

**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

The fourth newsletter of the LowInputBreeds project reports on the successful first project symposium which took place in March in Wageningen, the Netherlands, focussing on ethical issues in animal breeding. Furthermore the newsletter contains an article on small ruminant production systems in Crete, and the traits required in order to improve production efficiency and product quality in traditional low-input dairy sheep production systems. And like every newsletter, we report progress in the four LowInputBreeds subprojects.

Already now we would like to draw your attention to the next LowInputBreeds conference, which will take place in spring 2012 in Tunisia. More information is available in the last page of this newsletter and updates will be posted at the project website www.lowinputbreeds.org. Please also note that in June 2011 the course "Genomic Selection in Livestock" will take place in Davos, Switzerland, one of the LowInputBreeds workshops for early stage researchers and agricultural advisors/technologists to facilitate an exchange of ideas/opinions and know-how and encourage potential future collaboration.

Finally we would like to announce Carlo Leifert has handed over project coordination responsibility to Gillian Butler, also from Newcastle University. She is not new to the project – she is responsible for work package 1.2 on the development of improved cross-breeding strategies.

*Veronika Maurer, scientific coordinator and
Gillian Butler, coordinator*

Contents

Editorial	1
First LowInputBreeds Symposium in March 2011	2
Report on the first LowInputBreeds Symposium.....	2
Pictures from the LowInputBreeds Symposium.....	3
Ethical Concerns in LowInputBreeds: Comment on the First LowInputBreeds Symposium	3
Thematic Article.....	4
Characterisation of small ruminant production systems in Crete.....	4
Progress reports from the subprojects	7
Subproject 1: Dairy cow and cattle production systems	7
Subproject 2: Sheep production systems.....	9
Subproject 3: Pig production systems	10
Subproject 4: Laying hens.....	11
Forthcoming events	12
Announcement: LowInputBreeds Specialist Training Workshop in June 2011	12
Second LowInputBreeds Conference in Tunisia 2012	12



The LowInputBreeds project is co-financed as a Collaborative Project by the European Commission, under the Seventh Framework Programme for Research and Technological Development (Grant agreement No 222623). The contents of this newsletter are the sole responsibility of the authors, and they do not necessarily represent the views of the European Commission or its services. Whilst all reasonable effort is made to ensure the accuracy of information contained in this newsletter, this newsletter is provided without warranty and we accept no responsibility for any use that may be made of the information.



First LowInputBreeds Symposium in March 2011



**First Symposium on
Ethical Consideration
in Livestock Breeding**
March 15 and 16, 2011
Wageningen, The Netherlands

Report on the first LowInputBreeds Symposium

Ferry Leenstra¹

The first LowInputBreeds symposium, which took place in March 2011, was organized in cooperation with ECO AB,² the European Consortium for Organic Animal Breeding in the Hof van Wageningen, The Netherlands. Over 50 participants (researchers, policy makers and farmers) participated in plenary lectures, discussions and species specific workshops. Central theme in the symposium was: 'low input - niche or model for future livestock production?' with attention paid to ethical issues.

On March 15, the participants were welcomed by Veronika Maurer (FiBL), the scientific coordinator of the LowInputBreeds project. In the first plenary session Karsten Klint Jensen (Danish Centre for Bioethics and Risk Assessment) introduced the theme and set the scene for the discussions in the species specific workshops. Jozsef Ratky (Research Institute on Animal

Breeding, Hungary) discussed the effects and risks of different reproduction methods in breeding and Jack Windig (Wageningen UR Livestock Research) discussed the risks, benefits and alternatives of genomic selection.

In a joint paper Wytze Nauta and Anet Spengler Neff (ECO AB) discussed the organic perspective on breeding and reproduction in livestock production. For the first workshop, participants split up according to their species of interest: cattle, sheep, pigs and poultry. Each workshop considered the aims and outputs of the LowInputBreeds project within the context of ethics including comment by invited scientists from outside the project. Identified ethical issues were explored further in the second set of workshops on March 16.

In a second plenary session Anne-Marie Neeteson of the European Forum of Farm Animal Breeders (EFFAB)³ and FABRE TP⁴ gave a view on breeding goals in relation to current and future livestock production and Irene Hoffmann (FAO) discussed (agro)biodiversity in animal production and food security. Marijke de Jong (Dutch Society for Animal Protection) discussed welfare in livestock production and how specific labeling might increase consumers' awareness of animal friendly, low input systems. The last speaker in this session was Tom Dedeunwaerdere (University of Louvain) presenting first results on utilization of resources in low input livestock systems.

March 16 started with a plenary session on climate change and food security. Jorgen Elvind Olesen (Aarhus University) discussed the role of livestock production in climate change and Carlo Leifert (Newcastle University) presented views on food production in relation to utilization of resources. Discussion was lively, on identifying region and farm specific aspects and especially the need for a fundamental change of mind set in mainstream agriculture.

These ideas and other ethical issues listed the day before formed the basis of the second set of species workshops, identifying how they will be accommodated in future plans in the LowInputBreeds project.

Feedback from workshops opened the last plenary session and was reflected on by Anet Spengler Neff and Wytze Nauta offering an organic perspective. Anne Sophie Lequarré (EU project officer for LowInputBreeds) finished with an overview of the structure and role of the EU in relation to livestock research. The output of

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² www.eco-ab.org

³ www.effab.org

⁴ www.fabretp.info

the workshops will be elaborated on by Karsten Klint Jensen and co-workers for the across species activities of LowInputBreeds.

LowInputBreeds had its second general assembly during the meeting and ECO AB its annual general meeting.

Further information

- › The programme including the abstracts and presentations of the papers presented are available at the project homepage at www.lowinputbreeds.org/lib-symposium-2011-programme.html
- › Further information on work package 5.1 (ethical impact assessments) of the LowInputBreeds project is available at www.lowinputbreeds.org/1271.html

Pictures from the LowInputBreeds Symposium



Dr. Karsten Klint Jensen, Danish Centre for Bioethics and Risk Assessment (CeBRA)



Dr. Veronika Maurer, Scientific coordinator of the LowInputBreeds project, Research Institute of Organic Agriculture FiBL, Switzerland



Dr. Jozsef Ratky, Research Institute on Animal Breeding, Hungary



Prof. Dr. Jorgen Elvind Olesen, Aarhus University, Denmark
All pictures by Jozsef Ratky

Ethical Concerns in LowInputBreeds: Observations from the First LowInputBreeds Symposium

Karsten Klint Jensen¹

An important part of the first LowInputBreeds symposium were the species-specific workshops with the purpose of identifying ethical issues for further reflection within the project. The overall objective of the LowInputBreeds project is to develop novel breeding

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strategies and integrate them with management innovations in order to improve productivity and animal health/welfare. Except perhaps for worries about the consequences of certain breeding technologies, this objective does not in itself appear to raise ethical concerns. However, since there are often conflicts between improving productivity and animal health, the main ethical issues are concerned with how these objectives are balanced in the breeding goals.

Low input animal production deviates from conventional production by being based on specific values, ideas or conceptions that underlie the production

A clear example is organic production which is based on a range of ethical principles summarized some years ago by the International Federation of Organic Agriculture Movements (IFOAM).¹ Other forms of low input animal production are not organic, but still based on local traditions which again involve specific principles of production. The values underlying low input animal production systems thus make up their identity, which often find a clear expression in a brand. These basic characteristics of low input animal production both create specific problems (often related to keeping the animals outdoors) and constrain the set of feasible strategies for addressing problems.

Hence, in the workshops, researchers from the LowInputBreeds project met invited stakeholders from the communities supposed to benefit from the research. The researchers presented their perception of relevant ethical issues, and how these issues are dealt with by the research aims. The idea was then to have a dialogue with the stakeholders about whether the perception of problems is adequate, and whether the strategies deals with the problems in the best way. The details of this process still remain to be analyzed.

An interesting observation from the symposium was the great interest and engagement in more global issues such as climate and food security on a long term global scale. These issues tended to pop up in and interfere with the more local perspectives of the workshops. Clearly, animal production in general appears to face enormous challenges. Also low input animal production is affected by these challenges; however, no clear consensus of its future role in this global perspective was reached.

¹ www.ifoam.org

Thematic Article

Characterisation of small ruminant production in Crete

Alexandros Stefanakis² and Smaragda Sotiraki³

Subproject 2 of the LowInputBreeds project aims to improve performance, animal health & welfare, and product quality in organic and low input breed sheep production systems: one focus is breeding under Mediterranean conditions.

Sheep farming in Greece and in Crete - Background

Mediterranean sheep and goat production has historical and cultural links with long history in Greece and has survived because it is contribution to national identity as a traditional activity.



On the island of Crete, Greece, farmed sheep belong to the local breed Sfakia.

More than a million sheep and goats are farmed on the island of Crete in Greece mostly as dairy systems since earnings from milk sales form a large proportion of family income, despite of the moderate level of production.

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Some farms follow a semi-intensive system of production, but the majority traditionally operate under low-input systems with little capital investment especially on permanent structures and machinery.

Milk from the sheep and goats on the island is made into a range of local cheeses and other milk products.

Crete: Geographical conditions

The island of Crete, in Mediterranean Sea, is characterized by a range of high mountains (highest altitude 2500 m) covering most of the land area. The prevailing climate in the lowlands is xerothermic (biologically dry days $125 < x < 150$), which results in seasonal production of forages and indigenous vegetation. However, at higher altitudes (300–1000 m) the climate changes to semi-Mediterranean (biologically dry days $75 < x < 100$), allowing for a longer period of vegetation growth.

These marginal mountainous landscapes are ideally suited to extensive livestock production and indeed sheep and goat farming is a very important sector of Crete's agricultural production.

The Sfakia breed and typical production cycle

Under extensive production, sheep of the local 'Sfakia' breed are kept outdoors for most of the year feeding on available indigenous vegetation. Grazing is continuous mostly on marginal common lands and areas grazed by individual flocks are not clearly defined. Small fields are sown with oats or barley for sheep grazing, and in some cases, vetch is sown for grazing in olive groves. Supplementary concentrates are provided from the beginning of autumn to the end of winter (September to February). Between November and January a small quantity of purchased lucerne hay is also offered to the animals.



Sheep farm in the Greek mountains



Hand milking on an extensive sheep farm

Natural mating takes place in May-June, therefore lambing occurs around October-November. Lambs are raised on their mothers until weaning at the end of December. At 60- 80 days after lambing lambs are slaughtered at live weights of 13–16 kg and the milking of the ewes begins. Initially ewes are mostly hand-milked twice daily (morning-evening) from weaning and this is reduced to once a day (morning) by mid June until the end of the milking period in late July.

Sheep farming systems

From early summer to late autumn several extensively farmed sheep flocks still follow the traditional practice of grazing mountain pastures. These traditional sheep farming system can be characterized by the concentrated winter lambing (December to February) when flocks are in the lowlands. Subsequently, the system attempts to profit from spring grass growth by removing young lambs from the flocks and transferring the lactating ewes to grazing lands. This reduces the need for indoor feeding with harvested forages and purchased concentrates allowing profitable production based principally on grazing.

Farms classified as semi-intensive have higher capital invested on housing, machinery, land cultivated with forages and fencing, compared to the extensive farms. Sheep graze for several hours daily in fenced improved pastures and the rest of day are kept indoors. Feeding of sheep is based on concentrates for most part of the year (which takes place indoors) in combination with grazing on pastures. In autumn and winter before turnout to pastures, considerable quantities of hay is supplied. In most cases mating is synchronised and occurs earlier than on extensive farms. Milking is mostly in mechanised milking parlours.

Improvement of the sheep farming system

Sheep farming in Crete is largely traditional and there is scope for significant improvement (in our opinion) without major capital investments.

However, farmers have poor access to information and the absence of an effective extension system for dissemination of technical knowledge makes the development of a sustainable farming system difficult. There is a variety of reasons for the available technical expertise not reaching farmers; the distance of their locations from civil centres, their low formal education levels as well as the lack of state support investing in their education.

Required traits to improve production efficiency and product quality

The major traits required to improve production efficiency, product quality, but also animal welfare in such traditional low-input dairy sheep production systems have been identified as resistance to: heat stress, mastitis, endoparasite and foot rot. The LowInputBreeds project will use quantitative-genetic selection to improve those traits using traditional 'phenotype' based selection approaches and also novel selection tools (e.g. gene marker kits for traits such as parasite, foot rot and cold resistance), which present an option to increase selection efficiency of traits. Given the well documented phenotypic heterogeneity of these traits within the existing populations of the local breeds, these tools may allow a more rapid selection 'within breeds'.

These innovations are thought to be particularly suitable for Mediterranean and mountainous areas of Europe, where (a) pure-bred, local breeds play an important role and (b) there is greater resistance to cross-breeding approaches.



Taking milk samples for fatty acid

Progress reports from the subprojects

Subproject 1: Dairy cow and beef cattle production systems

Filippo Biscarini,¹ Sven König,² Anna Bieber,³ Gillian Butler⁴ and Henner Simianer⁵

Within subproject 1 ("Improving performance, animal health & welfare, environmental impact and product quality in organic and 'low input dairy cow production systems'"), the following activities have recently taken place in the three related work packages.⁶

Genomic selection in dairy cattle

Estimation of genomic breeding values (GEBVs) for bulls

At the University of Göttingen we (including PhD student Michael Kramer) are estimating genomic breeding values (GEBVs) for 2 traits; one of high heritability (milk yield) and one of low heritability (the

fertility measure of 'non return rate to service') in approximately 1200 Brown Swiss bulls genotyped with the 54k *SNP chip*. As expected, the accuracy of genomic selection is higher for high heritability traits than for low heritability traits; however, the expected benefits, in terms of relative gains in accuracy of estimated breeding values, are likely to be greater for traits of low heritability. The accuracy of GEBVs has been determined by comparing a random cross-validation scheme with one using data split by year of birth. The effect of GEBVs relating to SNPs on the sex-chromosomes is also being investigated and will be applied to genotype and phenotype data currently being generated for Brown Swiss cows from low input monitored herds.

Phenotyping and Genotyping

Anne Isensee and Anna Bieber of the Research Institute of Organic Agriculture (FiBL) have just completed their sixth and last phenotyping tour of approximately 1300 Swiss Brown dairy cows in 40 farms. All cows have been evaluated for several phenotypic characteristics. Newly recorded phenotypes as well as milking records from these animals have been constantly entered into a data base at FiBL.

Records on structure of the farms have been collected as input for modelling in work package 1.3.

Moreover, the second milk sampling to study the effect of contrasting feeding regimes on fatty acid composition has been finished in autumn 2010.

Genotyping of 1152 animals is running and is expected to be finished this spring. The newly developed high density (HD) SNP chip harbouring almost 800'000 SNPs will be applied to a total of 864 DNA samples, originating from 60 sires and 804 cows. DNA from 288 cows will be genotyped with the conventional chip containing 54'001 SNPs.

Cross breeding project is about to start

Nafferton Ecological Farming Group has recruited dairy farms with low-input or organic management in UK that have a number of different cross breeds among their cows. The aim is to monitor performance of approximately 1000 cross bred cows on approximately 30 farms with 30-40 cows per herd although we still have a few more farms to make this target. Generally speaking, these farms have a heavy reliance on grazing to meet nutritional demands of milk production and are not suited to the high performing Holstein/Frisian cows found under more intensive management. At present these farms operate a range of cross breeding strategies but there has been little evaluation of their suitability's

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⁶ 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

Each farm is monitoring between 2 to 4 groups of 10 to 15 cows with similar breeding and we will compare their performance under common management. Herd managers are asked to supply records on udder health, feet & locomotion, fertility and milk production over the forthcoming year. Milk samples will also allow us to compare fatty acids and antioxidants profile and identify individual cows or crosses producing milk that might be better for our health.

Multi-criteria evaluation in dairy and beef cattle

Sven König from the University of Kassel, and PhD student Tong Yin, University of Göttingen, have estimated genetic correlation between milk yield (production trait) and conception rate (fertility trait) for Brown Swiss cows in low-input farms. A random regression model allowed the correlation to be estimated throughout lactation (see the graph below). This was found to be around -0.7 for most of the time, rising to -0.3 towards the end of lactation, as milk yield declined. This result is consistent with publications for cattle on conventional farms, and implies a negative genetic relationship between production and fertility in dairy cattle, meaning that continued selection for milk yield would lead to a decrease in conception rates and other fertility traits.

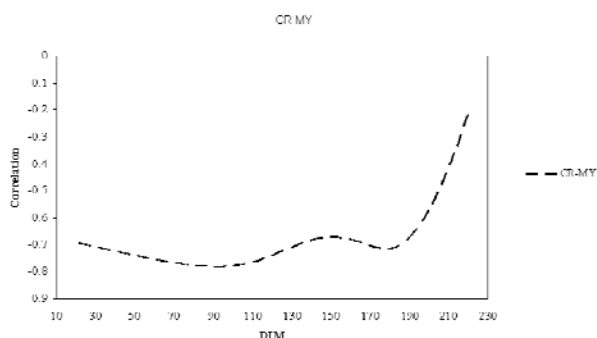


Figure: Genetic correlation between milk yield (MY) and conception rate (CR) along days in milk (DIM) estimated from Brown Swiss cows in low-input farm

Additionally, a comprehensive stochastic simulation program is being developed to compare breeding strategies in the genomic era, with respect to genetic gain and inbreeding.

First scenarios examined breeding programs for conventional farming. Breeding programmes employing genotyping of parents as a means of identifying future superior bulls were found to be competitive or superior to a classical young bull program. However, usually, a genomic breeding program will genotype young males and this was assessed in the second approach.

Scenarios with in this group were found to be superior over the young bull program by 1.0 SD to 1.2 SD of the average true breeding value of young male candidates. Within these scenarios, one scheme referred to an ideal situation under which genotypes for male calves are available without limitation. However, comparing average true breeding values, this ideal scenario is only superior if the reliability of genomic breeding values exceeds 0.50. So far, the conclusion is genotyping young males should be the main priority in today's breeding programmes and the next step is to verify results in a low input context.

Open Call

In autumn 2010 an open call to recruit additional partners for work package 1.3 on multi-criteria evaluation was issued. 19 applications were evaluated by three international experts and three new partners have been selected to join the LowInputBreeds project:

- › Animal Production Research Centre Nitra in Slovakia;
- › Department of Veterinary Science and Technology for Food Safety of University of Milan in Italy;
- › Moorepark Animal & Grassland Research and Innovation Centre of Teagasc in Ireland.

They will contribute phenotype and genotype data on dairy and beef cows, along with their expertise, to the project.

Outlook

The collection of phenotype records of low input cows is practically finished, and in the next weeks the genotyping of a sample from about 1200 cows will be completed. Most will be genotyped with the new high density 800k SNP chip and for those assessed for the 54k chip; SNP genotypes at missing loci will be imputed to reconstruct HD genotypic data. The method developed to date for genomic selection using bull's data will be evaluated for the ability to predict observed phenotype from the genetic data from the cows.

In work package 1.3, after estimating variance and covariance components for production and functional traits, a simulation study with a huge population of cows in both low input and conventional farm systems will assess the relative efficiency of selection based either on standard BLUP EBVs or genomic GEBVs. Also the existence and magnitude of a genotype-by-environment interaction between the conventional and low input farms will be investigated.

Subproject 2: Sheep production systems

Hervé Hoste¹

Activities from October 2010 to April 2011

During the last six months, some of the main experiments started in spring 2010 were completed. In many cases, further analyses of samples taken at necropsy either to examine the quality of meat or the parasitological data are still ongoing. Therefore, statistical analyses of data remain pending for most studies.²

Selection to improve abiotic and biotic stress resistance

The 1st round of monthly sampling in Crete for this work package was completed between December 2009 and July 2010 and a second year started in December 2010. However, the recent earthquakes in Christchurch, New Zealand disrupted facilities at the partner Lincoln University and has postponed analysis of bloods for genetic variation.

Management strategies of endoparasites

A large experiment comparing control management in combination with the transhumance of sheep was carried out by FiBL between spring and early October 2010. This was preceded by an indoor study comparing the anthelmintic (AH) activity of tannin rich (TR) fodders with or without faba beans (another TR feed). Meanwhile, a field experiment was performed by INRA to examine the influence of sainfoin to control gastrointestinal nematodes (GINs) in weaned lambs. Last an indoor experiment was performed by NAGREF to compare the AH efficiency of sainfoin and carob. Results obtained from all these studies confirmed sainfoin can

reduce nematode egg excretion and thus, pasture contamination. However, the AH effect appeared transient and highly dependent on the distribution of the TR fodders. Results obtained with other TR resources such as carob or faba beans appeared less promising but need further verification.

Development of strategies to improve lamb meat

INRA Theix and Toulouse have completed year 2 of studies comparing organic or conventional management and high or low pasture cover on lamb meat quality and parasite infections. Preliminary results suggest increasing stocking rates of organic systems might lower meat quality.

The University of Catania is currently completing the remaining laboratory analyses of the 2010 study considering the interaction between lamb management (outdoor versus indoor) and grazing time (morning, afternoon or whole day) on meat quality. Meat samples were assessed for; fatty acid composition, fat volatile compounds and oxidative stability.

The main results are:

- › *Muscle fatty acid composition*: It appears that no difference occurred in the carcass yield between lambs grazing on the afternoon rather than the whole day but the former results in a healthier fatty acid profile. Based on these results, a manuscript has been submitted to the journal *Meat Science*.
- › *Fat volatile compounds*: 60 compounds were measured including tracers of grass (2,3-octanedione; 1-ethyl-1,4-cyclohexanone) and indoors feeding (hexanal). Interestingly, pyrazine levels differed with time of grazing (morning vs afternoon grazing).
- › *Meat oxidative stability*: This has been measured by colour coordinates, myoglobin and lipid oxidation during 10 days refrigerated storage. Assessment is completed and currently being analysed statistically.

In addition, University of Catania is performing the laboratory analyses to assess quality (individual fatty acids and oxidative stability) in meat from 48 animals slaughtered at the end of the experiment conducted by FiBL in 2010, aiming at *Quantifying the effect of integrating the use of (a) tannin rich forages/ concentrates, (b) parasite tolerant breeds and (c) strategic use of clean pastures on lamb meat quality*.

Dissemination activities

Hervé Hoste, manager of the subproject on sheep, presented information on the potential of sainfoin and other tannin rich forages to control GI Nematodes in ruminants on the INRA stand during the Salon

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² 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

International de l'Agriculture held in Paris in February 2011; this fair has 800'000 visitors.

Outlook

From May 2011 to October 2011 new field studies will be performed and processing of results obtained from the four main experiments performed during 2010 will continue. Hopefully, analysis of blood samples to assess stress resistance in the Cretan sheep will start in New Zealand later this year.

Subproject 3: Pig production systems

Jascha Leenhouwers¹

Review of the past six months of the three work packages²

Progress made in subproject 3 on pig breeding from October 2010 until March 2011 is listed below:

- › Results of the literature study and technical survey of performance of traditional versus conventional pig breeds were presented at the EAAP conference in Crete (2010).
- › On Dutch organic farms, a rotation breeding structure has been implemented to provide organic farms with replacement gilts.
- › Sample collection for DNA profiling is on-going on two outdoor pig farms in Spain. Data will be used to reduce finisher mortality using a genetic fingerprinting approach.
- › Gilts from two genetic father lines have been born and reared under barren or enriched (organic) conditions to investigate the effect on future maternal behaviour. Interestingly, conventional farmers have shown an interest in the potential effects of rearing conditions on subsequent maternal behaviour. Results of this project may also be applicable in conventional

production, since there is likely to be pressure to convert existing farrowing conditions to loose housing pens.

- › In the evaluation of pig genotype on carcass and meat quality in heavy pigs used for regional pork products, the fattening period of the first trial started as planned in October 2010. Meat samples from the standard hybrid genotype, which reached slaughter weight of 165 kg, have already been taken. However, the first trial continues until the beginning of August 2011, when the last Angler Saddleback are expected to reach slaughter weight.
- › On March 16, the third progress meeting of subproject 3 (pig production systems) was held in Wageningen.

Outlook with regard to next period

- › Performance results of traditional and modern breeds in low input/organic production systems will be presented at the European Saddleback meeting in Germany (May 2011).
- › Sample collection for DNA profiling will start at a large outdoor low input pig farm in Brazil. These data will be used to implement a breeding strategy to reduce mortality of finishing pigs in low input pig production systems.
- › In the spring of 2011, the first litters will be born to gilts reared under barren and organic conditions and observations of gilt maternal behaviour during farrowing and lactation will begin.
- › In August 2011, the second trial investigating effects of pig genotype on carcass and meat quality will start.
- › Production of air dried sausage is planned for September 2011.

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² 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.

Subproject 4: Laying hens

Ferry Leenstra¹

LowInputBreeds for laying hens goes on farm²

After interviews with large numbers of free range and organic poultry farmers in France, Switzerland and The Netherlands and workshops to identify the ideal hen, farm visits have started on forty farms in each country. The farm visits follow a proven protocol and will provide additional data on best practice and performance of different genotypes under free range and organic systems.

A number of critical issues including feathering, incidence of twisted and broken keelbones and egg quality will be assessed. Quality of the feather cover and feather pecking are negatively related and both important for performance of free range systems. Twisted and broken keelbones are an indicator for overall skeletal problems and appear to be more of a problem in free ranging hens compared to cage systems. We want to explore differences between farms and identify possible explanations.

Egg quality reflects a number of issues, many of which can be assessed by information already available from records, like egg weight and percentage of second grade eggs. Moreover information will be collected on yolk colour and haugh units (an indicator of freshness and shelf life). If variation between farms is identified in feeding practices, especially relating to intake of grass from the range or supplementary algae that might cause changes in fatty acid composition of the eggs, samples will be taken for analysis. The relative proportion of omega-3 and -6 fatty acids are especially interesting.

The visits will also assess interest in, and potential for performance testing, a promising genotype, offered by Institut Sélection Animale, a Hendrix Genetics company. The farmers involved will be the core of the participatory farmers breeding network, although the network will also be open to others interested in free range and organic systems.

The farm visits will be carried out during 2011. In 2011 further workshops will be arranged depending on the topics the farmers indicate as necessary and/or interesting.



Mixed flocks of white and brown genotypes are typical for Swiss organic farms (Picture: Veronika Maurer, FiBL)



Feathering of hens is scored on 50 animals/flock during the farm visits (Picture: Monique Bestman, LBI)



Jeroen Visscher (ISA) and Esther Zeltner (FiBL) at a workshop with farmers in Frick (Picture: Hans-Peter Widmer, Schweizer Bauer)

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² 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

Forthcoming events

Announcement: LowInputBreeds Specialist Training Workshop in June 2011

From June 20-24, 2011, the **course "Genomic Selection in Livestock"** will take place in Davos, Switzerland.

It is one of the LowInputBreeds workshops for early stage researchers and agricultural advisors/technologists to facilitate an exchange of ideas/opinions and know-how and encourage potential future collaboration.

Applicants should send their applications (CV plus motivation letter) to veronika.maurer@fibl.org by April 26.

The workshop is organised by the LowInputBreeds partner agn Genetics.

More information

› www.LowInputBreeds.org

Second LowInputBreeds Conference in Tunisia 2012

The next LowInputBreeds conference will take place in spring 2012 (before Easter) in Tunisia. It is organized by the National Agricultural Research Institute of Tunisia. More detailed information will be made available at the LowInputBreeds homepage.

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Partner List of the LowInputBreeds project²¹

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 / Pigure 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

Imprint

The LowInputBreeds newsletter is published by the Research Institute of Organic Agriculture FiBL and Newcastle University, Nafferton Ecological Farming Group on behalf of the LowInputBreeds Consortium. The LowInputBreeds project is co-financed as a Collaborative Project by the European Commission, under the Seventh Framework Programme for Research and Technological Development (Grant agreement No 222623).

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This newsletter is available at project website www.lowinputbreeds.org. The newsletter is published every six months.

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²¹ For more details see <http://www.lowinputbreeds.org/partners.html>