



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

1. Research program

Research in organic farming 2000-2005 (DARCOF II)

2. Project title and number

II.6 Poultry Production Systems- Health and Welfare

3. Head of project

Poul Sørensen Dr. Agro., Souschef
Afd for Husdyravl og Genetik
Danmarks JordbrugsForskning
Postboks 50
8830 Tjele
Tlf: 89 99 13 03
Fax: 89 99 13 00
E-mail: Poul.Sorensen@agrsci.dk

4. Participating institutes

Danmarks JordbrugsForskning
Postboks 50
8830 Tjele
I. Afd. for Husdyravl og Genetik
Tlf: 89 99 19 19
Fax: 89 99 13 00
II. Afd for Husdyrsundhed og Velfærd
Tlf: 89 99 19 19
Fax: 89 99 15 00

Den kgl. Veterinær og Landbohøjskole
Institut for Veterinær Mikrobiologi
Stigbøljen 7
1870 Frederiksberg C
Tlf: 35 28 27 06
Fax: 35 28 27 57

5. Contact persons

Danmarks JordbrugsForskning. Samme som projektleder

Den kgl Veterinær- og Landbohøjskole
Centerleder Anders Permin
Fjerkrænetværket
Dyrlægevej 2
1870 Frederiksberg C
Tlf.: 35 28 37 63
Fax: 35 28 37 62
E-mail: APE@kvl.dk

6. Other project staff

Seniorforsker Birte Lindstrøm Nielsen. Afd. for Husdyrsundhed og Velfærd, Danmarks JordbrugsForskning, Postboks 50, 8830 Tjele.

Tlf. 89 99 13 73, fax: 89 99 15 00, e-mail Birte.Nielsen@agrsci.dk

Forsker Jørgen B. Kjær, Afd for Husdyrsundhed og Velfærd, Danmarks JordbrugsForskning, Postboks 50, 8830 Tjele

Tlf. 89 99 13 24, fax 89 99 15 00, e-mail J.Kjaer@agrsci.dk

Forsker Guosheng Su, Afd for Husdyravl og Genetik, Danmarks JordbrugsForskning, Postboks 50, 8830 Tjele

Tlf. 89 99 12 67, fax 89 99 13 00, e-mail Guosheng.Su@agrsci.dk

Forskningsassistent Nicoline Maag Eigaard, Institut for Veterinær Mikrobiologi, Den Kgl. Veterinær- og Landbohøjskole, Dyrlægevej 2, 1870 Frederiksberg C. (Ansæt pr 1. nov. 2001), e-mail NME@kvl.dk

Lektor Jens Peter Christensen, Institut for Veterinær Mikrobiologi, Den Kgl. Veterinær- og Landbohøjskole, Stigbøjlen 7, 1870 Frederiksberg C. e-mail JPC@kvl.dk

-
7. **Start of project: 2000**
End of project: 2004

8. Annual report/Application for continuation in 2001

A. Objectives and expected achievements (from application)

The objectives of the proposal is to improve the welfare of the bird and giving the farmer 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 production 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.

B. Project summary (from application)

The organic table egg production in Denmark has over the past 3-4 years increased from nought to 12 % while the table chicken production is at its beginning. The farmer that want to produce eggs is faced with the problem that the breeding stock available is genetically adapted to the conventional production, for laying hens in particular to cages. Basic research was done in the previous research program giving some results regarding rearing of the chickens and also to comparison of a non-commercial breed with the ISA Brown being the most common used hybrids for production of brown shelled eggs and furthermore direct breeding and selection to improve a breeding stock in respect to reducing their tendency to feather pecking was commenced.

In this proposal focus is on the laying hen in practical flocks. In Work Package (WP) 1 and 2 a number of herds will be chosen in which two different breeds will be placed 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 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 range and nesting and finally the management and the physical condition of the instalment will be evaluated. Further (WP 3) the breeding for reduced feather pecking will be continued and expanded to investigate the correlated changes to other trait. 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.

It is expected to obtain an improvement of the welfare of the bird and giving the farmer at better and less variable income. In particular to create a knowledge about suitability of existing breeding stock to the organic production forms, to give the genetic solution to control of the feather pecking/cannibalism syndrome, to determine the prevalence and incidence of disease and investigate interaction with other parameters in order to decrease or control these diseases and finally to get a better understanding of how to grow table chickens in organic farming.

Table 1: Work package list (from application)

No.	Work package title	Participants*	Budget (1.000 DKr)	Start	End	Deliverable No:
1	Breed performances and welfare at farm level	<u>JBK</u>	1270	2001	2004	D1-D4
2	Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry	<u>APE</u>	1590	2001	2003	D5-D13
3	Genetics of feather pecking	<u>PSO</u>	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	2003	
6	Co-ordination and management of the project	<u>PSO</u>	240	2000	2004	

* Responsible participants are underlined

C. Progress

C.1 Annual description (resume) 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 in a number of 6300 for each of the strains. Data collection has started.

FARM2 Situated in Vest Jylland. Agreement is obtained on placing the strains Hellevad and ISA Brown, each in a number of 3.000. The will be hatched medio oktober 2001 and the hen will be ready to start laying in februar 2002.

FARM 3 Situated in Thy. Negotiation on the lines Hyline and Isa Brown. She will start her next flock of 6 week old hens in april-may 2002 and she has room for 4.500 of each strain.

WP2 Work was started on task 13 on interactions of diseases. Post mortem examination of dead birds was started in the middle of October from Farm 1. Remaining farms are in the process of being selected.

WP3 Comprehensive studies of feather pecking was performed on 4th selected generation of the two lines. Based on this information 30 females and 12 males were selected as parent per line for next generation. They were produced as dayold chickens during July - August.

WP4 Contact has been made to a French breeding company with a view to import eggs for hatching in April 2002. The strains currently discussed are i657 (JA57 x i66) and S757N (JA57 x S77N). The outdoor areas at the rearing facilities has been equipped with 16 sandboxes for dust bathing and 32 supported roofs for providing shade.

WP5 Installed a balances for weighing of feed at Farm 1. Agreed with Farm 2 on some reorganisation of the weighing of feed.

WP6 Organising a workshop including researchers in all organic projects started up within the last year.

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

(To be completed for each work package)

WP 1: Breed performance and welfare at farm level	Time schedule according to application	Deviations, if any*
Task 1. Production parameters will be recorded on flock basis for a laying period of 12 month: egg mass, egg quality, feed conversion. The mangement system of the farm is described.	Running	
Task 2. Feather pecking behaviour, insidence of cannibalism, condition of integument is evaluated according to the methods rutinely used by JBK	Running	
Task 3. Morbidity and mortality (in cooperation with WP2)	Running	
Task 4. General behavioural function (aggression, range behaviour, nesting)	Running	
Task 5. Final evaluation and reporting		
Deliverables		
D 1. Production performances, egg quality and health of four hybrid		
D 2. Feather pecking behaviour and integument of four hybrids		
D 3. Individual range behaviour of four laying hybrids		
D 4. Final report of WP1		
Milestones		
Completed arrangements with contracting farms,	August 2000	Aug 2001
Completed first egg production period on farms,	August 2001	Sep 2002
Completed second egg production period on farms,	October 2002	Okt 2003
Completed third egg production period on farms,	December 2003	Dec 2004
Completed data analysis,	August 2004	Dec 2004

WP2: Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry	Time schedule according to application	Deviations, if any*
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.	Running	
Task 7. Post mortems will be carried out on all dead animal	Running	
Task 8. Causes of diseases (including zoonotic diseases) will be determined	Running	
Task 9. The serological profile for selected diseases in selected flocks will be determined at beginning (and end) of the production period	Running	
Task 10. Registration of parameters related to biosecurity	Running	
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	Running	
Task 12. Describe the prevalence and importance of zoonotic diseases in organic poultry	Running	

Task 13. In experimental studies the interaction between selected diseases will be studied in relation to genotype, disease manifestation, carrier status and behaviour	Running	
Deliverables		
D 5. Cross-sectional studies on causes on mortality in free-range chickens in Denmark	2002	
D 6. Longitudinal studies on the significance on diseases in free-range chickens in Denmark	2003	2004
D 7. Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on sensitivity to selected diseases in free-range chickens in Denmark.	2003	2004
D 8. Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on the persistence of selected diseases in free-range chickens in Denmark.	2003	2004
D 9. Investigations on haematological changes associated with dual infections with <i>Dermanyssus gallinae</i> and <i>Pasteurella multocida/E.coli</i> .	2004	
D 10. Investigations on the significance of <i>Capillaria</i> spp. On production parameters and the persistence of selected disease agents in free-range poultry	2004	
D 11. Assessment of immune status of multiple disease infected poultry	2004	
D 12. Investigations on complement killing activity of in-bred lines of chickens used for free-range poultry production	2004	
D 13. Final report	2004	

WP3: Genetics of feather pecking		
Task 14. The 4 th , 5 th and 6 th generations of the experimental lines will be produced in each of the years 2001 to 2003. Which briefly is : evaluation of feather pecking tendency during 20 min. of each hen grouped with 30-40 other. Calculation of breeding values selecting 30 females and 10 males for each of the lines. The corresponding control line is reproduced by random mating.	Running	
Task 15. The 5 th 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.	Jan 2002	Oct 2002
Task 16. Full sisters to these will be placed in the experimental farm named "Eco" cottage (See annex) 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. Contemporary the four hybrids used in WP1 will be placed and will be examined for the same traits/characteristics. The health will be followed by the program outlined in WP2.	Jan 2002	Oct 2002
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 responses to other trait of importance as		

Deliverables		
D 14. Genetic parameters of traits related to feather pecking (realised heritabilities, etc.)	2004	
D 15. Phenotypic and genetic correlation between feather pecking and egg production, egg quality, feed conversion, body weight etc	2004	
Milestones		
Completed recording of feather pecking behaviour in generation 4, october 2000		April 2001
Completed selection, reproduction 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, reproduction 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, november 2004		Nov 2004

WP4: Breed performance and welfare of table chickens		
Task 18. Twenty four groups of 100 broilers will be housed indoors for 6 weeks, after which 50 birds from each group will be moved to the experimental "ECO" cottage. Half of the groups will be given access to perches during all of the 12 week growth period.	Experimental planning started 2001 Practical experiment taken place in 2002	
Task 19. Automatic registration of perch use will be carried out using load cells, observations on the use of outdoor areas and general assessment of activity and measures of production. Incidence of breast blisters and quality of carcass	Experimental planning started 2001 Practical experiment taken place in 2002	
Task 20. We expect the experiment to yield sufficient information to advice producers as well as legislators on choice of table chicken breed for organic production under Danish conditions.		
Task 21. We expect to obtain knowledge which will contribute to alleviation of the breast blisters.		
Deliverables		
D 16. Data analyses	2002	
D 17. Final report and internationally reviewed article	2002	

Milestones		
Choose, import and hatch 3-4 table chicken breeds.	2002	
Experimental period and data collection	2002	

WP5: Farmer compensation, experimental farm and consultancy		
By support from the advisory centre in Skejby (Niels Finn Johansen) there will be chosen three organic farms in which it will be possible to divide the facilities into two units regarding: observation of birds, counting of eggs, recording of feed intake, blood sampling and post mortem examination. Each of these farms will be used for three consecutive flock. In the budget it is calculated with 30,000 kr for fencing pr herd and a maximum of 50 kr per hen in compensating or a maximum of 25.000 per flock.		
Milestones		
Agreement on the three farms before 1. January 2001		Oct 2001

WP6:Co-ordination and management of the projekt		
Run the project by inspiring and encouraging the participant. Having meeting regularly to discuss the progress obtained in the project and to co-ordinate the total project.		
Deliverables		
Annual Status reporting		

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

The project was approved to start its work on December 22, 2000, while the project plan in the application was worked out with the intention of starting April 2000. This postponing has had each effect on WP1, WP2 and WP4 with 6 to 12 months as it could be seen on the schemes in section C. 2. Regarding work in WP1 and WP2 the major effort so far in 2001 has been to create contacts to 10 organic farm with laying hens.

The major part of the work in WP1 was to get into contact with 3 farmers being willing to divide his farms into two parts and having two different strains of hens. Out of 100 organic egg producers in Denmark there are not many having facilities that is suitable without a lot of investments and at the same time the necessary interest to participate in a work like this. After half a year of search we have agreement with three farmers at the following level:

FARM 1 Situated in Vendsyssel. Contract established and Isa Brown and LSL were hatched in March and were transferred to Farm1 primo September in a number of 6300 for each of the strains. The hens is kept in 4 different houses and run-outs, but the feed and eggs are recorded daily from 2 houses together. In order to get that in work an investments in balances for weighing of feeds etc. was done for about 30.000 Kr. In this farm we are able to get eggs and feed recorded by strain, while we can score, record and measure all health and behaviour data with to replicates per strain. Data collection has started by the end of September.

FARM2 Situated in Vest Jylland. Agreement is obtained on placing the strains Hellevad and ISA Brown, each in a number of 3.000. The will be hatched medio October 2001 and the hen will be ready to start lying in February 2002. Some rebuilding of the feeding supply was necessary in order to get that information for each strain; the investment is budgeted to be 25.000 Kr

FARM 3 Situated in Thy. Negotiation on the strain Hyline and Isa Brown is ongoing. They will start the next flock of 16-week-old hens in April-may 2002 and there is room for 4.500 of each strain.

For WP2 negotiations is ongoing to get further 7 organic farms as observation farms regarding health. A position as Researcher was positioned at start of October after which the practical part of the work as e.g. task 7 (post mortem examination) has started. All animals will be examined according to indications, i.e. if a bacterial or viral infection is present the animals will be examined accordingly. As for parasitic infections all animals will be examined for these as earlier studies have shown that all animals are infected with at least one parasite species. Experimental infections are being planned. So far one study has been undertaken looking at the interaction between *Ascaridia galli* and *Salmonella enteritidis*. Unfortunately, this study was terminated due a missing infection with *Salmonella*. *For unknown reasons this infection did not establish itself in the animals. A new study is being planned to commence late this year.

For **WP3** comprehensive studies of feather pecking was performed on 4th selected generation of the two lines and the control line. As generations has passed the feather pecking in the low line has become low, studies were initiated to enlighten the gateway out of these. Breeding values were estimated for all potential birds (in total 452) by means of an Animal model taken into account all birds recorded back to generation 1. Based on this information 30 females and 12 males were selected as parent per line for generation 5. And they were reproduced chickens during juli – august and 557 females and 136 males from the selection lines and 272 from the control line is under rearing at the moment.

In **WP4** contact has been made to a French breeding company with a view to import eggs for hatching in April 2002. The strains currently discussed are i657 (JA57 x i66) and S757N (JA57 x S77N). The outdoor area at the rearing facilities has been equipped with 16 sandboxes for dust bathing and 32 supported roof for providing shade.

In **WP6** is planned a 24 hour workshop in which all participants in organic project that has an element of organic poultry and has been initiated during the last year. The purpose is to co-ordinate the efforts in these projects and also to give the several "new" researchers a look into the organic poultry world. The workshop will take place in November 2001 and will have 16-20 participants.

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

General

WP1 The recording at the three farms with two breeds on each will take continue. That means recording of production traits, post-mortem examination of all dead hens, clinical examination at various times for health status, blood sampling, Behaviour studies including feather pecking/cannibalism, use of outdoor areas etc. Medio 2002 negotiation with Farm 1 has to end by a decision of which breeds should be used for the next run. At the experimental farm at Foulum test of the Swedish hens, the Hellevad cross together with the feather pecking lines of WP3 and yet another that has to be tested.

WP2 Recording of health status by post- mortem examination, Serological profile, Causes of disease, registration of parameters related to biosecurity and clinical examinations at 7 randomly chosen farms in addition to the three under WP1 will be continued/started up.

WP3 Studies on feather pecking tendency on individual female chickens will take place at the age of 14 week and 28 week. They will be reproduced to the Foulum test under WP1 and later they will be selected for yet another generation. Quantitative studies on genetic parameters will be started up in order to estimate genetic correlations

WP4 The whole experimental part of this workpackage will be carried out in 2002 according to the plan given in C.2.

E. Project publications

No scientific publication that has its base in the present project is yet ready, but several presentation related to the subject has been delivered.

1. Articles in international, scientific journals with review procedures**2. Presentations at congresses, symposiums etc.****3. 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

4 Other presentations at meetings, field days etc.

Sørensen, P. Breeding strategies in poultry for genetic adaptation to the organic environment. Paper presented at the 4th NAHWOA workshop in Wageningen 25-27 March 2001

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 (ph.d. and post doc.), including visiting scientists and visits abroad**G. National and international co-operation**

Participated in the preparation of a EU proposal on *Breeding, Health and Welfare of Poultry in Free-range/organic egg production*. Sent to the commission on 18. October 2001. In total 13 partners from 6 countries and including three commercial breeding companies

H. Possible elaboration of project and achieved results