coli* and *Histomonas meleagridis* (black head). Furthermore, due to the outdoor conditions and the large flock size (up to 5.000 animals) parasitic diseases are very common (Permin et al. 1999). Several studies have shown that all animals are parasitized at a stage in their life and that specially *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria obsignata* and *Eimeria* spp. are common infections. Recent studies have shown that the interaction between for instance *Ascaridia galli* and *Pasteurella multocida* create *Pasteurella* carrier animals enhancing the zoonotic aspects of *Pasteurella*. *Ascaridia* eggs might also be able to transfer Salmonella to healthy animals (Chadfield et al. 1999). Many of these infections & aspects are not seen in conventional indoor systems due to the high level of management and biosecurity.

Under current Danish rules, breeds used in the organic table chicken production has to be slow-growing and the growth period must be at least 81 days. One of the major problems in organic broiler production is the high incidence of breast blisters, which in a recent Danish survey was 7% on average, with some farms having a 17% incidence. Breast blisters can become puss filled and painful to the touch, and the condition is worsened by contact with ammonia rich litter. In addition to these obvious welfare consequences, breast blisters also result in a quality downgrading of the carcass at the slaughterhouse. Perches are obligatory in organic broiler houses, but little is known about the relationships between breast blisters, perch availability and the use of perches and outdoor areas by broilers. Breed differences in the prevalence of breast blisters has also not been investigated. In order to ensure high welfare standards in organic broiler production it is also important to choose breeds which are robust and behaviourally suitable.

In this project major focus is on the laying hen in commercial, organic flocks.

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

No	Work package title	Participants*	Budget (1.000 DKK)	Start	End	Deliverable no(s):
1	Breed performances and welfare at farm level	<u>JBK</u> , PS, GS	1270	2001	2005	D1-D4
2	Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry	<u>APE</u> , NME, JPC	1590	2001	2004	D5-D13
3	Genetics of feather pecking, and breed performance at experimental level	<u>PSO</u> , JBK, GS	1020	2000	2003	D14-D15
4	Breed performances and welfare of table chickens	<u>BLN</u>	660	2001	2002	D16-D17
5	Farmer compensation, experimental farms and consultancy.	<u>PSO</u>	850	2000	2004	
6	Co-ordination and management of the project	<u>PSO</u>	240	2000	2005	

- Responsible participants are underlined

In Work Package (**WP**) **1** three herds will be chosen in which two different breeds will be placed on each farm in a way that all parameters of interest can be followed for each breed separately. Among the parameters recorded or examined is production in terms of egg yield/quality and feed efficiency. Mortality/morbidity by post mortem examination, clinically evaluation and test for residuals of disease agents. Behaviour traits like feather pecking, use of the outdoor range and nesting and finally the management and the physical condition of the instalment will be evaluated. In **WP 2** the above mentioned three farms and an additional number of farms (4-8) that is considered as representative for the about 100 Danish organic egg producers. Further in **WP 3** the breeding for reduced feather pecking will be continued and expanded to investigate the correlated changes to other trait, in this WP we will under experimental condition compare a number of different genetic stock that might be of interest but not has been tested in practical farming. In **WP 4** investigation will be carried out to look at different breed and their ability to perform under the rules for organic production of table chickens, in particular focus will be on perches their forms and the chickens use of them and also the consequences for development of breast blister.

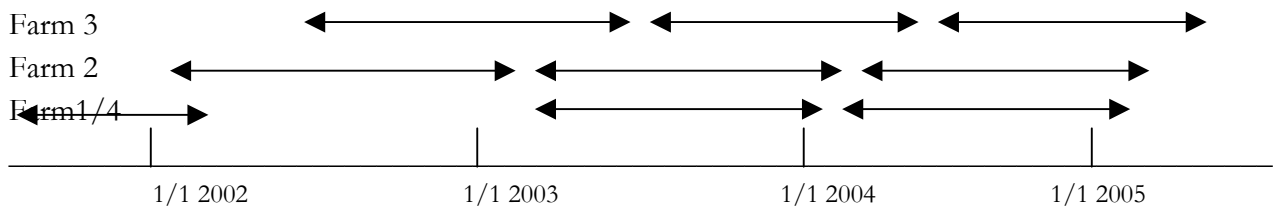
## Description of work

### Workpackage 1

This work package will consist of a field study where a number of alternative breeds of laying hens will be compared to ISA Brown in organic production systems. On each of three farms installations will be place to ensure separate recordings of egg yield, feed intake and diseases/mortality and behaviour is possible. Each year in two or three years one flock of alternative birds as well as one flock of ISA will be established. Flock sizes of the alternative hens will be at least 500 hens. A representative sample of hens in each flock will be individually marked for the study of behaviour on an individual level.

- **Task 1.** The mangement system of the farm will be described and environmental conditions will be recorded. Production parameters will be recorded on flock basis for a laying period of 12 month: egg mass, egg quality, feed conversion..
- **Task 2.** Feather pecking behaviour, insidence of cannibalism, condition of integument is evaluated according to the methods rutinely used by JBK
- **Task 3.** Morbidity and mortality (in coorporation with WP2)
- **Task 4.** General behavioural function (aggression, range behaviour, nesting)
- **Task 5.** Final evaluation and reporting.

Revised Time scedule (2002) for having 3 batches of comparisons on each of three farms:



### Workpackage 2

The project is planned as a PhD-study, with an expected duration of 3 years. The project will include several phases as described below:

1) *Cross-sectional studies in selected poultry flocks* (1 year):

- **Task 6.** At a particular time during the production period animals will be collected and examined for the presence of viral, bacterial and parasitic diseases.

2) *Observational studies (cohort studies) in selected flocks* (1-2 years):

Based on the cross-sectional studies longitudinal studies will be carried out in selected flocks from time of hatching to slaughter (72 weeks).

- **Task 7.** Post mortems will be carried out on all dead animals
- **Task 8.** Causes of diseases (including zoonotic diseases) will be determined
- **Task 9.** The serological profile for selected diseases in selected flocks will be determined at beginning (and end) of the production period
- **Task 10.** Registration of the management system including elements of importance for the hygienic level and relate that to biosecurity
- **Task 11.** At pre-set times, i.e., 5, 30 and 72 weeks after start of production, clinical examinations of a representative number of animals in the selected flocks will be carried out
- **Task 12.** Describe the prevalence and importance of zoonotic diseases in organic poultry

3) *Experimental studies* (1-2 years):

- **Task 13.** In experimental studies the interaction between selected diseases will be studied in relation to genotype, disease manifestation, carrier status and behaviour

*All studies will be carried out in the same farms as described by WP1 and WP3 but additional flock might be needed in order to satisfy statistically background for estimating the prevalence and incidence*

### **Workpackage 3**

This work package will focus on recording feather pecking behaviour and production parameters, as well as range behaviour and nesting behaviour, in experimental lines already selected divergently for feather pecking. The commercial breeding companies in Europe will be asked to suggest a suitable breed for organic egg production. they will be compared with a couple of non-commercial breed at the experimental "eco cottage" system at Foulum.

- **Task 14.** The 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> generations of the experimental lines will be produced in each of the years 2001 to 2003 according to the protocol used in the former project, which briefly is : evaluation of feather pecking tendency during 20 min. of each hen grouped with 30-40 other. Calculation of breeding values by means of an Animal Model (Sorensen and Kennedy, 1986) and using the DMU programme (Jensen and Madsen, 1993) selecting 30 females and 10 males for each of the lines which are reproduced as parent for the next generation. The corresponding control line is reproduced by random mating.
- **Task 15.** The 5<sup>th</sup> generation of parents will be used to produce about 450 experimental hens for test of individual production parameters in individual cages in order to estimate their breeding values for egg yielding trait. Full sisters of these will in another project (see section D for further explanation) be tested in a free range system.
- **Task 16.** Full sisters to these raised under Task 15 will be placed at a commercial farmer and the birds will be individually recorded for the trait related to feather pecking behaviour, laying pattern, their use of the outdoor facilities and on a flock basis their production potential. - Each of the European breeding companies offering breeding material for layers is asked to suggest a breed they consider as suitable for organic egg production. These breeds will be bought as hatching eggs and hatched together with a couple of non-commercial breeds and later on reared and kept for a full production period at the "Eco" cottage" at Research Centre Foulum. Each breed will be housed as 4 replicates each with 40 hens. The birds will be individually recorded for the trait related to feather pecking behaviour, laying pattern, their use of the outdoor facilities and on a flock basis their production potential. The health will be followed by the program outlined in WP2.
- **Task 17.** On the base of these recordings we will be able to estimate the success in reducing feather pecking behaviour in laying hens and we will also estimate the correlated respons to other trait of importance as other behaviour trait like cannibalism and egg laying trait.

**Work package 4**

Two different table chicken strains will be chosen based on the available information.

- **Task 18.** Sixteen groups of 65 broilers will be housed indoors for 6 weeks, after which 52 birds from each group will be moved to outdoor housing facilities. Comparisons will be made between the two strains in 8 of the groups, and between three different perch availability's (0, 7.5 and 15 cm per bird) within one of the strains in 12 groups. Four of the groups thus partake in both comparisons.
- **Task 19.** In both trials, perch use is recorded using video equipment, the use of outdoor areas is recorded by behavioral observations using a time sampling technique, and data on breast blisters, foot pad lesions, dermatitis and production parameters will be obtained at slaughter.
- **Task 20.** We expect the experiment to yield sufficient information to advice producers as well as legislators on the relative suitability of these strains for organic table chicken production under Danish conditions.
- **Task 21.** We expect to obtain knowledge that can contribute significantly to the alleviation of breast blisters in organic table chicken production.

**B. Objectives and expected achievements**

The objectives of the proposal is to obtain knowledge needed to improve the welfare of organic reared poultry and give the producer at better and less variable income. That will be carried out through investigating the problems related to management, production, health and their interactions using different breeds of laying hens and table chickens held in organic free-range system.

In particular:

- To create knowledge about the suitability of the existing breeding materials regarding table egg production under organic principles on farm level.
- To conclude investigations about the genetic mechanisms in laying hens, having influence on feather pecking and cannibalism, to an extent that commercial breeding companies can use this in their breeding programmes.
- To identify elements in the management and environments which will improve the welfare of the birds
- To investigate the incidence (occurrence) of diseases in organic table egg production systems and to relate disease prevalence and management system
- To investigate the interaction between diseases
- To develop strategies to improve disease prophylaxis in organic poultry production
- To examine the relationship between availability and use of perches in table chickens of different breeds and the time budget of the birds and the incidence of breast blisters as parameters for welfare.

## C. Midterm results and progress

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

In WP1 the major effort has been to get into contact with and select three farmers that is willing to divide his facilities into two parts in order to keep two different strains of hens and record laying and feed intake separately. The situation in the moment is as follow:

FARM 1 Situated in Vendsyssel. Contract established and ISA Brown and LSL were hatched in March and they were transferred to Farm1 primo september 2001 in a number of 6300 for each of the strains. Data collection started, but also it became clear that the ISA brown in particular were infected with *Pasteurella* in spite of vaccination. After a couple of month and a high mortality it was decided 1) to continue a close follow up on the health problems. 2) No further behaviour studies would be taken. 3) Production parameters will be withdrawn from the data base at The Danish Poultry Council and they will be used with care. Later the owner of the Farm1 has decided to stop with this flock already after 9 months, and we have agreed with him that no further research is done on this farm.

FARM 2 is situated in Vest Jylland. Agreement was obtained on placing the breeds Hellevad and ISA Brown, each in a number of 3.000. They were hatched medio oktober 2001 and reared at Bredahl Fjerkræ and transferred to Farm 2 at the age of 16 weeks and the hen started to lay in februar 2002. Agreement on the next flock is obtained and will consist on Isa Brown and Lohmann Tradition the rearing will start medio oktober 2002 at Bredahl Fjerkræ.

FARM 3 is situated at the west coast of Vendsyssel. Agreement on Isa Brown and Hyline in a number of 3.000 for each breed was obtained and they started rearing at Bredahl Fjerkræ primo March 2002 and were transferred to Farm 3 in June 2002.

On both farm 2 and 3 less investment has been done in order to make sure that feed intake could be recorded for each of the two breeds. The production has run without problems so far and both of them seems to be willing to continue with 2<sup>nd</sup> and 3<sup>rd</sup> flock.

Protocols for the behavioural and clinical recordings has been developed and recordings are done according to the plans.

As substitute for Farm 1 we have made an agreement with a farmer in Mid-Jutland. That is termed Farm4 and the rearing of chicks for this farm will start at January 2003, and constitute of Isa brown and Lohmann Silver

WP2. Work was started on task 13, interactions of diseases. At the moment data are being analysed from a study of interaction between *Ascaridia galli* and *Salmonella* in chickens and a paper is in the process of being written. Post mortem examinations of dead birds from Farm 1 were started in the middle of October 2001. Due to the high mortality caused by outbreaks of *Pasteurella multocida* and *Erysipelothrix rhusiopathiae*, PM has been done on more than 700 birds from the farm and at the moment further investigations are being carried out on the isolates of above mentioned agents. All the remaining chickens on the farm were slaughtered in July 2002. Two publications are being prepared from this study.

Post mortem examinations were also started on chickens on farm 2 in February 2002 and on those on Farm 3 in June 2002. The remaining farms in the cohort studies are in the process of being selected.

WP3. In generation 4, feather pecking behaviour of selection lines as well as the control line was recorded in October, 2000. Recordings were made in three line groups at first. However, unexpected effects of mixing selection lines and control line during recording of feather pecking were found. Therefore we had to replicate the recordings in March, 2001, this time in two line groups as well as in single line groups. On the total dataset it was possible to estimate effects of social group dynamics, and preliminary results were presented at the 11<sup>th</sup> European Poultry Conference in Bremen 2002. In short, the inclusion of the control line reduced the level of feather pecking in the selection lines, probably due to social dominance. Clinical examinations revealed a higher body weight of the control line compared to both selection lines. Selection lines did not differ from each other with respect to body weight, but the level of feather pecking was significantly higher in the high-line, medium in the control and lowest in the low-line, as expected. Comprehensive studies of feather pecking has been performed in October, 2001, on the 5<sup>th</sup> selected generation in groups holding the two selected lines. Based on this information 30 females and 12 males will be selected per line as parents for the 6<sup>th</sup> generation.

Task 15: Parents of generation 5 have produced chickens for task 15 and data on individual egg production and feed efficiency have been collected during spring, 2002. Data analysis will be performed in the coming months.

Task 16: Parents of generation 5 of selection lines as well as control line have produced 1500 chickens for task 16. A contract with a commercial farmer has been made. A complete rearing unit with 48 pens has been built. Chickens were placed in the unit in July 2002. Recordings of feather pecking, general activity and individual egg laying pattern will be done, starting in November 2002. As there is no access to outdoor area in the commercial unit, hens will be placed in the 'eco-cottages' for recording of range behaviour. This will be done in July-August, 2003, fulfilling the goals of task 16 in relation to the selected lines. With regard to the commercial breeds day-old chickens were placed in the 'eco-cottages' in July 2002. Eggs from 6 breeds were incubated, but due to low fertility/hatchability there was a shortage of chickens of one breed (Bovans Gold), resulting in only 5 breeds are being tested.

WP4 Two simultaneous experiments were carried out from 9<sup>th</sup> of April to 2<sup>nd</sup> of July 2002. In the first experiment two strains were compared: i657, which is the strain conventionally used for organic table chicken production in Denmark, and Labresse, which is a dual-purpose strain of French origin. Both strains were kept according to the rules for organic table chicken production in Denmark (e.g. they had access to perches from day-old and roughage available from 3 days of age, outdoor access from 6 weeks of age and were slaughtered at 84 days of age). In the second experiment, only i657 birds were used. They were kept in 12 groups of 50, and had access to either 0, 7.5 or 15 cm of perch space per bird throughout the rearing period. In both trials, perch use was recorded using video equipment, the use of outdoor areas was recorded by behavioural observations using a time sampling technique, and data on breast blisters, foot pad lesions, dermatitis and production parameters were obtained at slaughter. The data is currently being analysed.

## C.2 Fulfilment of deliverables and milestones

<b>WP 1: Breed performance and welfare at farm level</b>	Time schedule according to application	Deviations, if any*
<b>Deliverables</b>		
D 1. Production performances, egg quality and health of four breed	Running	
D 2. Feather pecking behaviour and integument of four breeds	Running	
D 3. Individual range behaviour of four laying breeds	Running	
D 4. Final report of WP1		June 2005
<b>Milestones</b>		
Completed arrangements with contracting farms, (See item D)	August 2000	Aug 2001
Completed first egg production period on farms,	August 2001	Feb 2003
Completed second egg production period on farms,	October 2002	Feb 2004
Completed third egg production period on farms,	December 2003	Jun 2005
Completed data analysis,	August 2004	Jun 2005

<b>WP2: Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry</b>	Time schedule according to application	Deviations, if any*
<b>Deliverables</b>		
<b>D 5.</b> Cross-sectional studies on causes on mortality in free-range chickens in Denmark	2002	
<b>D 6.</b> Longitudinal studies on the significance on diseases in free-range chickens in Denmark	2003	2004
<b>D 7.</b> Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on sensitivity to selected diseases in free-range chickens in Denmark.	2003	2004
<b>D 8.</b> Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on the persistence of selected diseases in free-range chickens in Denmark.	2003	2004
<b>D 9.</b> Investigations on haematological changes associated with dual infections with <i>Dermanyssus gallinae</i> and <i>Pasteurella multocida</i> /E.coli.	2004	
<b>D 10.</b> Investigations on the significance of <i>Capillaria</i> spp. On production parameters and the persistence of selected disease agents in free-range poultry	2004	
<b>D 11.</b> Assessment of immune status of multiple disease infected poultry	2004	
<b>D 12.</b> Investigations on complement killing activity of in-bred lines of chickens used for free-range poultry production	2004	
<b>D 13.</b> Final report	2004	

<b>WP3: Genetics of feather pecking</b>	Time schedule according to application	Deviations, if any*
<b>Deliverables</b>		
<b>D 14.</b> Genetic parameters of traits related to feather pecking (realised heritabilities, etc.)	2004	
<b>D 15.</b> Phenotypic and genetic correlation between feather pecking and egg production, egg quality, feed conversion, body weight etc	2004	
<b>Milestones</b>		
Completed recording of feather pecking behaviour in generation 4	October 2000	April 2001
Completed selection and reproduction of gen. 4 and start of rearing of generation 5	January 2001	June 2001
Completed recording of feather pecking behaviour in generation 5	October 2001	March 2002
Completed selection and reproduction of gen. 5 and start of rearing of generation 6	January 2002	Oct 2002
Completed recording of feather pecking behaviour in generation 6	October 2003	Aug 2003
Completed recording of test birds in cages and "Eco" cottage of generation 6	October 2003	March 2004
Completed calculation of genetic parameters	March 2004	Aug 2004
Completed report and papers,	Nov 2004	

<b>WP4: Breed performance and welfare of table chickens</b>	Time schedule according to application	Deviations, if any*
<b>Deliverables</b>		
<b>D 16.</b> Data analyses	2002	
<b>D 17.</b> Final report and internationally reviewed article	2002	2003
<b>Milestones</b>		
Choose and hatch 2 table chicken breeds, experimental planning.	2002	
Experimental period and data collection	2002	

#### **D. Description of deviations and subsequent adjustments of plans**

WP1 Farm1 drop out as host. We have negotiated with a new host and this Farm4 will hardly finish the second period until Feb. 2005 and Farm 3 is further more delayed such that the 3<sup>rd</sup> batch is expected to end in June 2005. (See page 6 for a revised time schedule of WP1). Although the last part of a batch is giving a minor workload it is considered necessary to have some economic resources spared for 2005, that is why 168.000 are carried over from the years 2002-2003 within WP1. This change is clarified in the new Budget.

WP2 Due to the quantity of data generated as a result of high mortality on Farm 1 caused by

outbreaks of *Pasteurella multocida* and *Erysipelothrix rhusiopathiae*, further laboratory work will be undertaken and two publications are expected from the study.

The time schedule in WP3 has been delayed by 6 months since October 2000. See section C for details.

## E. Project publications and other products

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

Kjaer, J.B. & Sørensen, P., 2002. Feather pecking and cannibalism in free-range laying hens as affected by genotype, dietary level of methionine + cystine, light intensity during rearing and age at first access to the range area. *Appl. Anim. Behav. Sci.* 76, 21-39.\*\*

Kjaer, J.B., Sørensen, P. & Su, G., 2001. Divergent selection on feather pecking behaviour in laying hens (*Gallus gallus domesticus*). *Appl. Anim. Beh. Sci.* 71, 229-239.\*\*

Permin, A., Christensen, J.P., Bisgaard, M. (2002). Consequences of concurrent *Ascaridia galli* and *Escherichia coli* infections in chickens. *Avian Pathology* (accepted).\*

Dahl, C., Permin, A., Christensen, J.P., Bisgaard, M., Muhairwa, A.P., Petersen, K.M.D., Poulsen, J.S.D., Jensen, A.L. (2002). The effect of concurrent infections with *Pasteurella multocida* and *Ascaridia galli* infections in domestic chickens. *Veterinary Microbiology*.\*\*

Schou, T.W., Permin, A., Roepstorff, A., Kjær, J., Sørensen, P. (2002). *Ascaridia galli* infections in 4 different layer lines. *British Poultry Science*. \*\*

### 2. Papers presented at congresses, symposiums, etc.

Kjaer, J.B. (2002). Recording of feather pecking and selection against feather pecking. *Archiv für Geflügelkunde*, special issue september, 11th European Poultry Congress, afsbtracts, 6-10 September, 2002, Bremen. Ed. European Federation Worlds Poultry Science Association, 31 (invited paper).

Hegelund, L., Kjaer, J.B., Kristensen, I.S. and Soerensen, J.T. (2002). Use of the outdoor area by hens in commercial organic egg production systems. Effects of climatic factors and cover. *Archiv für Geflügelkunde*, special issue september, 11th European Poultry Congress, afsbtracts, 6-10 September, 2002, Bremen. Ed. European Federation Worlds Poultry Science Association, 141 (poster).

Sørensen, P., 2001. Breeding strategies in poultry for genetic adaptation to the organic environment. *Proc. Fourth NAHWOA Workshop on Breeding and feeding for animal health and welfare in organic livestock systems*, 24-27. March, Wageningen, Holland, 51-62.  
\*

Sørensen, P., 2001. Status og perspektiver for forskning og udvikling af økologisk ægproduktion. FØJO-rapport nr 11, 7-12.\*

### 3. Reports, articles in agricultural journals, etc.

Sørensen, P. 2001. Den faglige baggrund: Økohøns kræver eget avlsarbejde *Landsbladet* 17. august 2001

Sørensen, P. 2001 Avl for høns der er tilpasset en økologisk ægproduktion *Dansk Erhvervsfjerkræ* 9:303-305

Nielsen, B. L. (2000). Svært at finde den bedste slagtekylling. *Økologisk Jordbrug*, 25 aug. 2000. p16.\*

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

Permin, A. Sygdomsproblemer i den økologiske konsumægproduktion med vægt på parasitære sygdomme. Oplæg ved Nordisk Konsulent -og Veterinærmøde. Skeikampen 18-20 november 2001

## F. Scientific education

Nicoline Maag Eigaard who is currently working as a research assistant is expected to register as a PhD student in the near future since her the process has already been initiated. The study period is expected to take 3 years. The Royal Veterinary and Agricultural University has agreed to finance one year of the PhD study.

Nicoline is currently undertaking 2 modules in Immunology and Poultry diseases as part of the Ph.D. study. These courses will end in Jan year 2003.

## G. National and international cooperation

**The interacting context with other projects** on organic poultry production in Denmark was the topic of a 24 h workshop held in November 2001. In total it had 15 participants of which 8 came from DIAS, 3 from KVL, 3 from the Advisory Service organisations in Denmark and one from Danish Animal Welfare Society. Three of them had started a Phd study within the area of organic poultry production and 12 of the participants was involved in one of the following projects:

The present project (5)

Three non-darcof projects

- Improvement of Nutrition and Health in Organic Egg Production (1)
- Development of new poultry production systems (3)
- The outdoor areas for poultry (3)

At the workshop plan and ideas of each of the project were presented and discussed. It was considered as a succes both in information each other on the various project and trying to

find links between them but also a learning process for those that had little knowledge on general poultry production and special issues on organic production systems.

**Research cooperation** is established with one of the above mentioned project (Improvement of Nutrition and Health...) in relation to Task 16, as half of the replicates is supported with roughage. Influence of using roughage on health and intestine environments is investigated and also a possible interaction with genotypes will be investigated.

The Project leader (PS) is **member of the Steering group** for the above mentioned project (The Outdoor areas for poultry) and had participated in meetings and one workshop so far.

In relation to the welfare in organic egg production in Denmark, the Ministry of Food, Agriculture and Fisheries, called experts to participate in **a working group to formulate a revised set of control measures, including animal welfare indicators**. These new control measures are to be included in the official control of organic egg production. Furthermore, we have held a 2-day training course on Foulum, including practical lessons on two commercial farms. All official controllants of licensed organic egg production units (approx. 12 persons) have participated. **Two persons from the project participated (A. Permin and J.B Kjær)**. The new control scheme has now been tested on most (>80%) of all commercial organic organic egg production farms in Denmark. Results from test are being analysed now, also under participation of project participants.

**A EU-proposal entitled "A breeding programme for: Healthy and well-adapted laying hens in organic and free-range systems - for a rural and animal friendly egg production in Europe"** was worked out during 2000 in a cowork with scientist from Germany, Austria, Switzerland, Denmark and Netherland, with a German co-ordinator and PS as the danish participant. The proposal failed to pass the evaluation of the EEC.

An **Expression of interest for FP6** has been forwarded to EU entitled **Organic Farm Animal Breeding** is under evaluation at the moment. PS is the contact person for DIAS and has participated in a meeting in Netherland primo September 2002 to formulate the strategy for such a network.

**Nordic Gene Bank Animal** has established a working group with the purpose to describe existing breeding stock of hens within the Baltic Sea that is suitable for free range egg production, organic egg production is considered to belong to this group. PS is chairman of the group and they will have a report at the end of 2002.

## H. Critical reflection on the project

In the negotiation with the farmers on choice of breeds there has been some limitation in obtaining optimal solutions, as the farmers denied to take unknown breed unless they got a higher amount of guarantee, than the project was able to give. At the time of writing the application we were aware of this situation, but at the same time we were working with formulation of the EU proposal (see item G), that also would include similarly comparisons at farm level of various breeds in a number of countries. As these proposal failed to pass the EU-evaluation, the restriction in which breeds we were able to compare at farm level became more serious.

As a reaction to this we had the chance to use Research Center Foulum's Facilities in the "Eco Cottage" fully to test of the more rare breeds that is offered from breeding companies in Europe together with the Danish Hellevad and a Dual purpose breed. This has been made possible as another project has taken over to test the bird's mentioned as full sisters of generation 5 in Task 16.

## 8. Budget

### A. Account for any change in budgets

See Section D for explanation of the transfer of 168.000 from 2002 and 2003 to 2005. The total budget remind unchanged.

### 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 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months	24.5	35.5	27.5	11.0	2.0	100.5
Scientific personnel	18.5	25.0	20.5	11.0	2.0	76.0
Technical personnel	6.0	10.5	8.0	0		24.5

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries	823	1005	760	323	81	2992
Scientific personnel	660	754	560	323	81	2378
Technical personnel	163	251	200			614
Other operational costs	205	289	290	73	18	875
Equipment						
Others (please specify) 1)	185	200	400	53	50	888
*) 2)	33	33	33			99
Direct costs	1246	1527	1483	449	149	4854
Indirect costs (20% of direct costs)	207	260	210	80	19	776
Total **)	1453	1787	1693	529	168	5630

#### Comments:

\*) For item 1) is expenses for rebuilding Farm1 to Farm3 to the research condition and some compensation to the farmers for extra work, and expenses for running the eco-cottage at Fou-lum during 2002 and 2003. For item 2) is given the expenses to the experts to create contact to 8-10 practical farmers.

\*\*)

Due to the postponing of start of the "Eco cottage" with 3 month in 2002 100.000 kr is moved from 2002 to 2003.

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**9. Signatures and stamps**

Name	Institute	Date	Signature
Head of project			

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## Appendix I. Detailed budget

### A. Budget for each participating institute (1.000 DKr)

Name of Institute: Danmarks JordbrugsForskning

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months	<b>17.5</b>	<b>21.5</b>	<b>13.5</b>	<b>4.0</b>	<b>2.0</b>	<b>58.5</b>
Scientific personnel	<b>14.5</b>	<b>13.0</b>	<b>7.5</b>	<b>4.0</b>	<b>2.0</b>	<b>41.0</b>
Technical personnel	<b>3.0</b>	<b>8.5</b>	<b>6.0</b>	<b>0.0</b>		<b>17.5</b>

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries	<b>635</b>	<b>680</b>	<b>430</b>	<b>140</b>	<b>81</b>	<b>1.966</b>
Scientific personnel	<b>560</b>	<b>479</b>	<b>280</b>	<b>140</b>	<b>81</b>	<b>1.540</b>
Technical personnel	<b>75</b>	<b>201</b>	<b>150</b>			<b>426</b>
Other operational costs	<b>170</b>	<b>168</b>	<b>182</b>	<b>38</b>	<b>18</b>	<b>566</b>
Equipment						
Others (please specify)	<b>185</b> <b>33</b>	<b>200</b> <b>33</b>	<b>400</b> <b>33</b>	<b>53</b>	<b>50</b>	<b>888</b> <b>99</b>
Direct costs	<b>1023</b>	<b>1081</b>	<b>1045</b>	<b>231</b>	<b>149</b>	<b>3.529</b>
Indirect costs (20% of direct costs)	<b>162</b>	<b>171</b>	<b>122</b>	<b>37</b>	<b>19</b>	<b>511</b>
Total	<b>1185</b>	<b>1252</b>	<b>1167</b>	<b>268</b>	<b>168</b>	<b>4.040</b>

**Comments:**

**A. Budget for each participating institute (1.000 DKr)**

Name of Institute: Den Kgl Veterinær og Landbohøjskole

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months	<b>7.0</b>	<b>14</b>	<b>14</b>	<b>7</b>		<b>42</b>
Scientific personnel	<b>4.0</b>	<b>12</b>	<b>12</b>	<b>7</b>		<b>35</b>
Technical personnel	<b>3.0</b>	<b>2</b>	<b>2</b>			<b>7</b>

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries	<b>188</b>	<b>325</b>	<b>330</b>	<b>183</b>		<b>1.026</b>
Scientific personnel	<b>100</b>	<b>275</b>	<b>280</b>	<b>183</b>		<b>838</b>
Technical personnel	<b>88</b>	<b>50</b>	<b>50</b>			<b>188</b>
Other operational costs	<b>35</b>	<b>121</b>	<b>108</b>	<b>35</b>		<b>299</b>
Equipment						
Others (please specify)						
Direct costs	<b>223</b>	<b>446</b>	<b>438</b>	<b>218</b>		<b>1.325</b>
Indirect costs (20% of direct costs)	<b>45</b>	<b>89</b>	<b>88</b>	<b>43</b>		<b>265</b>
Total	<b>268</b>	<b>535</b>	<b>526</b>	<b>261</b>		<b>1.590</b>

**Comments:**

**B. Budget for each participating department (1.000 DKK)**Name of Institute and department: **DJF og Afd for Husdyravl og Genetik**

Workpackage 1+3+5+6

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months	<b>6.0</b>	<b>3,5</b>	<b>2,5</b>	<b>1,0</b>	<b>1.0</b>	<b>14,0</b>
Scientific personnel	<b>6.0</b>	<b>3,5</b>	<b>2,5</b>	<b>1,0</b>	<b>1.0</b>	<b>14,0</b>
Technical personnel						

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries	<b>240</b>	<b>141</b>	<b>100</b>	<b>32</b>	<b>41</b>	<b>554</b>
Scientific personnel	<b>240</b>	<b>141</b>	<b>100</b>	<b>32</b>	<b>41</b>	<b>554</b>
Technical personnel						
Other operational costs	<b>40</b>	<b>30</b>	<b>35</b>	<b>8</b>	<b>8</b>	<b>121</b>
Equipment						
Others (please specify)	<b>185 33</b>	<b>200 33</b>	<b>400 33</b>	<b>53</b>	<b>50</b>	<b>888 99</b>
Direct costs	<b>498</b>	<b>404</b>	<b>568</b>	<b>93</b>	<b>99</b>	<b>1.662</b>
Indirect costs (20% of direct costs)	<b>57</b>	<b>35</b>	<b>27</b>	<b>9</b>	<b>9</b>	<b>137</b>
Total	<b>555</b>	<b>439</b>	<b>595</b>	<b>102</b>	<b>108</b>	<b>1.799</b>

**Comments:**

Name of Institute and department: **DJF, Afd for Husdyrsundhed og Velfærd**

Workpackage 1 + 3

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months	<b>8.0</b>	<b>8.5</b>	<b>11.0</b>	<b>3.0</b>	<b>1.0</b>	<b>31.5</b>
Scientific personnel	<b>5.0</b>	<b>4.0</b>	<b>5.0</b>	<b>3.0</b>	<b>1.0</b>	<b>18.0</b>
Technical personnel	<b>3.0</b>	<b>4.5</b>	<b>6.0</b>			<b>13.5</b>

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries	<b>255</b>	<b>257</b>	<b>330</b>	<b>108</b>	<b>40</b>	<b>990</b>
Scientific personnel	<b>180</b>	<b>144</b>	<b>180</b>	<b>108</b>	<b>40</b>	<b>652</b>
Technical personnel	<b>75</b>	<b>113</b>	<b>150</b>			<b>338</b>
Other operational costs	<b>70</b>	<b>70</b>	<b>147</b>	<b>30</b>	<b>10</b>	<b>327</b>
Equipment						
Others (please specify)						
Direct costs	<b>325</b>	<b>327</b>	<b>477</b>	<b>138</b>	<b>50</b>	<b>1.317</b>
Indirect costs (20% of direct costs)	<b>65</b>	<b>66</b>	<b>95</b>	<b>28</b>	<b>10</b>	<b>264</b>
Total	<b>390</b>	<b>393</b>	<b>571</b>	<b>166</b>	<b>60</b>	<b>1.581</b>

**Comments:**

Name of Institute and department: **DJF og Afd. for Husdyrsundhed og Velfærd**  
 Work package 4: Slagtekyllinger

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Man-months	<b>3,5</b>	<b>9.5</b>				<b>13.0</b>
Scientific personnel	<b>3,5</b>	<b>5.5</b>				<b>9.0</b>
Technical personnel		<b>4.0</b>				<b>4.0</b>

Year:	Consumption before 2002	Expected consumption 2002	2003	2004	2005	Total
Salaries	<b>140</b>	<b>282</b>				<b>422</b>
Scientific personnel	<b>140</b>	<b>194</b>				<b>334</b>
Technical personnel		<b>88</b>				<b>88</b>
Other operational costs	<b>60</b>	<b>68</b>				<b>128</b>
Equipment						
Others (please specify)						
Direct costs	<b>200</b>	<b>350</b>				<b>550</b>
Indirect costs (20% of direct costs)	<b>40</b>	<b>70</b>				<b>110</b>
Total	<b>240</b>	<b>420</b>				<b>660</b>

**Comments:**