

**Title: Poultry Production Systems- Health and Welfare**

**Acronym: PPS-HW**

**Date: March 2000 Budget revideret i april**

**1. Summary**

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.

**2. Research group**

Poul Sørensen, (PSO) Dept. of Animal Breeding and Genetics, DIAS (Project leader & WP3)

Jørgen Kjaer, (JBK) Dept. of Animal Health and Welfare, DIAS (WP1)

Anders Permin, (APE) Institute of Veterinary Microbiology, KVL (WP2)

Birte Lindstrøm Nielsen, (BLN) Dept. of Animal Health and Welfare, DIAS (WP4)

Within each Work Package groups of scientists from various institutions are collaborating. See paragraph 8.

**3. Introduction**

Within the last 10 years organic (free-range) farming has expanded tremendously in Denmark. Specially organic table egg production has increased from almost nothing in 1996 to about 12% of the market eggs in 1999. In total approximately 100 farms operate as organic table egg producers. Organic production of table chicken has also commenced, however, the production is still relatively limited.

Organic egg production is not unproblematic. The commercial breeding material available has a high capacity for egg production, but has over the last 30 to 40 years been through a genetic adaptation to a cage environment. During this period the breeds developed for production in cages have apparently lost part of their original hereditary ability to demonstrate a suitable social behaviour in large free-range flocks, and this may compromise their welfare, (Andersen, 1996; Sørensen, 1996). Furthermore, the free range egg production system in which the hen is offered access to outdoor facilities appears to results in a range of diseases among which several are not seen in indoor systems (cage or deep litter) (Permin and Nansen, 1996). According to the annual report from The Danish Poultry Council (Anonymous, 1999) 4.8 and 9.4% died in a

production period of one year in respectively cage and deep litter system, while 14.9 % died in the organic system. The reasons for this high mortality are not known. In both deep litter systems and the organic systems the mortality includes cannibalism, but the extent is not known.

The management of free-range laying hens was a well known matter until about 1960 and recommendation and advice were given, among others, by W. A. Kock in his comprehensive book *Håndbog i Fjerkræhold* (1935). Reading these books may solve some of the management problems in the organic egg production, but one has to realise that at least two major difference exist between then and now, and they are: Flock size is 10 to 50 fold higher, and labour cost has increased dramatically.

The Danish rules for production of organic table chickens include that the chicken should be 81 days before slaughter and that they shall have access to outdoor facilities in the last half of the rearing period. Due to the high growth capacity of modern broilers they are not suitable as base for such a production because they will weigh 4-6 kg at slaughter and also because their welfare is seriously compromised due to leg disorders. The problems regarding health and management is as for laying hens except that no knowledge exist from the first half of the 20<sup>th</sup> century.

Animal welfare is an issue of particular concern in organic farming. The feather pecking/cannibalism syndrome is seen as the most serious in the laying hens, and among table chickens the major welfare problem of concern for the welfare are breast blisters and their leg condition. For both types of bird health problems, often in an interactions with management and breeds, contribute to reduced welfare. Also the condition and management of the indoor-outdoor facilities and the birds possibility to use them, needs to be examined.

#### **4. State of the art**

##### ***Background***

The hens 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 (Sørensen, 1996). In free-range flocks, including organic systems, many cases have been observed in which hens have performed feather pecking that ended with an unacceptable high rate of cannibalism.

The breed combination currently used in organic table egg production systems in Denmark has 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 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?

Ever since 1947 the Random Sample Test (RST) was the system after which the various breeding materials were compared (Dickerson, 1965). In Denmark the RST-test was carried out in floor systems until 1980, in most other countries the test was carried out using cages 10-20 years earlier. The benefits of the RST are that the egg producers got the comparison of many different breeds and could make their choice among these, but it also gave an excellent base for evaluating the changes that had taken place over time (Flock, 1995). Most RST-station was supported by public funds, and managed by research institute. As poultry breeding became more and more commercialised these arrangement were given up and the RST station, have been closed one by one, which mean that only four are left in Europe at the moment and none of them deals with organic table egg.

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 (Sørensen, 1997). 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. The few large transnational breeding companies have until recently refused to show interest for the small market for laying hens particularly adapted to organic free range system. However a few month ago Lohmann Tierzucht started to sell a

particular breed combination suitable for organic table egg production, and other companies on the European market are soon expected to follow this initiative.

Among the behaviour traits giving rise to particular welfare problems for the hen in organic production systems are feather pecking and cannibalism. Kjaer and Sørensen (1997) found 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.

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 (Fisker, 1999). 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 down-grading 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.

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.

### **Former and ongoing projects**

The previous research program under Darcof: Production of Organic Foods also termed Programme 2 included the project Egg Production Systems. In this project the following was found.

- Comparing non-commercial breeds with the ISA Brown under experimental condition showed considerable differences as the yield was in favour of ISA Brown while they had an unacceptable high mortality due to cannibalism (19%) over 7 month while the non-commercial had almost no mortality. (Sørensen et al. 1999).
- Rearing with different lighting programme does not seem to create any difference in later behaviour.
- Rearing in the "Eco" cottage compared with chickens reared in confinements demonstrated a considerable difference in nesting behaviour as chickens reared in the "Eco" cottage laid less floor eggs.
- Addition of methionin to an organic mixture of feed to laying hens did not improve the general laying but caused a slightly larger eggs. (Sørensen et al 1999).
- Divergent selection for tendency to feather pecking in two generation has created difference on tendency to feather pecking, but information on the relation to other important trait has not been carried out, due to the time factor.

The research group behind (WP2) is involved in problems related to diseases of poultry and has published a range of internationally refereed papers. However, to date longitudinal studies have not been carried out to

determine the diseases, their incidence and significance in organic free-range poultry. Studies carried out to date

- Parasitic diseases are common in organic poultry production systems (Permin et al., 1999)
- *Ascaridia galli* is capable of transferring *Salmonella* to health chickens vis-à-vis the role of *Heterakis* in transferring histomonas to turkeys (Chadfield et al., 1999)
- Parasitic infections creates aggressive birds leading to behavioural changes (Nørgaard et al., 2000)
- Decreased production and increased mortality due to parasitic diseases (Permin et al., 2000)
- Concurrent infections creates carrier animals (Permin et al., 2000)

## 5. Objectives and expected achievements

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.

## 6. Description of workpackages including methods

**Table 1: Workpackage list**

Work-package No	Work package title	Responsible participant	Budget	Start	End	Deliverable No
1	Breed performances and welfare at farm level	JBK	1270	2001	2004	D1-D4
2	Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry	APE	1590	2001	2003	D5-D13
3	Genetics of feather pecking	PSO	1020	2000	2003	D14-D15
4	Breed performances and welfare of table chickens	BLN	660	2001	2002	D16-D17

5	Farmer compensation, experimental farms and consultancy.	PSO	850	2000	2003	
6	Co-ordination and management of the project	PSO	240	2000	2004	

**Table 2: Description of workpackages**

**WP1: Breed performance and welfare at farm level**

Workpackage number:	1		
Start date or starting event:			
Responsible person:	JBK		
Contributing persons:		PSO	Tech
Person-months:	13	1,5	11

**Objectives WP1**

Overall objective:

- Improve welfare of poultry in organic farming systems.

Immediate objectives:

- Investigate performance and behaviour in relation to welfare and suitability for the organic free range system of the three Breeds/Hybrids thought to be adapted to organic free-range system in comparison with the ISA Brown hen in commercial farms.
- On this basis calculate economic and welfare consequences of choosing these hybrids for organic egg production on a commercial scale

**Description of work WP1**

This work package will consist of a field study where three alternative hybrids of laying hens will be compared to ISA Brown in organic production systems:

- **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.
- **Task 2.** Feather pecking behaviour, insidence of cannibalism, condition of integument is evaluated according to the methods routinely used by JBK
- **Task 3.** Morbidity and mortality (in cooperation with WP2)
- **Task 4.** General behavioural function (aggression, range behaviour, nesting)
- **Task 5.** Final evaluation and reporting

Three commercial farms will be involved. On each farm one flock of alternative birds as well as one flock of ISA will be established in each of three years, a total of 18 flocks. Flock sizes of the alternative hens will be around 500 hens. A representative sample of hens in each flock will be individually marked for the study of behaviour on an individual level.

### **Deliverables**

The following papers are expected outcomes of the project:

- **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

Completed first egg production period on farms, at latest August 2001

Completed second egg production period on farms, at latest October 2002

Completed third egg production period on farms, at latest December 2003

Completed data analysis, at latest August 2004

### **WP2: Studies on disease incidence and the significance of diseases and interaction in organic free-range poultry**

Workpackage number:	2
Start date or starting event:	1. January 2001
Responsible person:	APE
Contributing persons:	See list
Person-months:	42

### **Objectives**

Overall objective:

-Improved welfare of poultry in organic farming systems.

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Immediate objectives:

Investigate the occurrence of diseases, their interaction and significance in organic table egg production systems and to elucidate the possible relationships between disease prevalence and production system; and

- Investigate if differences exist as to diseases among different genetic lines (See WP1+WP3)
- Investigate the interaction of selected diseases under experimental conditions using genetically characterised lines (See WP1 + WP3).
- On this basis develop strategies to improve the diseases prophylaxis in organic poultry production systems

### **Description of work**

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 parameters related 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*

## **Deliverables**

The following papers are expected outcomes of the project:

- **D 5.** Cross-sectional studies on causes on mortality in free-range chickens in Denmark.
- **D 6.** Longitudinal studies on the significance on diseases in free-range chickens in Denmark.
- **D 7.** Experimental investigations on the influence of *Dermanyssus gallinae* on sensitivity to selected diseases in free-range chickens in Denmark.
- **D 8.** Experimental investigations on the influence of *Dermanyssus gallinae* on the persistence of selected diseases in free-range chickens in Denmark.
- **D 9.** Investigations on haematological changes associated with dual infections with *Dermanyssus gallinae* and *Pasteurella multocida/E.coli*.
- **D 10.** Investigations on the significance of *Capillaria* spp. on production parameters and the persistence of selected disease agents in free-range poultry.
- **D 11.** Assessment of immune status of multiple disease infected poultry.
- **D 12.** Investigations on complement killing activity of in-bred lines of chickens used for free-

range poultry production

- **D 13.** Final report

### Milestones

Experimental investigations will be carried out in animals representing genetic lines available in Denmark for organic production to generate basic knowledge on interaction of diseases and the existence of disease resistance in the lines available. Experimental results can subsequently be discussed in relation to practical production conditions.

### WP3: Genetics of feather pecking

Workpackage number:	3			
Start date or starting event:	1. april 2000			
Responsible person:	PSO			
Contributing persons:		JBK	GSU	Tech
Person-months:	3,5	4,0	4,0	2,5

### Objectives

Estimate genetic parameters between feather pecking and production traits using experimental lines developed especially for this purpose. The aim is to give specific advise to breeding companies for developing commercial strains for organic farming

### Description of work

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. Recording will be on line- as well as individual level. This means that birds will be housed in groups in experimental free range pens, in 4-bird cages as well as single cages.

- **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 yeilding trait.
- **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 examined for the same traits/characteristics. 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.

#### Deliverables

- **D 14.** Genetic parameters of traits related to feather pecking (realised heritabilities, etc.)
- **D 15.** Phenotypic and genetic correlation between feather pecking and egg production, egg quality, feed conversion, body weight etc.

#### Milestones

- Completed recording of feather pecking behaviour in generation 4, october 2000
- Completed selection, reproduction and start of rearing of generation 5, january 2001
- Completed recording of feather pecking behaviour in generation 5, october 2001
- Completed selection, reproduction and start of rearing of generation 6, january 2002
- Completed recording of feather pecking behaviour in generation 6, october 2003
- Completed recording of test birds in cages and "Eco" cottage of generation 6, october 2003
- Completed calculation of genetic parameters, march 2004
- Completed report and papers, november 2004

#### WP4: Breed performance and welfare of table chickens

Workpackage number:	4
Start date or starting event:	May 2001
Responsible person:	BLN
Contributing persons:	Tech
Person-months:	9      4

#### Objectives

To test different broiler breeds in both indoor and outdoor systems in order to examine the relationship between availability and use of perches and outdoor areas, and the consequences for the time budget of the birds and the incidence of breast blisters.

#### Description of work

Three to four different table chicken breeds will be chosen based on available information, so that the breeds represent a variety of types with clear characteristics for general assessment of these traits. One of the breeds may be a conventional broiler hybrid for comparison.

- **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 (See annex) at Research Centre Foulum. The chickens will have access to outdoor areas. Half of the groups will be given access to perches during all of the 12 week growth period.
- **Task 19.** Automatic registration of perch use will be carried out using load cells, observations on the use of outdoor areas will be made as well as general assessment of activity levels and measures of production. Incidence of breast blisters and quality of carcass will be measured at slaughter.
- **Task 20.** We expect the experiment to yield sufficient information to advice producers as well as legisla-

tors on choice of table chicken breed for organic production under Danish conditions.

- **Task 21.** We expect to obtain knowledge which will be contribute to alleviation of the breast blisters.

#### **Deliverables**

- **D 16.** Data analyses
- **D 17.** Final report and internationally reviewed article

#### **Milestones**

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

#### **WP5: Farmer compensation, experimental farm and consultancy.**

Workpackage number:	5
Start date or starting event:	April 2000
Responsible person:	PSO
Contributing persons:	Ad- visor
Person-months:	3

#### **Objectives**

To supply WP1 and WP2 with 3 practical farms on which comparison between breeds can be performed, and further a number of practical farms in which intensive recordings of existing herds can be done. Also to supply WP1 and WP3 with an experimental farm.

#### **Description of work**

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.

#### **Deliverables**

#### **Milestones**

Agreement on the three farms before 1. January 2001

#### **WP6:Co-ordination and management of the projekt**

Workpackage number:	6
Start date or starting event:	April 2000
Responsible person:	PSO
Contributing persons:	
Person-months:	4.5

**Objectives**  
To co-ordinate and manage the various work package of the proposal.

**Description of work**  
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

**Milestones**

## 7. Implementation and time schedule

**Table 3: Deliverables list**

Deliverable No	Deliverable title	Delivery date	Meeting	Nature
D1	Production performances, egg quality and health of four hybrid	2003		Publication
D2	Feather pecking behaviour and integument of four hybrids	2003		Publication
D3	Individual range behaviour of four laying hybrids	2004		Publication
D4	Final report of WP1	2004	Seminar	
D5	Cross-sectional studies on mortality in organic laying hen	2002		Publication
D6	Longitudinal studies on the significance on disease in free-range chickens in DK	2003		Publication
D7	Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on sensitivity to selected diseases in free-range chickens in Denmark	2003		Publication
D8	Experimental investigations on the influence of <i>Dermanyssus gallinae</i> on the persistence of selected diseases in free-range chickens in Denmark	2003		Publication
D9	Investigations on haematological changes associated with dual infections with <i>Dermanyssus gallinae</i> and <i>Pasteurella multocida</i> / <i>E.coli</i> .	2004		Publication

D10	Investigations on the significance of <i>Capillaria</i> spp. on production parameters and the persistence of selected disease agents in free-range poultry.	2004		Publication
D11	Assessment of immune status of multiple disease infected poultry	2004		Publication
D12	Investigations on complement killing activity of inbred lines of chickens used for free-range poultry production	2004		Publication
D13	Final report of WP2	2004	Seminar	
D14	Genetic parameters of traits related to feather pecking	2004		Publication
D15	Phenotypic and genetic correlation between feather pecking and egg production, egg quality, feed conversion, body weight and health parameters.	2004		Publication
D16	Data analyses of WP4	Apr 02		
D 17	Final report and internationally reviewed article	Jul 02	Seminar	Publication

**Table 4: Time table (EXCEL FILE)**

## 8. Collaborative partners

In WP1 and WP2 an extended use of herd information obtained by the Danish Poultry Council will be made. Also one of the advisors of DPC Niels Finn Johansen will be used as advisor in getting contact with the right herds for these two Work Package.

Dr. Preisinger the daily leader of the genetic section at Lohmann Tierzucht, Cushaven in Germany expressed his enthusiasm for the developed technique in evaluating and recording the feather pecking at the recently held Poultry Genetic Symposium in Mariensee, and he will discuss further the matter with us in future visits at research Centre Foulum.

Research groups consists of (in alphabetic order):

### WP1

Jørgen Kjær, HSV, DIAS

Per Isaksen, HSV, DIAS

Poul Sørensen, HAG, DIAS

### WP2

Magne Bisgaard, IVM, KVL

Pernille Fraas Johnsen, Institute of Animal Husbandry and Health IHH, KVL

Karl Pedersen, National Veterinary Laboratory (SVS)

Mogens Madsen, SVS

Allan Roepstorff, Centre for Experimental Parasitology (CEP), KVL

Henrik B. Simonsen, IHH, KVL

Stig Milan Thamsborg, IHH, KVL

WP3

Poul Sørensen, HAG, DIAS

Guosheng SU, HAG, DIAS

Jørgen Kjær, HSV, DIAS

Per Isaksen, HSV, DIAS

WP4

Birte Lindstrøm Nielsen, HSV, DIAS

## 9. Budget

**Institution 1:** Dep. Of Animal Health and Welfare, DIAS WP1+WP2

**Institution 2:** Dept. of Animal Breeding and Genetics, DIAS, WP1 +WP2 + WP5 + WP6

**Institution 3:** Dept. of Animal Health and Welfare, DIAS, WP2

**Institution 4:** Inst. Of Veterinary Microbiology, KVL, WP3

In 1000 kr

<b>Institution 1</b>	2000	2001	2002	2003	2004
Salary (scientific)	72	108	144	180	108
Salary (technical)	12	63	113	150	0
Operation	20	50	120	147	30
Overhead	21	44	77	95	28
<b>Total</b>	<b>125</b>	<b>265</b>	<b>464</b>	<b>572</b>	<b>166</b>

<b>Institution 2</b>					
Salary (scientific)	99	141	141	141	32
Salary (technical)					
Operation	10	30	30	35	15
Consultancy	33	33	33		
Farm & experim	80	185	525	100	
Overhead	21	36	35	36	9
<b>Total</b>	<b>243</b>	<b>425</b>	<b>764</b>	<b>312</b>	<b>56</b>

<b>Institution 3</b>		2001	2002		
Salary (scientific)		140	180		
Salary (technical)		88	0		
Operation		112	16		
Overhead		85	39		
<b>Total</b>		<b>425</b>	<b>235</b>		

<b>Institution 4</b>					
Salary (scientific)		270	275	280	
Salary (technical)		50	50	50	
Operation		121	121	108	
Overhead		88	89	88	
<b>Total</b>		<b>580</b>	<b>580</b>	<b>533</b>	

<b>Grand Total</b>	368	1644	1986	1410	222
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**Grand Total over 5 year: 5,630,000 kr**

## 10. References

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