

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

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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 Skafia 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