Priority Innovations for European Sheep and Goat Industry Members

Daniel Martin-Collado[1], Gus Rose[2], Clara Diaz[3], Kostantino Zaralis[4], and David Yañez-Ruiz[3]

[1]Centro de Investigación y Tecnología Agroalimentaria de Aragón, Zaragoza, Spain, e-mail: danielmartincollado@gmail.com
[2]Aristotelio Panepistimio Thessalonikis, Greece, e-mail: gus@gusrose.com
[3]Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Spain, e-mail: cdiaz@inia.es
[4]The Organic Research Centre, United Kingdom, e-mail: Kostas.z@organicresearchcentre.com
[5]Agencia Estatal Consejo Superior De Investigaciones Científicas, Spain, e-mail: david.yanez@eez.csic.es

Abstract. Innovation and innovative practices can improve the sustainability of sheep and goat sector, however, they are not extensively used, tested or validated. In this context, iSAGE project aims to explore the potential of key innovations that may contribute increase the sustainability of sheep and goat production system in Europe. Key innovations were identified using a survey and 2 workshops with 18 European industry and science organizations. Industry partners then selected 35 innovations to test on farms. The main reason for industry partners to test these innovations was related to economic sustainability. However, direct and indirect social and environmental benefits of the selected innovations will also be explored using farm data, surveys and interviews. Some remarkable innovations were related to the development and implementation of genomic selection and individual recording technologies, and to the increase social sustainability of sheep farming by boosting the generational turnover and support new entrants.

Keywords: innovations, sheep, goats, iSAGE, industry, sustainability

1 Introduction

The sheep and goat sector in Europe is very diverse with different stages of development and diversity across and within counties and among breeds (De Rancourt et al. 2006). This diversity applies to many elements such as feed resources and feeding systems, breeds, types of farming (milk and/or meat), types of products, production intensity, and importance of the farming to the area. In general, sheep and goat sector is less developed than pig, poultry and cattle sectors, which are usually less diverse. Still, innovations are being developed for intensive sheep and goat systems; however, there is a significant proportion of farms that operate using very

similar technology and knowledge used in last decades. This lack of technical and innovative development may be reducing the effectiveness and sustainability of sheep and goats systems.

Innovations and innovative practices that have helped farming systems evolve include practices and technology related to feed and drugs, animal breeding, product marketing, infrastructural and organizational operations. Recent development of information and precision technology, data management and genetics and genomics, have led to a whole new set of farming innovation that have been, or are planned to be introduced into farms (Caja et al., 2014). In many cases these innovations are still being developed and tested and their potential being explored for sheep and goat industry (Dubeuf, 2014). In addition, the innovations need to be tested on various farming systems to understand their relevance, benefits, and trade-offs (Dubeuf and Sayadi, 2014). However, the testing and spread of innovations on sheep and goat farms is challenging due to its heterogeneity.

Other challenges for introducing innovation into sheep and goat production systems are:

1. Relative to other agricultural sectors, sheep and particularly goat technology has remained relatively stagnant and neglected from the mainstream research.
2. Low sector incomes. Increasing input costs, combined with inadequate farm-gate prices and poor monetization of by-products have made incomes among the lowest in the agricultural industry and heavily dependent on public support.
3. Lack of skilled workers. The sector productivity is hampered by a lack of technical services and training. Declining rural populations creates a shortage of skilled workers.
4. High farmer age and lack of generation transfer. Sheep and goat farmers are older than farmers in other sectors. Elderly farmers are often reluctant to make changes and young people are not interested in the business.

Therefore, the iSAGE project aims to identify and explore the potential of key innovations that may contribute increase the sustainability of sheep and goat production system in Europe.

2 Methods

We identified innovations that the European sheep and goat industry think are important to increase sustainability. These innovations were found with help from the EU funded iSAGE project (isage.eu) consortium which includes 18 partners representing the sheep and goat industry. These industry institutions are among the most relevant and representative of sheep and goat farmers in the Finland, France, Greece, Italy, Spain, Turkey, and UK.

We identified and explored key innovation for sheep and goat sector using two steps:

1) *Identification of key sector innovations.* Research and industry partners identified the most relevant innovations in their countries using an online survey

and two project workshops. The online survey asked, which innovations the partners thought would benefit and impact sustainability of the sheep and goat sector. All 18 iSAGE industry partners answered the survey. The results of the survey were shared with all partners and discussed with industry partners in two project meetings in Thessaloniki in April 2016 and Zaragoza in June 2016. A list of key innovations for European sheep and goat farming was produced as the outcome of the workshops.

2) *Test and exploration of selected innovations*. Industry partners chose, from the identified innovation, the most interesting and feasible innovations for their needs and status of their specific industries. Innovation case studies were then defined and protocols designed to test and explore the potential of selected innovation. Case studies were designed to understand (i) how and why do farmers use (or not use) innovations and innovative practices to make their farms sustainable, and (ii) under what conditions are innovations and innovative practices applicable.

3 Results and Discussion

3.1 Identification of key sector innovations

The industry partners identified fifty-two innovations and innovative practices. These innovations fit into different categories: individual recording, animal handling equipment, pasture and forage management and improvement, drug alternatives, health and welfare tests, reproduction, breeding and genetics, and marketing. Due to the diversity of farming system, some innovations were only relevant or applicable in some countries, while other had a wider relevance. We categorized these potential innovations into dairy or meat (D/M), sheep or goat (S/G) and intensive or extensive farm types (INT/EXT). Innovations were also rated according to their applicability for case studies (Low, Medium and High). The innovations identified cover the diversity of sheep and goat systems in Europe. Therefore, the benefits of the innovations potentially apply to all European sheep and goat industries. Table 1 shows innovations which were considered highly applicable and of general interest to European sheep and goat industries.

3.2 Test and exploration of selected innovations

Industry partners selected 35 innovation case studies about reproduction (8), farm technology; which included individual data recording (6) and handling technology (1), breeding and genetics (6), forage and feeds (4), health and welfare (3), pastures and grazing (2), products and marketing (2), and others (3). The main reason to choose most of those innovation was to increase economic sustainability of farms. Therefore, profitability appears to be the main incentive for farmers (and industry institutions) to voluntarily introduce and assess innovations on their farms.

Despite economics being the main driver of innovation selection, in many cases there were indirect environmental (through increased efficiency) and social benefits, which farmers were also interested in identifying and assessing. To do so, case studies included the analysis of farm data, and farmer interviews and surveys

Table 1. Potential innovations applicable to the European sheep and goat industries.

Type	Innovation	Dairy or Meat	Sheep or Goat	INTensive or EXTensive
Pasture management	Improve grazing practices	D/M	S/G	EXT
	Improve pasture quality	D/M	S/G	EXT
	Better use of by-products	D/M	S/G	INT
	Improve meeting animal requirement and supply	D/M	S/G	INT
Animal health and welfare	More sound and scientifically proven use of antibiotic alternatives in feeding	D/M	S/G	INT/EXT
	More regionally integrated plans in place	D/M	S/G	INT/EXT
	Use of sensor RFID ear-tags as welfare indicators	D/M	S/G	INT/EXT
	Cortisol Hair analysis	D/M	S/G	INT/EXT
Reproduction	Improved fertility through better quality of frozen semen	D	G	INT
	Assisted reproduction techniques	D	G	INT
	Better use of rams and reproduction plans	D/M	S/G	INT/EXT
Breeding and genetics	Routine data collection (recording programmes)	D/M	S/G	INT/EXT
	Use of elite flocks (link to AI)	D/M	S/G	INT/EXT
	New traits to increase resilience and hardness (longevity, fertility, health)	D/M	S/G	INT
	Development of genomic selection	D/M	S/G	INT/EXT
Farm technology	On-farm data collection linked to animal ID	D	S/G	INT
	Animals stress automatic sensors	D/M	S/G	INT
	Electronic microchip readers and automatic milk recording systems for individual milk production.	D	S/G	INT
Product processing	Freeze drying for longer storage and exportation to China	D	S/G	INT/EXT
	New dairy products and meat cuts	D	S/G	INT/EXT
Products marketing	Promote fresh sheep and goats products	D/M	S/G	INT/EXT
	Better use of the environmental and social aspects of sheep farming in the marketing of sheep meat.	D/M	S/G	INT/EXT
	Improve labelling and product recognition	D/M	S/G	INT/EXT
	New recipe books	D/M	S/G	INT/EXT
	Explore alternative markets (Middle East and China)	D/M	S/G	INT/EXT

One case study which aims to increase social sustainability is the assessment of the UK Ambassador Program. This program aims to boost the generational turnover and support new entrants to sheep farming. The initiative provides an opportunity for young farmers from England, Wales, Scotland and Northern Ireland to attend practical training delivery sessions throughout one year on a number of sheep topics such as farm/livestock management and business planning. The case study will collect mostly qualitative data through interviews with present and past participants in the Ambassador Programme. This is an important case study because lack of generation turnover is a common problem of sheep and goat industries across Europe. Therefore, the results of this case study will show the potential of implementing similar programmes in other countries.

There were two innovations which will be tested across countries:

a)   *Genomic selection.* The across-country case study on genomics will explore the potential, drivers and constraints of genomic selection in the sheep and goat sector. The case study involves research and industry partners from France, Greece and Spain, It has two main aims. Firstly, to evaluate the potential contribution of genomic selection to genetic gain by simulating scenarios using real data structures of each population involved and creating scenarios of implementation. In addition, the case study will also use economic data to evaluate if the potential benefits of this tool pay off the investment in genotyping. Secondly, the case study will explore the impact of using genomic selection on current breeding programmes implementation. This awareness will be recorded by surveying and interviewing farmers about their awareness of genomic selection and their perception on the economic and organizational constraints for its implementation in breeding programmes.

b)   *Individual data recording technologies* are at different stages of implementation in several countries and their full potential and development of individual recording has not been reached as compared to more developed systems (i.e. pig, poultry and cattle). Partners from France, Greece, Spain and Turkey have designed case studies focusing on different aspects of individual data recording systems, from technology developments to extension activities. Partners will work together to find a general overview of the state, needs, potential and constraints of data recording technologies and systems for sheep and goat industry in Europe.

4   Conclusion

iSAGE innovation case studies have just started and will be completed across the next two years. The 35 selected case studies will explore and show the potential impact that innovations have to improve the economic, environmental and social sustainability of sheep and goat farms. Case studies of success are expected to be relevant to the sheep and goat industries in Europe because innovations were chosen by industry members who are a large representation of the sector across Europe.

References

1. Caja, G., Carné, S., Salama, AK., Ait-Saidi, A., Rojas-Olivares, MA., Rovai, M. and Alshaikh, MA. (2014) State-of-the-art of electronic identification techniques and applications in goats. Small Ruminant Research, 121, p.42-50.
2. De Rancourt, M., Fois, N., Lavín, M. P., Tchakérian, E., and Vallerand, F. (2006). Mediterranean sheep and goats production: An uncertain future. Small Ruminant Research, 62, p.167-179.
3. Dubeuf, JP. (2014) Science, technology, innovation and governance for the goat sectors. Small Ruminant Research, 121, p.2-6.
4. Dubeuf, JP., and Sayadi, S. (2014) Multi-functionality issues for small ruminants: What changes are needed in territorial public policies and training?: Report of two round tables on territorial issues and training for the development of goat farming. Small Ruminant Research, 121, p.136-145.