

## **Welfare standards and precision livestock measures in dairy sheep and goat farms**

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EU countries produce near 28 and 11% of the world's sheep and goat milk, mainly devoted for cheese and dairy products. The EU small ruminant dairy production is mainly located in the Mediterranean area and encouraged by the current milk prices and the increasing demand of dairy products. Although traditional production systems are still predominant, EU dairy sheep and goat farms tend to intensification with long periods of permanent housing and large number of animals per farm (i.e., thousands), the suitable individual care of animals being unaffordable by traditional methods. Electronic identification of small ruminants is currently mandatory by sanitary reasons and already implemented in most EU countries (i.e., >600,000 head) which offers interesting opportunities for applying livestock precision measures in dairy sheep and goat farms. This is the case of the available automatic milk meters supplying individual yield and milk flow data at each milking. There are few objective data available on the welfare requirements and the relationship of metabolic and productive indicators for dairy sheep and dairy goats, most of them extrapolated from dairy cows. Moreover, despite being usually considered together, there are dramatic differences in physiology and behaviour between dairy sheep and dairy goats, as well as between some of their very diversified breeds (i.e., wool cover, ear length), making necessary a specific study of the relevant indicators to be used in each case (i.e., critical temperatures, sub-acute rumen acidosis, ketosis, lameness) in practice. Use of infrared cameras, rumen sensors (i.e., pH and temperature), body temperature (i.e., stress-induced hyperthermia) and activity data loggers, most of them similar to those used in dairy cattle, is currently very limited and needing further research. This study reviews the state-of-the-art of the measuring technologies currently available, summarizes the known impact of some management practices and the physiological particularities of dairy sheep and dairy goats, when compared to dairy cows. Several priority research areas are also identified.

### **Acknowledgements**

This article is based upon work from COST Action FA1308 DairyCare, supported by COST (European Cooperation in Science and Technology, [www.cost.eu](http://www.cost.eu)). COST is a funding agency for research and innovation networks. COST Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.