TECHNICAL NOTE

LowInputBreeds

Dairy Sheep Breeding

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About

In order to optimize the dairy production from sheep and avoid high treatment and intervention costs, scrupulous management at all stages of production is required. This is usually complex, since many factors need to be taken into account including infrastructure, pasture management and nutrition. In this technical note particular emphasis is given to preventive measures to preserve good health and high reproductive performance of dairy ewes.

General characteristics of dairy sheep

The **length of lactation** and **milk production** per lactation are the most important characteristics of dairy breed animals. Improving these traits is of major importance in dairy sheep farms.

There is big variation in milk production potential among sheep breeds and, as with other species of dairy animals, also considerable genetic variation within most breeds. Thus, ewe selection based purely on breed is not the ultimate answer to improve milk production.

Better milk yields can be achieved, for example, by monitoring and grouping ewes within flocks according to their physiological stage, enabling successful breeding and proper management by targeting inputs to the appropriate stage of their productive cycle.

The dairy breeds

The Mediterranean region with its long tradition in cheese production and consumption is home to many breeds of dairy sheep. Breeds such as the Lacaune from France, Sarda from Italy, Awassi from Israel, East Friesian from Northern Europe, and Chios or Sfakiano from Greece appear to be the most productive. Milk yields range from 250 to 600 litres per ewe over a lactation period of up to 260 days.

Our research within the LowInputBreeds project is studying the mountainous Sfakiano breed which is a dairy breed of dual purpose (milk/lamb meat). More precisely, we focused on control of the most common biotic (i.e.: mastitis, parasitic infections and foot rot) and abiotic (i.e: climate, management system etc.) stress factors since they can significantly affect (a) production efficiency, (b) product quality, but also (c) animal welfare.

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Download at www.lowinputbreeds.org

Management systems of dairy sheep farms

Based on capital investment and feeding system, dairy sheep farms can be classified as:

- Extensive
- Semi-intensive
- Intensive

The most commonly applied management systems in southern Europe are the extensive and the semi-intensive, with main differences based on the capital invested and the farm infrastructures. These are low-input systems, since farmers invest little per ewe, especially regarding permanent infrastructures and machinery.

In extensive farms the invested capital is relatively low. Local breeds of animals are used, which are well adapted to the local environment and significantly resistant to many diseases. Nutrition is mainly based on grazing of mountainous pastures and cultivated fields with fresh oat or barley, which in some cases is limited due to semi-arid climate (e.g. in south Europe). Sheep are kept outdoors almost throughout the year although shelter is used during winter for protection from bad weather conditions.

Although productivity of these farms is usually medium or low, the quality of milk products produced can be high especially due to the ewes' diet. The nutritional and sensory characteristics of such dairy products are usually of high qua-lity and acceptability by consumers.

In semi-intensive sheep farms, the invested capital is higher with more facilities available, including functional buildings, milking machines and mechanisation.

Sheep are grazed daily for several hours in improved pastures and also offered a concentrate supplement when back in the stable. Milking in most cases is mechanised and takes place indoors (milking parlour).

Nowadays we face **the challenge** to preserve the "identity" of such traditional management systems enhancing productivity and milk quality. The **LowInputBreeds Project** aims to utilize advanced techniques to improve productivity and functionality of such low-input management systems and simultaneously confirming the high quality of their milk products. The LowInputBreeds project is using selection to improve breeding traits by using a combination of traditional 'phenotype' based selection approaches and 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. There is well documented phenotypic heterogeneity for these traits within the existing populations of the local breeds, so these tools may allow a more rapid selection 'within breeds'.

Milking of ewes with a portable milking machine in an extensive farm in Crete, Greece. (Photo: N. Tzanidakis)

Facts on sheep breeding

Nutritional requirements

Good health status, especially as regards the gastrointestinal track, is a prerequisite for productivity. The microbial flora of their rumen acts as 'a biochemical factory', playing an important role in regurgitation, fermentation and food digestion. In order to maintain normal functions, farmers have to pay attention to the following:

- Avoid sudden changes in feed type and/or quantity; they are likely to result in low productivity and health problems.
- Fodder should form at least 30 % of the diet dry matter, to maintain rumen stability.
- Avoid oral antibiotics after weaning, which is likely to upset the balance of microbial flora in the rumen.

Reproduction physiology facts

Sheep are seasonal breeders (reproductive activity occurs only at specific times of the year). To manage them properly farmers have to know that:

- Day length is important; precisely the reduction of daylight going into autumn is the main trigger for reproductive cycling.
- During the 4 to 5 months breeding season, ewes are in oestrus (heat) for about 24 to 36 hours every 18 to 25 days until they conceive. Oestrus can occur at other times of the year but is less predictable and more difficult to detect in many breeds.
- The duration of a ewe's pregnancy is about 5 months (147 days).
- Depending on the breed and nutrition at the time of conception, the mean lambing rate is 1.5 lambs per ewe, and tends to increase in older ewes.
- Young ewes can be mated at 7 to 8 months of age, if well developed.

Reproductive performance can be further altered by controlling, with natural and/or artificial methods (nutrition, ram effect, intravaginal sponges or melatonin implants), the reproductive cycle of ewes.

Action required by farmers

Reproduction Management

There are various phases in the reproductive cycle of the ewe (Figure 1); each with its own characteristics and physiological status, affecting the nutritional requirements of the animals. Precisely:

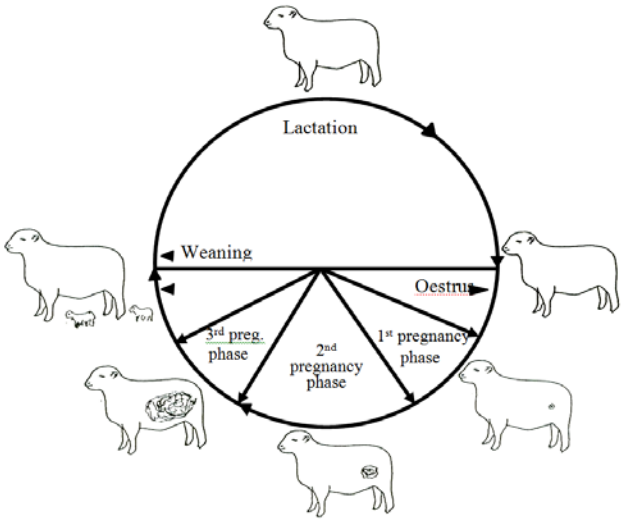

Figure 1: Reproductive cycle of ewes

a) Breeding season

In order to optimise conception and encourage a compact lambing preparation needs to start at least two months before the expected mating period.

General instructions:

- Separate all ewes from sight, sound and smell of rams for at least 50 days before breeding.
- Vaccinate, administer antiparasitics (if necessary) and cut long hoofs, 1 month before.
- If there are infectious diseases (especially, those interfering with reproduction, e.g. enzootic abortion) in farm or in neighbouring farms, take preventive measures.
- Ovulation is influenced by ewe nutrition and body condition, aiming for ewes in Body Condition Score (BCS) 2.5 to 3.5 and rams 4. Ideally ewes ought to be separate into groups, based on their condition with feeding targeted to gain or lose condition as appropriate about a month before mating.
- Ewes should not be rebred within two months of their last parturition (leave time for the uterus and udder to recover).
- Three weeks before mating, rams need to be suddenly introduced to ewes (start of mating) to achieve a rapid (7 to 9 days) and concentrated onset of oestrus by the 'ram effect'.
- Ensure the correct "male to female" ratio (in natural cycling 1:20 and in case of oestrus synchronization, 1:10) depending on ram experience.

b) 1st phase of pregnancy (1st month)

To prevent the early embryo deaths, stress should be avoided in this critical period:

1. Limit excessive handling of ewes; i.e. avoid vaccinations.
2. Animals must not be crowded or transported.
3. Prevent the exposure of animals to high temperatures; i.e. provide shelters with shadow.
4. Nutrition has to be constant and monitored.

c) 2nd phase of pregnancy (2nd & 3rd month)

During this period the nutritional needs of ewes are low, because the nutritional demands of the embryos are negligible (Figure 2).

The proper development of the placenta is essential for survival and development of foetuses in the uterus. So, animals must maintain condition (not get leaner or fatter).

Ultrasonographic diagnosis of pregnancy is suggested in order to separate uniparous and multiparous ewes in different groups as this has a major impact over subsequent feed requirements.

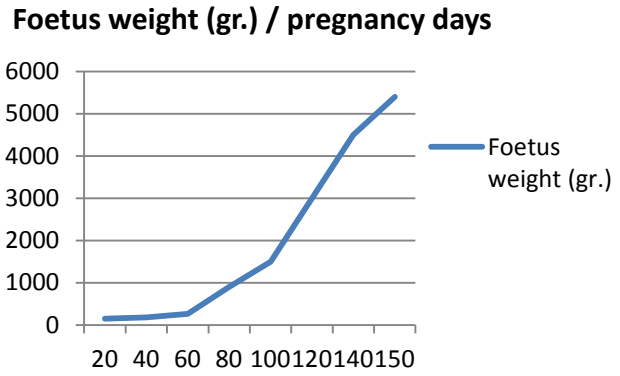

Figure 2: Growth curve of foetus weight during single lamb pregnancy

d) 3rd phase of pregnancy (4th and 5th month)

This phase of pregnancy is the most critical and problems can affect productivity of the ewe and health status of mother and lambs after parturition. The nutritional needs of ewes during the last stage of pregnancy increase considerably, especially if carrying twins, because embryos grow with increasing rates (Figure 2). This period is also critical for the nutritional condition of ewes at parturition, which is essential for a high productive lactation.

- At the beginning of this phase, the vet has to assess the nutritional status of ewes (BCS) in order to make a plan for the last two months of gestation.
- Weak animals must be separated into a group, for better care.
- It would be good to separate the early from the late lambing ewes.
- Seven weeks before predicted lambing, ewes must be fed as if they were producing 1 kg milk per day. Rations must

be balanced for energy, protein, salts, trace elements and vitamins to prevent common metabolic conditions such as hypocalcaemia or pregnancy toxaemia, although ewes need forage in addition to cereals (maize, barley, oat).

- Antiparasitic treatments (if necessary) and essential vaccinations have to be made one month before the estimated parturition date.
- Provide approximately 1 square meter/animal within housing and avoid overcrowded, transport or other stresses.
- Towards the end of this phase, some days before the parturition, pens must be cleaned and disinfected.
- In case abortions are encountered, the animals should be separated and veterinary consultation should be sought.

e) Lambing

- Ewes should be monitored 24 hours per day during the lambing period. Proper care should be given to the animals in need and discomfort avoided.
- In case of health problems around lambing time, such as dystocia, cervix prolapse or mastitis, animals should be separated to avoid spreading potential pathogens and treated immediately.
- Always check if there is enough colostrum and milk for the lambs; udders should be thoroughly inspected for signs of mastitis.

We must not forget that:

- Mastitis is high prevalent the first three weeks after birth.
- Lambs must consume 500 to 1000 ml of colostrum within 4 to 6 hours of birth.
- Iodine tincture must be applied to the lambs' umbilical cords immediately after birth.
- Small, weak lambs should be kept in a warm, clean, draft free environment, ensure they manage udder-feeding and administered vitamins and energy supplements if appropriate.
- In case of disease (i.e. pneumonia, diarrhoea) history in the farm antibiotics could be administered preventively to avoid losses.
- Provide a high quality concentrate feed and increase the quantity of fodder (hay) to compensate for a temporary reduction in ewes' appetite after birth, and to maintain milk production/quality.
- Fifteen days after birth, feed ought to be gradually increased to support milk production. The ration has to be properly balanced by a nutritionist/animal scientist according to ewes' live weight, age, nutritional status and available feeds.
- Lambs have to be vaccinated for enterotoxaemia at 20 to 30 days with a repeat after four weeks, if mothers had not been vaccinated one month before parturition.
- If lamb deaths occur due to *Pasteurella* spp. infection or if there has been a similar problem in previous years, lambs should be vaccinated with a combination vaccine (enterotoxaemia and *Pasteurella*), at 15 to 20 days with a booster vaccination one month later.
- If there is a history of paratuberculosis in your farm or the neighbouring area, lambs can be vaccinated at the age of 10 to 30 days for this disease.
- An antiparasitic treatment may be given to lambs from 30 to 40 days of age, depending on the history of the farm/area and recent faecal egg counts (FEC) of the flock. Lambs also ought to be checked for ectoparasites.

f) Weaning of Lambs

The lambs should be weaned no later than 45 days of age (preferably at 30 days). The earlier lambs are weaned the less ewes will be stressed and by this way the quantity of milk produced will be higher.

- The lambs consume solid feed, after the 15th day of age and this can be encouraged with good quality hay and a special weaning ration. An optimal solution is to create a separate creep area, accessible only to new born lambs.
- After weaning, young lambs will have to adapt to the conditions of a new environment, so daily inspections are required (check quantity of food they consume, health status, weight gain etc.).
- Lambs with problems, such as diarrhoea, reduced appetite or weight loss, should be separated from the rest, to receive treatment in a clean, warm and wind draft free space (also to avoid the spread of pathogens).

Ewe Milking

Milk production by ewes increases from lambing until the 3rd to 7th week of lactation, depending on the breed. Then, it remains rather constant for about 1 to 3 months, gradually decreasing later on before the onset of the dry period (figure 3).

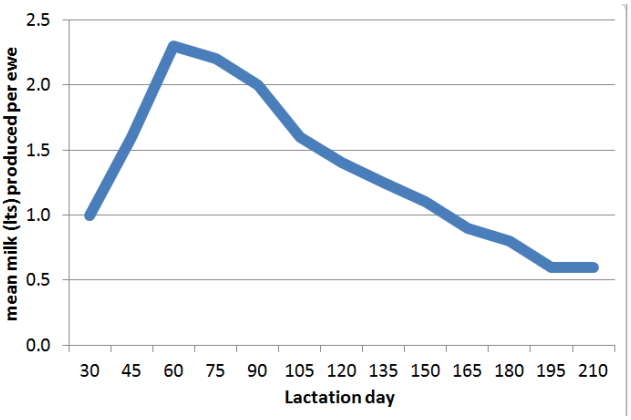

Figure 3: Average milk yield of Sfakia ewes per day of lactation period.

Hand milking in extensive farm. Photo: N. Tzanidakis

Animals with low dairy capacity reach maximum milk production earlier and are also drying off earlier than those which produce more milk.

Factors affecting milk production:

- The genetic potential of ewes.
- The numbers of lambs - ewes with two lambs produce more milk compared to ewes with single lambs.
- The body condition score and weight of ewes - excessive feeding (a common mistake) leads to fattening and reduces milk production.
- Nutrition during late pregnancy - an unbalanced ration will result in subsequent reduced in milk production.
- Nutrition during lactation - animal needs differ from stage to stage and feeding needs to be matched accordingly. Moreover sudden changes can reduce milk quantity and such adverse effects are more pronounced after the 3rd month of lactation.
- The age of ewes - milk production increases from first lambing until the 3rd/4th, remains quite stable until the 5th/6th lactation period and, then decreases in older ewes.
- The number of milkings per day - ewes milked three times instead of twice per day give higher yields.
- The season of the year - extreme weather conditions affect milk production.

Udder infections

Mastitis is the inflammation of the udder, usually following microorganisms invasion through the teats, and is one of the most frequent pathological conditions of dairy sheep.

The factors that are involved in contamination of the udder are presented in figure 4, these relate to the ewes, their environment and the presence of potential pathogens.

Mastitis creates significant health problems and major economic losses due to:

- Reduction of milk quantity and quality
- Permanent destruction of udder tissue
- Increased mortality
- High treatment costs
- Potential for antibiotic resistant organisms developing.

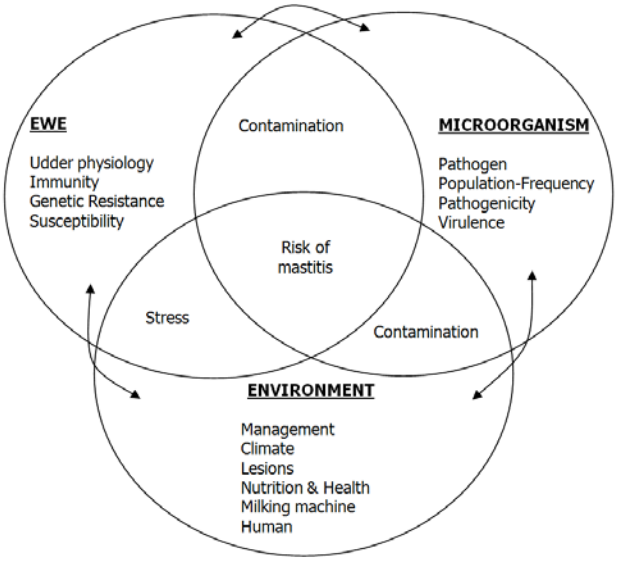

Figure 4: Frequent factors causing mastitis

After each milking, the teat duct remains open for 30 minutes. During this period ewes are more susceptible to invasion of microorganisms from the teat, especially if the animals lie on dirty surfaces (Figure 5).

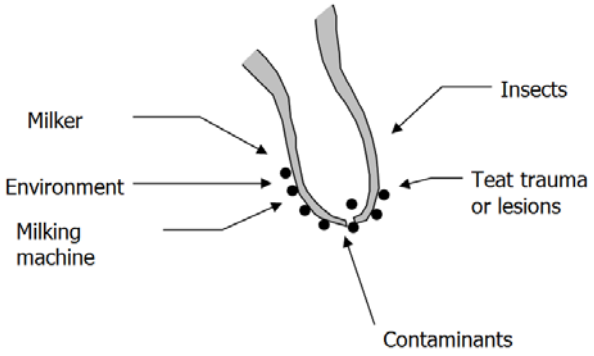

Figure 5: Invasion sources of pathogens to an udder teat

Ewes with clinical mastitis are only the "tip of the iceberg". For each clinical case, a number of subclinical cases are usually present, which cause, significant production losses, even in the absence of clinical signs.

Prevention and treatment are of major importance in the control of mastitis and, depending on the country, a few vaccines are available, which help mainly with clinical mastitis. Therapeutic approach and adjusted treatment schemes should be applied under the guidance of the veterinarian, who will send milk samples for microbiological examinations and antibiotic testing and then conduct a therapeutic approach specialized for each farm.

Conclusion

Management on a dairy sheep farm is an important but complex procedure, necessary for the commercial viability. Management strategies have to account for all aspects of reproductive physiology, productive performance and the health status of the animals as well as nutrition, grazing systems and the quality of infrastructures. The farmer may not handle all these aspects by his own; mistakes and inappropriate management can lead to disastrous results, regardless if modern equipment and facilities are available. Thus, it may be prudent to seek advice and help by professionals (veterinarians, animal scientists) to ensure proper animal and farm management necessary to improve yield and quality of milk and dairy product.

Traditional breeds are known to be more robust to abiotic and biotic stress factors and improvements in extensive and semi-intensive management systems have proved effective to reduce diseases (especially parasites and mastitis) and veterinary medicine inputs. Integration of innovative breeding, management and nutrition enhancement with bioactive plants are expected to be the main outputs of the LowInputBreeds project. A main aim is also to improve productivity and support farmers overcome numerous modern problems of sheep farming.

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Imprint

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LowInputBreeds

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Review

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Cover picture

Ewe and her lamb grazing in Cretan mountain (Greece). Photo by Nikolaos Tzanidakis

Publishers

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