LowInputBreeds

Issue 5 November 2011

NEWSLETTER of the LowInputBreeds project

Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in European organic and 'low input' milk, meat and egg production

Editorial

Dear Readers,

With this newsletter we are informing our readers about progress made in the subprojects of the LowInputBreeds project.

Our thematic article in this issue by Ferry Leenstra and Veronika Maurer explains the difference of free range and organic poultry farms and farmers.

We would particularly like to draw your attention to the 1st article on page 2 about the next LowInputBreeds symposium which takes place from May 15 to 18 2012 in Tunisia – this is an ideal opportunity to share findings from the project and we would like to encourage all partners to submit an abstract.

Veronika Maurer, scientific coordinator and Gillian Butler, coordinator

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Second LowInputBreeds Symposium in May 2012

The second symposium of the LowInputBreeds project is taking place May 15 to 18, 2012 in Tunis, Tunisia. It is held in together with the 14th International Seminar of the FAO-CIHEAM[1] Network on Sheep and Goats, Sub-Network on Nutrition[2]. The seminar is entitled "**Feeding and management strategies to improve livestock productivity, welfare and product quality under climate change**".

Organisers of the 14th International Seminar of the FAO-CIHEAM Network on Sheep and Goats, Sub-Network on Nutrition

The event is organized by the Tunisian LowInputBreeds partner, the National Institute of Agricultural Research of Tunisia (INRAT), the Pasture and Livestock Agency (OEP-Tunisia), and the International Centre for Advanced Mediterranean Agronomic Studies – Mediterranean Agronomic Institute of Zaragoza (CIHEAM-IAMZ), in cooperation with the LowInputBreeds project.

Free contributions to the event are encouraged for all sessions, either as theatre presentations or posters. Please send your summary (less than 250 words) before 30 November 2011(for LowInputBreeds partners by **December 15, 2011**) to:

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More information is available at the websites www.iamz.ciheam.org/tunisia2012 and www.lowinputbreeds.org/symposium-2012.html

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[1] FAO = Food and Agriculture Organisation of the United Nations, www.fao.org

CIHEAM: International Centre for Advanced Mediterranean Agronomic Studies, www. ciheam.org

[2] Information on this subnetwork is available at http://www.iamz.ciheam.org/en/pages/paginas/pag_investigacion3a.htm

Thematic Article

Free range and organic poultry farms and farmers: do they differ?

Ferry Leenstra[3] and Veronika Maurer[4]

For the LowInputBreeds project we interviewed 275 farmers in Switzerland, France and The Netherlands with free range and organic hens by e-mail and telephone in order to find out in what way free range and organic farms differ. There were several questions to characterize the farm and management issues. We identified some differences between organic and free range farms, but also quite a lot of similarities.

In France and The Netherlands farmers already had several years of experience with poultry before they started with free range or organic laying hens. In Switzerland it appears that most farmers started right away with free range or organic egg production. On average farmers with free range or organic hens have 10 years of experience with this type of production. On almost all farms one or two people take care of the hens.

In Switzerland laying hens are the main income source for 26 percent of the free range farmers but only 10 percent of the organic farmers. In France on about 50 percent of the farms hens are the main source of income, while in The Netherlands this is for 73 percent of the free range farmers and 60 percent of the organic farmers.

Only a limited number of farmers report direct selling of eggs from the farm. In Switzerland all farms have a contract with an egg trader. In France a large majority had a contract, mostly with an egg trader, but also with integration through the feed company. In The Netherlands about 20 percent of the farmers do not have a contract for marketing the eggs.

In Switzerland and The Netherlands almost all farms participate in a quality control programme, but in France about 70 percent of farmers do not participate in a quality program.

Almost all farmers record the performance of their stock. The proportion of farmers that use a data management program is over 50 percent in The Netherlands and about 50 percent in France and Switzerland. Online database management programmes are provided more and more through independent and feed companies.

In Switzerland and France all farmers have data on egg grades and egg weight although in The Netherlands about 10 percent of the farmers do not keep this record.

On some farms there are several houses with production data registered for separately each house or flock. On most farms however, the hens are considered to be in single flock, that is in the same house and/or data on egg production are only available for all hens together. In The Netherlands about 50 percent of the farms record more than one flock, in France about one third and in Switzerland about 12 percent.

In The Netherlands about 30 percent of the farms have two different ages (more than one month difference) in parallel. In France this is similar for free range farms. In Switzerland and on organic farms in France on almost all farms only one age is present.

Flock size clearly differs between countries and systems: organic flocks are smaller than free range flocks, and flocks in Switzerland are smaller than those in France, which are smaller than those in The Netherlands.

White layers in an aviary system in Switzerland (Photo: FiBL)

In Switzerland almost all hens are in aviary systems, where hens can freely move between tiers in the house on top of each other, thus having more usable area than the ground surface of the house. In France the hens are for a large majority in floor systems (with one tier only), while in The Netherlands aviary and floor systems are equally present.

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More farmers with organic birds report higher mortality than farmers with free range birds, often reported to be due to *E. coli* infections other diseases and predation.

In The Netherlands the majority of farmers provide roughage, often daily and especially on organic farms. A variety of sources are used: alfalfa, maize silage, grass silage. In Switzerland only on a limited number of farms provide roughage. In Switzerland and The Netherlands additional grain is provided, inside the house, but also in the wintergarten (quite common in Switzerland). From France we did not get indications that either roughage or grain was provided. Supplementing litter was most common in Switzerland.

However, answers on feeding and management often had question marks and seem less reliable than data on egg production and mortality. During the farm visits, carried out in 2011, special attention is being paid to these issues.

Striking differences between the systems and the countries are flock size and the proportion the laying hens have in the farm income. Organic farms are smaller and provide a smaller part of farm income compared to free range farms. This is the case in all three countries. However, in The Netherlands the proportion of farms where laying hens are the main source of income is larger than in France, and in France it is larger than in Switzerland. This is directly related to flock size.

We are now recording management, performance, and animal health and welfare parameters into more detail on 40 selected farms per country. This will give a further insight into differences and similarities of the two production systems and, hopefully, help to improve weak points of both systems.

Progress reports from the subprojects

Subproject 1: Dairy cow and beef cattle production systems[5]

Florence Ytournel,[6] Michael Kramer, Tong Yin, Sven König[7], Anna Bieber, [8] Beat Bapst,[9] Henner Simianer[10] and Gillian Butler[11]

Phenotyping and Genotyping

The sixth and last phenotyping tour of approximately 1300 Swiss Brown dairy cows on 40 farms was finished in May by Anna Bieber and Anne Isensee (Research Institute of Organic Agriculture, FiBL). Cows were evaluated for several phenotypic characteristics. Meanwhile data sets for different phenotypes have been extracted from the database at FiBL and

[5] The work packages of subproject 1 'dairy and beef cattle production systems' are:

Work package 1.1 Development of within breed selection systems to improve animal health, product quality and performance traits; comparing genome-wide and traditional quantitative-genetic selection

Work package 1.2 Development of improved cross breeding strategies to optimise the balance between 'robustness' and performance traits; comparing cross-breeds with pure-bred Holstein Friesian genotypes

Work package 1.3 Design of optimised breeding and management systems for different macro-climatic regions of Europe; model-based multi-criteria evaluation with respect to performance, animal health and welfare, product quality and environmental impact

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distributed to project partners for further validation and evaluation.

Moreover, 1100 milk samples collected by FiBL for University of Newcastle (UNew) in autumn 2010 (to study the effect of contrasting feeding regimes on fatty acid composition) were denied delivery to UK by customs. Luckily samples finally came back to FiBL in good conditions and aliquots for dry-freezing could be taken which were successfully resent to UNew.

Genotyping of recorded cows (n=1152) suffered an unforeseen delay caused by variability in DNA quality. More than 40 percent of the blood samples had to undergo a second extraction (in some cases using blood originally taken as reserve). Genotyping at Helmholtz-Institute (Germany) is still underway and expected to be finished in October 2011.

Crossbreeding for low input and organic dairying

The task of collecting milk samples, performance, input and health records from cross bred cows in UK dairy herds is proving challenging.

Typical crossbred cows on UK low input dairy systems (photo: Gillian Butler)

The level of assistance necessary from participating farmers is testing their commitment to the project. They need to supply individual records and milk samples from nominated cows, in some cases 30 to 40 cows often from large herds of over 300 animals. We have successfully completed the 1st round of sampling and are indebted to our dedicated farmers.

Genomic selection in low input dairy cattle

Genomic approaches have been used to evaluate the breeding values of about 1100 Brown Swiss bulls genotyped with the 54K SNP chip for four traits. It appeared the accuracy of evaluation was greater for the highly heritable traits (e.g. yield) than for the low heritable traits (e.g. calving to insemination interval) (Table). However accuracy exceeded 0.67 for all traits, providing encouraging results for a future implementation.

Table: Accuracy of the genomic breeding values for four traits

Trait	Heritability	Accuracy
Milk yield	0.34	0.766
Non Return Rate	0.27	0.749
Somatic Cell Score	0.09	0.692
Interval Calving to First Insemination	0.04	0.673

No effect of the sex chromosomes on the accuracy of the estimated breeding values could be shown. The contribution of each chromosome to the total variance was estimated using the method of Pimentel et al. (2011).[12] It appeared to be strongly dependent on the size of the chromosome for all traits.

Multi-criteria evaluation in dairy and beef cattle

Within the framework of work-package 1.3, Sven König (University of Kassel) and the PhD student Tong Yin (University of Göttingen) have done a stochastic simulation to investigate the impact of natural service sires, genotype by environment interactions (GxE), and genomic selection in organic breeding programs. It could be clearly shown that genomic selection is also a valuable tool for organic breeding programs to increase genetic gain. Especially selection of natural service sires can be improved, because their genomic breeding values have the

[12] Pimentel, Eduardo da Cruz Gouveia, Malena Erbe, Sven König and Henner Simianer (2011) Genome partitioning of genetic variation for milk production and composition traits in Holstein cattle. In: Frontiers in Genetic, May2011, Volume2, Article19. Available at http://www.frontiersin.org/livestock_genomics/10.3389/fgene.2011.00019/full

same reliabilities as breeding values of sires from artificial insemination programs. Inbreeding coefficients of selected sires were lower when basing selection strategies on genomic breeding values instead of using conventional breeding values or pedigree indices. Hence, a genomic breeding value is a valuable tool to depict an animal's individuality. When strong GxE exist, setting up an own breeding program also for small organic populations might be sensible. Selection will be more accurate when selecting sires directly in those environments where their daughters are producing.

Outlook

The analysis of the genotypes of phenotyped animals has started in Göttingen. The next step will be to estimate the breeding values of the cows using the pedigree or the genomic information to evaluate the potential of genomic selection in cows and for new phenotypes.

Concerning the multi-criteria evaluation, the simulation program will be extended in the near future, also using information by selected external partners from Ireland, Czech Republic, and Italy. Additionally, including more 'environmental aspects', e.g. greenhouse gas emissions, will be a major task in the next months.

Subproject 2: Sheep production systems[13]

Hervé Hoste[14]

Most trials started in spring 2010 will soon be completed at the end of autumn 2011 although statistical analyses of results remains to be performed.

Within breed selection to improve abiotic and biotic stress resistance

The detailed recording to identify individual Sfakiano sheep in Crete, best able to cope with stressors has finally been completed in October 2011. Over the past 2 years, a total of 20 ewes on each of 20 farms (10 extensive and 10 semi-intensive) had monthly faecal and milk samples collected during their lactation period and milk yield, estimated parasite burden and body condition score recorded. Initial analysis of results from the first year showed:

- In general, parasitic egg output was low in both systems, especially in late lambing ewes in extensive flocks.
- Ewes in semi-intensive systems showed peak parasite egg excretion in June-July. Farming system, lambing period and their interactions significantly influenced parasite infections.
- No correlation was found between parasitism and milk quality.

Blood collected from ewes (from both years) and rams will be sent to Lincoln University in New Zealand for genetic analysis early in 2012.

[13] The work packages of subproject 2, sheep production systems:

Work package 2.1 Development of within breed selection systems to improve abiotic and biotic stress resistance and performance traits; comparing marker assisted and traditional quantitative-genetic selection systems for functional traits.

Work package 2.2 Development of improved endoparasite management strategies based on integrating (a) feed supplementation with tanniniferous forages with (b) strategic use of clean pastures and/or (c) the use of parasite tolerant breeds.

Work package 2.3 Development of strategies to improve lamb meat quality based on optimising (a) TF feed supplements (b) grazing regimes and/or (c) the use of stress tolerant breeds

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Management strategies for endoparasite control

A large experiment run by the Research Institute of Organic Agriculture (FiBL) compared management approaches to control gastro intestinal nematodes (GINs) in combination with the transhumance systems of sheep production. The experimental ran during 2010 and all post mortem samples have now been collected, although analysis for worm counts and parasite characterisation is still on-going. Meat quality assessment was performed by the University of Catania.

In a second experiment, the anthelmintic effect of different feeds, rich in condensed tannin (CT), has been examined in ewes around parturition, to evaluate their ability to reduce the periparturient relaxation of immunity (PPRI). Four groups of ewes with comparable infections of gastro intestinal nematodes (GINs) were fed either (1) sainfoin (2) clover/grass and faba beans (3) clover/grass as a control or (4) sainfoin and faba beans (diets balanced for energy and protein) for 24 days in late pregnancy. A fifth group of ewes in early gestation was included to define the effects of PPRI. Blood samples (to assess pathophysiological parameters) and individual faecal egg counts (FEC) were performed twice weekly. The preliminary results indicate:

- Both groups receiving sainfoin showed lowest FEC throughout the trial, approximately 4000 EPG (EPG = mean worm egg excretion).
- The distribution of FEC in the control and the faba bean group were very similar, approximately 7000 EPG.
- Animals in early gestation showed a lower average egg output (4300 EPG).

A precautious conclusion would be that feeding sainfoin during periparturient phase could compensate for the PPRI. Further analyses are on-going.

Finally, a field experiment to assess sainfoin in controlling gastrointestinal nematodes (GINs) infection in lambs around weaning has been repeated for the second year by INRA. Individual faecal and blood samples were taken twice-monthly between June and August 2011 for parasitological (EPG[15]) and pathophysiological measurements and the worm populations in the digestive tract was characterised (worm counts, species composition and fertility) at slaughter.

- Results of year1 (2010) found no differences in parasitological parameters (egg excretion, worm counts or fertility) or pathophysiological measurements (i.e. anemia PCV) between lambs receiving sainfoin or not) although the former did show a lower index of diarrhea.
- However, in year 2, egg excretion was reduced by nearly 50 percent in the lambs consuming sainfoin but with no difference in anemia (PCV) values. The necropsic procedures are still in progress.

This experiment is scheduled to be repeated for a 3rd year to verify observed differences, relating to variations in sainfoin or an indirect effect of pasture contamination.

Development of strategies to improve lamb meat

For the third year of the LowInputBreeds project, INRA compared the impact of two factors (0 kg nitrogen (N) fertilizer per hectare (ha) versus 100 kg N/ha and high or low pasture allowance) on lamb carcass and meat quality, level of parasite infections and number of necessary anthelmintic treatments in 192lambs. Lambs were born in March, weaned in June and by Nov 2011 nearly two thirds of the animals have been slaughtered at approximately 35 kg live weight.

Gastro intestinal nematode (GIN) infection was regularly monitored (faecal and blood samples) and controlled to ensure growth rate modulated via pasture availability. Meat fatty acid composition, peroxidation level and a sensory evaluation were assessed.

Within this subproject, the University of Catania evaluated the effect of time of grazing within the day (morning vs afternoon) on lamb meat quality, and a number of papers have been published or will be published (see list at the end of this article). Furthermore the University of Catania is currently performing the remaining laboratory analyses on the pasture samples collected over the experiment to achieve a complete overview on the diurnal variation in pasture chemical. The hypothesis is that the diurnal variation in the chemical composition of pasture may affect the biosynthesis of indole in lambs.

[15] Mean worm egg excretion (EPG)

Steffen Werne, a PhD Student from FiBL visited the UMR INRA/ENVT IHAP[16] in Toulouse at the start of July 2011 to learn the method to measure pepsinogen in serum samples and then to implement the method in the FiBL laboratory.

Outlook

October 2011 to February 2012 will be the period when analyses of the results obtained from the main field experiments in Greece (SP 2.1), Switzerland (SP 2.2), Italy (SP2.3) and France (SP2.2 and SP2.3) will be performed and discussed between partners, aiming to submit contributions to the 2nd symposium of the LowInputBreeds project in Tunis in May 2012.

Publications

Luciano G., Biondi L., Pagano R.I., Scerra M., Vasta V., López-Andrés P., Valenti B., Lanza M., Priolo A., Avondo M. The restriction of grazing duration does not compromise lamb meat colour and oxidative stability. Submitted for publication in Small Ruminant Research

Vasta V., Pagano R.I., Luciano G., Scerra M., Caparra P., Foti F., Cilione C., Biondi L., Priolo A., Avondo M. (2012). Effect of morning vs afternoon grazing on intramuscular fatty acid composition in lamb. Meat Science, 90, 93-98.

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Hoste, H, Torres-Acosta J.F.J. 2011. Non chemical control of helminths in ruminants: adapting solutions for changing worms in a changing world. Vet Parasitology 180, 144-154.

Hoste H., Sotiraki S., Mejer H., Heckendorn F., Maurer V., Thamsborg S. Alternatives to chemical antiparasitic drugs in livestock in organic farming. In revision as a chapter for a Book proposal entitled "Organic Farming, prototype for sustainable agriculture ?" Springer Ed. Under review.

N.Tzanidakis, N.Voutzourakis, A. Stefanakis, C.Brozos, E.Kiossis, S.Sotiraki. Interactions between gastrointestinal nematodes and subclinical mastitis in low-input dairy sheep management systems in Greece. 23rd international conference of WAAVP, Buenos Aires, Argentina, August 21-25 (2011) Proceedings p.30

Prache S. , Benoit M., Tournadre H., Cabaret J. , Laignel G., Ballet J. , Thomas Y. ; Hoste H., Pellicer M., Andueza D. , Hostiou N., Giraud J.M. 2012. Plateforme INRA de recherches en production ovine allaitante AB : de l'étude de verrous techniques à la conception de systèmes d'élevage innovants. Accepted Communication to the 3R (Rencontres Recherches Ruminants) Conference, Paris 7-8 Décembre 2011.

[16] For information about the Unité Mixte de Recherche INRA / ENVT 1225 Interactions Hôtes - Agents Pathogènes (UMR INRA/ENVT IHAP) of the National Veterinary School at Toulouse, France, see http://www.envt.fr/node/78

Subproject 3: Pig production systems[17]

Jascha Leenhouwers[18]

Review of the past six months

The suitability of traditional and modern pig breeds for low input/organic production systems was assessed by literature study and farm surveys in various countries throughout Europe. Findings were presented at the European Saddleback meeting in Germany (May 2011) and will be published in a scientific journal.

Within this subproject, a genetic fingerprinting approach is being developed to reduce mortality of finishing pigs in organic and low input systems. This involves collecting DNA from dead finisher pigs and using this information to trace fathers which can then be excluded from the breeding program, on the basis of their contribution to mortality. So far, biological material for DNA profiling of dead pigs and possible fathers has been collected on outdoor farms in Spain and Brazil. These samples are ready to be analysed and subsequent results will be implemented directly in the breeding program.

[17] The work packages of subproject 3, pig production systems:

Work package 3.1 Development of a flower breeding system to improve pig survival and robustness related traits in small populations; comparing the performance of breeds from 'flower' and conventional breeding systems.

Work package 3.2 Effect of management innovations (gilt rearing and lactation systems) on mothering ability of sows as well as pre- and post-weaning diarrhoea and losses of piglets.

Work package 3.3 Effect of traditional, improved and standard hybrid pig genotypes and feeding regimes on carcass, meat and fat quality in heavy pigs used for premium, regional pork products.

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Picture: Piglets with access to some additional pasture during the suckling period (Photo: Jascha Leenhouvers)

Previous results in this subproject have shown it is possible to breed for heat stress resistance, which is especially relevant where sows are kept outdoors in hot climates. The (genetic) effects of heat stress on farrowing rate were investigated and subsequently submitted for publication in a scientific journal.

The effects of rearing environment on mothering ability of sows as well as pre- and post-weaning diarrhoea and piglets losses are being investigated. The first mothers from conventional and organic rearing systems have now given birth to their first litters. These litters received 1) no outdoor run, 2) a standard concrete outdoor run with concrete floor or 3) an outdoor run with concrete floor and additional pasture for the piglets. Maternal behaviour, piglet mortality and gastro-intestinal health of piglets during the rearing period are being monitored over the next two years. One of the goals of this subproject is to determine the effect of pig breed and feeding regimes on nutritional and/or sensory quality characteristics of fresh and processed pork meat. In a trial focused on air-dried sausages, 72 animals were slaughtered in the first week of July 2011 with chemical analysis of meat, sausage preparation and testing in process finishing at the end of 2011. The remaining data sets concerning performance, carcass and meat quality are completed.

Outlook with regard to next period

A consultation workshop "How to create a market around local breeds" involving producers, processors and pork supply chain stakeholders will be organised in 2012.

The effects of heat stress in sows on litter size will be investigated. Focus will be especially on identifying the most heat-sensitive period during gestation.

A survey of fat quality (e.g. fatty acid composition, fat soluble antioxidant content and/or skatole) of pigs carcasses produced in low input and organic systems in three different macroclimatic zones will commence in January 2012. Protocols for sample collection are being finalised and we are about to liaise with other partners in this subproject to collect the first of the seasonal sample in January (others will follow in May and August 2012).

Regarding the effects of breed and feeding regime on the quality of air-dried sausages, the second and final trial began in October 2011, again with a total of 72 castrates aiming to start slaughter in March 2012.

Subproject 4: Laying hens[19]

Ferry Leenstra[20]

Report for the period April 2011 to October 2011

In our search for an ideal hen suited to free range and organic systems, we started farm visits (40 farms in Switzerland, France and The Netherlands each) to get better insight into variation in management and actual condition of the hens with regard to feather cover, breast bone and foot pads.

In the earlier article in this newsletter "Free range and organic farms and farmers: do they differ?", we give a first impression on variation in management described by the farmers in the (telephone) interviews.

It is difficult to get a precise view on feather condition from farmers' judgement and there are indications that hens that can freely move around (as in free range and organic systems) have a rather high risk on

[19] The work packages of subproject 4, laying hen production systems:

Work package 4.1 Development of 'FARMER PARTICIPATORY' breeding systems to improve productivity, health and welfare and egg quality related traits; comparing standard with farmer participatory breeding systems

Work package 4.2 Effect of, and interactions between, laying hen genotypes, feeding regimes, 'welfare-friendly' moulting protocols and prolonged use of layers on performance, and animal health and welfare

Work package 4.3 Effect of, and interaction between, laying hen genotypes and management innovations on egg quality

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damaging their breast bone and foot pads. These health parameters are therefore recorded during farm visits when hens are in the second half of their productive life at about 45 weeks of age. In addition we collect information on management and nutrition and try to find best practices with regard to productivity, health management and behaviour. Farm visits are now more or less half way.

Besides overall performance we also want to get insight in egg quality. High levels of unsaturated fatty acids are desirable for human nutrition and we know egg fatty acid composition is very dependent on nutrition of the hens. During the visits we look for farms with interesting contrasts in diet (such as feeding of roughage) that might cause differences in egg quality. Subsequently eggs from these farms will be analysed for fatty acid composition to add to other assessments of egg characteristics (egg weight, cracked or dirty shells, and yolk colour) to optimize management for egg quality.

Until now the number of flocks retained to lay beyond 80 weeks is very limited and in Swiss farms with a prolonged laying period or with a moulted flock health data are examined to get insight into the health risks of such practices with special attention for intestinal parasites. The study includes 10 flocks on 3 farms. Feed prices and egg market situation as well as the condition of the flocks themselves will determine if additional farmers want to moult or keep the hens for an extended laying period.

In workshops farmers clearly indicated, they thought free range and organic systems require a heavier hen with greater eating capacity compared to conventional systems. Institut de Sélection Animale (ISA), a Hendrix Genetics company, is able to provide an experimental cross (hybrid) expected to be 10 % heavier than typical genotypes used for egg production. Currently a number of hens of this experimental cross are being raised on an organic farm in the Netherlands. At 17 weeks of age (end of 2011) the hens will be distributed to 6 to 7 mainly organic farms in The Netherlands for testing during the laying period. Dependent on the results during rearing a second batch may be tried for further experimenting.

If other genotypes (crosses) appear, that might be suitable for free range and organic farms, we will also try to incorporate those in the testing program with farmers that volunteer for testing those genotypes. Where possible, there will be an on-farm comparison with conventional genotypes.

Nutrition of free range hens in general and organic hens in particular was discussed with organic feed manufacturers to evaluate genotype x diet interactions and optimise diets with regard to feather pecking and other production traits. When the LowInputBreeds project was planned, it looked feasible to experiment with diets containing meat and bone meal, often said to reduce feather pecking to some extent. Currently the decision to allow non-avian meat and bone meal for poultry diets seems to be further away. Moreover, until very recently the EU target of 100 % regionally produced organic ingredients for organic animal diets was due to start in January 2012. However, for laying hens it would then be extremely difficult to formulate an adequate diet and on October 3rd, it was decided to delay these demands. The uncertainty over the expectation for organic diets has delayed the testing of alternative diets for free range hens and discussions with the feed manufacturers have been reassumed.

So, overall we have been working on several parts of our work package: better insight in management practices, testing a new genotype, setting the base line for exploration of health of hens with a prolonged laying period, looking for interesting contrasts in management and feeds that influence egg quality and start-up of (field) tests with alternative dietary composition. A scientific paper on performance of different layer genotypes under organic and free range conditions has been submitted and is currently under review.

Reports about LowInputBreeds events

Report about the Course on Genomic Selection in Davos in June 2011

Nicola Bacciu, Alex Barenco, Anna Bieber, and Farhad Vahidi

From June 20-24, 2011 one of the LowInputBreeds' specialist training workshops: on genomic selection, took place in Davos Switzerland. This five-day course was organized by LowInputBreeds partner agn Genetics, together with the Animal Breeding and Genomics Centre and Institute of Animal Sciences from Wageningen University and Research Centre.

Tutors on this course were Prof. Dr. Dorian Garrick and Prof. Rohan Fernando from the Department of Animal Science, Iowa State University, USA.

The very nature of this topic involves specialist language and concepts with a lot of acronyms and jargon which makes it difficult for non-specialists to comprehend. This article is a simple outline in an attempt made to make it more accessible and the full report can be found on the LowInputBreeds website.

Genomic selection is an approach where organisms are selected for breeding based on information from their genetics rather than what they look like, how fast they grow or other *phenotypic* traits we can (or maybe can't) measure. The aim of the workshop was to evaluate genomic selection, linking phenotypic records with genetic markers such as Single Nucleotide Polymorphism or SNPs (called "SNIPS") - areas of the genetic code where variation is identified as being present. This genetic variation is assessed using specialist statistical models known as Bayesian Methods of analysing probability to calculate a *genomic breeding value*. The course explained the range in Bayesian methods currently employed (A, B, C and CPi) and their properties.

Bayesian statistics probabilities quantify beliefs or knowledge about possible values of parameters.

Three steps of Bayesian data analysis can be distinguished:

- Setting up a full probability model: provide a joint probability distribution for all variables
- Calculating and interpreting the appropriate posterior (conditional probability distribution) using prior beliefs and observed data.
- Evaluating the fit of the model and implication of the posterior distribution

One of the main differences between classical and Bayesian statistics is the use of *prior* information. Hereby beliefs about parameters are assumed previously to data analysis and formulated as prior probabilities. The evidence from the trial/data set is described using a so-called likelihood function. The likelihood is the conditional probability for the data given the parameters. Combining the prior assumptions and the likelihood function leads to *posterior probabilities*, which are conditional probabilities for the parameters given the data.

Full report on the LowInputBreeds website

http://www.lowinputbreeds.org/index.php?id=1656

Short report about the LowInputBreeds exchange programme

Steffen Werne[21]

The programme allowing scientists involved in the LowInputBreeds project (work package 5.3) to exchange between laboratories funded a short stay of Steffen Werne (FiBL) at the French National Institute for Agricultural Research INRA, Unit Veterinary Parasitology, under the leadership of Dr. Hervé Hoste in Toulouse. Within one week, the knowledge of two important methods was transferred.

One focus of subproject 2 of the LowInputBreeds project is improving sheep health. Helminth parasites remain one of the most important health and welfare challenges. Helminth populations are increasingly resistant to most of the currently available anthelmintics, particularly in small ruminants (Jackson and Coop, 2000) and consumers demand high quality animal products i.e. free of drug residues (Waller und Thamsborg, 2004). These factors provide a strong stimulus for current research on alternative solutions, one of which is the use of bioactive plants, which can affect helminths at various stages of their life cycle. These properties are most probably based on plant secondary metabolites, like tannins, and many studies have focused on forages containing tannins (Hoste et al., 2006).

Two such forages have been used in a feeding trial in Switzerland: Sainfoin (*Onobrychis viciifolia*) and

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field bean (*Vicia faba*). To assess the impact of a tannin containing feed, it is important to know the content of tannin which can be measured by different methods. A quick and relatively simple method is called the "Radial Diffusion Assay" (RDA). This was the first of two methods transferred from INRA Toulouse to FIBL Switzerland. The method allows the measurement of the tannin content of a sample equivalent to a tannin standard (e.g. tanninic acid). In few words, sample liquids are transferred on an agarose plate containing bovine serum albumin, tannins react with the albumin and a corona effect will make the reaction visible and thus measurable.

Secondly, a method to capture serum pepsinogen concentration in sheep was realized. The concentration of pepsinogen, an inactive pre-stage of pepsin (an enzyme for protein digestion), in blood serum is positively related with the worm burden in the abomasum of the animal. Therefore, pepsinogen concentration is a useful parameter to assess abomasal nematode infections. Both methods are highly appreciated at FiBL to analyse samples from the LowInputBreeds project.

At this point, many thanks are due to the people involved at the Veterinary Parasitology Unit in Toulouse.

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Partner list of the LowInputBreeds project[22]

Partner 1: Newcastle University UNEW, UK, Coordinator

Partner 2: Research Institute of Organic Agriculture FiBL, Switzerland, Scientific coordinator

Partner 3: Institut National de la Recherche Agronomique INRA, France

Partner 4: Wageningen UR, Livestock Research, The Netherlands

Partner 5: University of Göttingen / Georg-August-University Göttingen UGöt, Animal Breeding and Genetics Group, Germany

Partner 6: University of Catania UCat, Department of Animal Sciences, Italy

Partner 7: National Agricultural Research Foundation NAGREF, Greece

Partner 8: Federal Research Institute for Rural Areas, Forestry and Fisheries vTI, Institute of Organic Farming, Germany

Partner 9: Danish Centre for Bioethics and Risk Assessment, University of Copenhagen, UCPH-CeBRA, Denmark

Partner 10: University of Ljubljana ULju, Animal Science Department, Slovenia

Partner 11: University of Louvain UCLou, Centre for Philosophy of Law, Belgium

Partner 12: Swissgenetics, Switzerland

Partner 13: Swiss Brown Cattle Breeders' Federation SBZV, Switzerland

Partner 14: Applied Genetics Network agn, Switzerland

Partner 15: Institute for Pig Genetics IPG, The Netherlands

Partner 16: TOPIGS Iberica / Pigture Ibérica, Spain

Partner 17: Institut de Sélection Animale BV ISA, a Hendrix Genetics company, The Netherlands

Partner 18: Institut National de la Recherche Agronomique de Tunisie INRAT, Tunisia

Partner 19: Lincoln University UL-NZ, Faculty of Agriculture and Life Sciences, New Zealand

Partner 20: University of Guelph UG-CAN, Centre for Genetic Improvement of Livestock, Canada

Partner 21: Federal University of Vicosa UVF, Animal Science Department, Brazil

Partner 22: Louis Bolk Institute, Driebergen, The Netherlands

[22] For more details see http://www.lowinputbreeds.org/partners.html

Publications of the LowInputBreeds project

Publications of the LowInputBreeds project can be downloaded at the project website www.lowinputbreeds.org > Publications.

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