Best Practice Guide on Goats

This guide aims to assist dairy goat farmers using new technologies on farm. It outlines the different technologies available for goats, and offers some general advice on their use.

Introduction

In the European Union, dairy goat sector is pretty small when compared to dairy cows sector. Even so, EU owns only 3 % of the world's dairy goat herds, but produces 10.5 % of the world's goat milk (FAOSTAT, 2014); this is the only continent where goat milk has such an economic importance and organization. In Europe, dairy goat production is more common around the Mediterranean basis, where it is important from an economic, environmental and sociological perspective to the Mediterranean countries (Spain, France, Italy and Greece), but is also important in North-Europe countries like the Netherlands.

Productive systems vary from semi-extensive situations to highly technological intensive farms. Some regions have typically extensive grazing-based productions, often using native breeds to produce PDO or PGI products. However, farms using high productive breeds tend to intensification. Anyway, there is room for improvement in all cases, so it is worthwhile to go in depth into all the technologies available for dairy goat producers.

Which sensors can I use?

Here you can find the main type of sensors and technologies currently used in dairy goat farming. For more detailed information about available commercial technologies you can see the document ***Warehouse of technologies.***

Electronic identification devices

Electronic tagging in small ruminants is compulsory since 31 December 2009 in the EU, usually by a ruminal bolus. In goats, the ruminal bolus may be replaced by any of the following alternatives with the approval of the competent authority: an electronic ear tag, an electronic leg tag on the right posterior extremity or an injectable transponder on the right metatarsal.

Photo 1. Example of electronic ID leg tag for goats. Source: SCR.

The use of individual electronic identification offers several advantages, and could be useful for: automatic milk recording systems, kidding recording, health problems, traceability, sorting gates or automatic weighing; making it possible also for genetic improvement.

It can be used for the automation of routine tasks and the reduction of time and human error during performance recording and data

transfer. Ait-Saidi et al. (2008) found that a Semiautomatic Milk Recording Systems with electronic ID would produce a saving in labour cost ranging from €0.5 to €12.9 per milk recording for goat herds from 24 to 480 goats, respectively. Electronic ID was more efficient for labour costs and resulted in fewer data errors, the benefit being greater with previously trained operators and larger goat herds.

Automatic milk meters

Automatic milking systems are one of the most common technologies used worldwide. Their use may range from simply milk meters adapted to goat production, to automatic milking systems with electronic ID, measurement of milk yield, electrical conductivity, milking time, flow rate…

Bullet points
Depending on your farm situation you may choose one system over another. Some questions you might ask yourself: - *How many animals are milking?* - *Which data I need to collect?* - *How the data transfer works?* - *How easy is it to use the system?* - *How long will the system last?* - *Which is the warranty policy?* - *What support is available?* - *Which other technologies are being used on farm?*

Table 1. General performance indicators (KPIs) of udder health on goat farms (but depending on the breed).

KPI	Target
Days in milk	> 240
Milk production per milking	1-3 L
% protein in milk	> 3.2
% fat in milk	> 4.5

Milk electrical conductivity meters

Milk electrical conductivity (EC) has been used in dairy cattle as a tool for mastitis detection for either early subclinical and clinical cases. It can be automated in the milking parlour and gives early results (on-line), as well as it have positive economic effects of shorter treatments, less milk loss, and better milk quality and safety. But in goats several factors other than mastitis are related to EC: parity, lactation stage, individual variation of EC, farm and analysed milk section.

EC sensors can be located on the short milk tube or claw. Better results are obtained when daily variations of EC in a gland were considered in the algorithms, alone or combined with other variables (yield or temperature); most studied methods used comparison of gland EC with moving average of previous days. Other methods include several variables and more complex algorithms (neuronal net, tracking signal method, fuzzy logic) but the results are similar to those mentioned above.

Reproduction

No sensors are available to monitor reproduction on goat farms yet. DeLaval software helps you analysing your data to pinpoint the optimal window for insemination. But there are no pedometers or progesterone automatic detectors adapted to goats.

Management software

There is a long list of management software solutions for goat farms, with a wide range of features. The best ones are linked to electronic ID and data from the milking parlour, but usually they also allow manual data entrance for a global farm management.

Why are these programs useful?

First of all because data is knowledge. If you always have information about milk production, you can identify trends that may indicate a health issue sooner, know which animals are failing to perform to expectations, and help you plan your breeding based on anticipated future demand. Therefore, you will have a tool to make more informed decisions, which may also help to improve your farm's performance and increase productivity.

Features:

Management software can be useful to monitor oestrus cycles, milking data, treatment records, genetic evaluations or breeding information, for example. You can check historic data from an individual animal or all the herd, look for key performance indicators and link this information with cost analysis.

Some programs can also share the information with your usual veterinarian or assessor to prevent health issues. On the other hand, they may provide the reports required by the Authorities i.e. treatment records.

The combination of the software with electronic ID will minimize errors and help you to create valuable information.
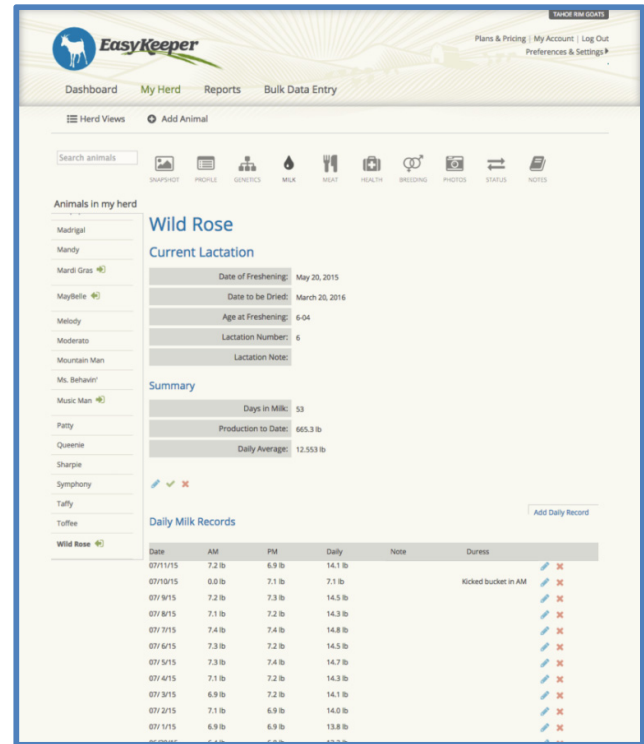

Photo 4. Example of management program. Source: EasyKeeper.

Smart housing

Dairy goat production can also take advantage of smart housing technologies in order to improve productivity, and monitor and control the environment to acquire optimal environmental conditions.

You can see the **Best Practice Guide on Housing** for more detailed information. You can also check out this case-study about using light to extend the breeding season in goats; and this other about a program for monitoring and management of farms by the use of sensors.

Automatic feeders

Feed is an essential part of the management of dairy farms, and is one of the highest costs

of milking production. It is indispensable for the profitability of the farm and also directly influences animal performance and health status.

Automatic feeders can be used to: increase feed intake, control of feed/concentrates, recognize individual needs and adjust the daily ration for each goat, so waste less feed. Individual feed monitoring helps to calculate the productivity of each goat versus the quantity of feed being consumed. But automatic feeders are not only available for individual feeding. Since December 2016 the automatic feeder system Lely Vector is also available for goat farms. This system provides fresh feeding round-the-clock to the groups of goats. It offers extensive flexibility and allows easy adjustment of the mixed ration or changes to concentrates for each group of goats with minimal labour input into mainstream farming.

On the other hand, automatic feeders for kids are also a great investment. They have grown in popularity because they can save hours of daily hand-work (reduced labour cost and labour flexibility), feed smaller proportions more often (so prevent gorging and bloating), increase daily gains, maintain high hygiene and improve health of animals.
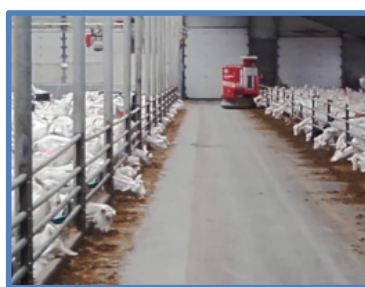

Photo 2. Left photo: Example of automatic individual feeder for adult goats. Source: DeLaval. Right photo: Example of automatic feeder for groups. Source: Lely Vector.

Before deciding to buy any computerized feeder, farmers must consider the maximum number of animals that will use the system and the benefits of automation in their farm.

In order to monitor the nutrition status of your animals, you may combine these sensors with an automatic weighting system. You can also add a sorting gate to simplify the management of the animals.

Table 2. General KPIs of feed management and efficiency.

KPI	Target
Dry matter intake	5% of body weight
Water intake	up to 3 times total dry matter intake

Specific case: Salt Stone Reader

In many cases, the extra apportion of salt in the feeding of animals is essential for the correct growth, development and reproduction of goats. But how can you control and monitor the animals who go to lick the salt stone?

The company BioControl has developed the "Salt Stone Reader" that will record the animal ID by reading their RFID ear tags when they pass by the reader. This way, you can keep an overview of the animals missing the nutritional supplement. This is of great importance in semi-extensive or grazing conditions, but might also be useful in large barns.

The recordings are send through the phone network to the company server, and the user can go to the webpage to see the recorded readings. The salt stone reader uses a solar

panel and a battery to store energy, and can therefore be placed in an area without access to electricity.

With this technology, you can identify animals not recorded, and kits that are not following their mother. In a large grazing area you can also see irregularities of where the animals are grazing or which of them are grazing together, and track missing animals from "when an where" they were last seen.

It can also be combined with sorting gates to plan the gathering more efficiently.

Photo 3. *Salt Stone Reader on a grazing area. Source: BioControl.*

Specific case: technology for extensive systems

Some farmers have dairy goat (and sheep) herds in extensive or semi-extensive conditions, usually linked to native breeds and PDO or PGI products. In this case, the most useful technology is **GPS location**.

The main problem for these farmers is to locate their herd for milking. If it is not possible to find them, they can spend several days away from milking and lose milk. That's why

they use GPS location systems. Farmers use a few animals as sentinels (or all of them) with the GPS system and then they always know where their animals are at any time.

Some systems can also highlight where action needs to be taken: illnesses, accidents, births, robberies or attacks from other animals.
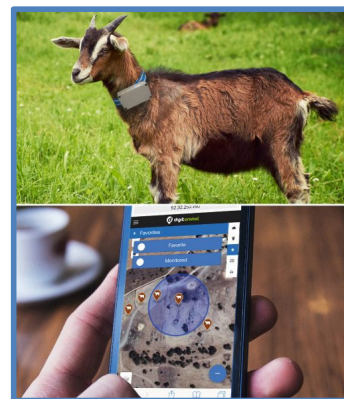
Check out this case-study to get more information.

Photo 5. *Example of GPS system for goats. Source: Digitanimal.*

What is new in research?

- pH and temperature sensors: for monitoring rumen function and to discriminate between sensitive and tolerant goats to rumen acidosis. At this moment commercial boluses are not available to measure it, because they are too big for oral administration and their use requires surgery (experimental conditions).

- Lying behaviour: Changes in standing and lying behaviour are frequently used in farm animals as indictors of comfort and health. For this reason Zobel et al. (2015) studied the

validation of accelerometer-based data loggers for use in goats. The loggers could record lying behaviour in both mature, pregnant does and younger (8–12 mo) goats. Note that cow-accelerometers can not be used in goats because their size makes them unsuitable for use on small ruminants.

- **Electronic Alpha®-Detector:** for automated detection of mounting activity for sheep. This tool is still in development, but is based on detection of the ewe (who is equipped with a RFID transponder) accepting mounting by the ram (who is wearing a leather harness with the Alpha Detector). Alpha-Reader (Alpha-R®) remotely collects mounting data and analyses it in order to obtain a list of mounted ewes. The objective is to have a real-time monitoring of males and females' sexual behaviour, and identify ewes that should be mated for natural mating or artificial insemination after male effect. It could be useful also to evaluate ram's libido. It is designed for sheep but maybe it can also be used for goats.

Best practices and tips

When you think about investments in technology you need to find the systems that would best suit your farm needs. Some tips and considerations:

- Keep changes to a minimum and evaluate data results with your veterinarian or advisor (i.e. changes in nutrition or milking protocols).
- Have you several groups of animals to be managed different?
- Before buying new technologies look at the other functionalities that would best suit your farm needs.
- Combine all the data to improve decision making.
- Early identification of potential management challenges helps maximize efficiency and productivity, reducing potential milk production losses and improving animal health.
- Integrate the electronic ID with other tools like sorting gates or automatic recording systems.
- Monitor all your data so you will benchmark your animals historically or against other herds.

Note: Many other technologies do not provide information to help decision-making, but could be an improvement for specific situations. For example, a lot of milking systems adapted for goats, feeder pushers or small rotating brushes for goats. Do not forget them when you consider investing in your farm on a first step.

Technology should be a way of helping stockman target their stockmanship skills, but not be seen as a replacement for good stockmanship.

consult your veterinarian or advisor to ensure that the actions suit your farm.