Appraisal and Monitoring of Small-Scale Dairy Goat Production System
Y. Mena¹, F. A. Ruiz², R. Gutiérrez¹ & J. M. Castel¹

Abstract: In Spain there is a great variety of goat production systems, from the most traditional mixed (milk/meat) types to the most technologically advanced milk ones. To improve efficiency in these farms, small-scale appraisal and monitoring should be used. Because goat farmers are not used to record information, monitoring and data collection should be carried out monthly. Up to now, data collection included the use of land and labor, productivity, reproductive and feeding management, incomes and expenditures. Computerized management programs are recommended to analyze data. Indicators are used for various objectives as to compare results with established objectives, to compare a production system in different places or conditions or to analyze possible trends of production systems. Although technicians and researchers have mostly used monitoring data for technical and economic advice, aspects concerning environmental and social issues of livestock, should also be taking into account. For that, it is important to use methodologies and programs that facilitate joint analysis of the three (economical, environmental and sociological) sustainability areas. To improve the Spanish goat sector, it is absolutely essential that the producer, technicians, politics and researchers work together in the development of an adequate system of advisory.

Key words: dairy goats, monitoring, on-farm assessment, sustainability indicator

Avaliação e Acompanhamento do Sistema de Produção de Caprinos Leiteiros de Pequena Escala

Resumo: Na Espanha, existe uma grande variedade de sistemas de produção de caprinos, desde os tipos mais tradicionais de dupla função (leite/carne) para os mais tecnologicamente avançados (leite). Para melhorar a eficiência nessas fazendas, a avaliação e o acompanhamento da pequena escala deve ser usado. A coleta de dados incluiu o uso da terra e do trabalho, produtividade, manejo reprodutivo e alimentar, rendimentos e despesas. Programas de gestão informatizados são recomendados para analisar os dados. Os indicadores são utilizados para diversos objetivos como comparar os resultados com os objetivos estabelecidos, para comparar um sistema de produção em locais ou condições diferentes ou analisar possíveis tendências dos sistemas de produção. Apesar de técnicos e pesquisadores utilizarem principalmente dados de monitoramento para assessoria técnica e econômica, aspectos relativos a questões ambientais e sociais da pecuária, também devem ser considerados. Por isso, é importante o uso de metodologias e programas que facilitem a análise conjunta das três áreas de sustentabilidade (ambiental, econômica e sociológica). Para melhorar o setor caprino espanhol, é absolutamente essencial que produtores, técnicos, políticos e pesquisadores trabalhem em conjunto no desenvolvimento de um sistema adequado de consultoria.

Palavras-chave: cabras leiteiras, monitoramento, avaliação na fazenda, indicador de sustentabilidade

¹ ETSIA (School of Agricultural Engineering) of Seville University, Agroforestry Science Department, Ctra. Utrera km.1, 41013, Seville, Spain
² IFAPA (Andalusia Institute of Agricultural Research and Training), Economy and Sociology Department, Camino de Purchil”, Apdo. 2027, 18080 Granada, Spain
Introduction

Small-scale appraisal and monitoring (AM) is a tool to improve the working conditions of livestock farms by assessing management, productivity and profitability of farming.

Research developed for the authors of the present paper on AM in Spanish goat farms found two different outcomes (Castel et al. 2010; Mena et al. 2005a; Ruiz et al. 2008): a) there is a vast diversity of dairy goat production systems and b) there is little data collection and analysis by farmers or technicians at farm level. Although most of the this research have been focused on classification and improvement of profitability of dairy goat farms in Andalusia (south of Spain), the most recently work of this team has focused on indicators related to social and environmental aspects of farm sustainability (Batalla et al. 2013).

The aim of this paper is to review the experience of authors regarding the use of AM for classifying farms, increasing profitability and assessing sustainability.

Dairy Goat Production in Spain

The EU27 has a 1.5% of the world goat population, 11.5% of the milk and 1.9% of meat production (FAO, 2011). Greece, Spain, France and Italy are the biggest goat producers in EU (35.7, 21.6, 10.3 and 7.3% of population, respectively) (FAO, 2011). In general, the EU flocks are specialized in milk production, especially in countries such as France and Spain. These countries produce 33.4 y 23.8 % of the EU 27 milk production, respectively, mainly due to the high productivity of their goats.

Goat production in Spain is not relevant in the whole agricultural economic activity, being only 0.56% of the Agrarian Final Production (AFP) and 1.53% of the Livestock Final Production (MAGRAMA, 2012). Goat milk is only 8.9% of the total milk (75.6% is for cow milk and 15.5 is for ewe milk) production. Although of little economic importance, goat production is highly relevant for the socioeconomic development of unfavoured areas and the environmental conservation. In fact, almost the totality of Spanish goat farms is based on one of the 22 indigenous breeds registered by the Spanish Ministry for Agriculture, Food and Fisheries.

Traditionally, goat production in Spain was orientated towards the breeding of seasonal 20-40 kg kids using grazing pastures and the production of cheese at farm level. However, several changes have occurred that evolved in a different type of goat production in Spain. These changes include new sanitary rules that made difficult the marketing of rural cheese production, new tendency on marketing kids (8 kg) and farm technicality. After the mid90’sthe price of cereals destined for animal feed was low and milk price was high; this formula provided the path for intensive and specialized milk systems. However, this tendency stopped in 2008, due to the increase of cereal prices and the decrease of prices paid to farmers for milk production. As a consequence of this, the number of Spanish goat farms has decreased 27.2% from 2007 (SITRAN, 2013). Besides the lack of profitability, further factors have influenced this process: the lack of young family descendants taking care of the farm activities, the hardness of the work, the bureaucratic and administrative obstacles and the changes in the financial support from the Common Agrarian Policy of EU. Currently, 15.000 goat farms (1.2 millions goats), located mainly in the south and center regions of the country (including Canary Island), are registered in Spain of milk or mixed (milk-meat) production (MAGRAMA, 2012).

A great diversity in farm size has also be found, having 31% of the farms with 251 to 500 goats, and 23% with more than 500 goats (MAGRAMA, 2012). There is also a great variety of systems of production.
There are systems, from the most traditional mixed (milk/meat) to the most technologically advanced milk. Table 1 shows the classification in three clusters, of the goat production systems in a mountainous area of Andalusia (south of Spain) through multivariate analysis (Ruiz et al. 2008). Differences among clusters are related to system size (area and number of animals), productive factors (indoor feeding and labor) and milk yield.

In general, milk goat farms in Spain are divided into two groups; those in which the goats are always “stabled” (SS) and those in which the goats are “grazing” (GS). The GS use indigenous breeds such as Verata (Gaspar et al., 2011) and Payoya (Ruiz et al. 2008), although also Murciano-Granadina, Malagueña, Florida, Palmera, Majorera and Tinerfeña are used (Mena et al. 2006). These systems are in the majority in South and Southwest regions. In some cases, goats graze all year, especially in mountain areas, in others, graze only when there is an abundance of forage, as occurs in the areas where goats cohabit with agriculture (Mena et al., 2005a). Basically farmers take advantage of natural pastures although they also use cultivated fodder fields and agricultural residuals. Goats also receive a supplement indoor, basically from concentrates and fodder which is around 45% of the total annual feeding cost in systems with Payoya breed (Ruiz et al., 2008). Milk production is between 300-500 litres per goat and per year and shows a high seasonality (70% of the annual yield being between February and June). The income for the sale of suckling goats is around 15-20% of the total income for each goat and year (Ruiz et al., 2008).

The “stable” system use more productive Spanish milking breeds such as the Murciano-Granadina, Malageña, Florida and Majorera. Productions fluctuate between 400 to 800 litres per goat and per year, depending on the genetic management and installations. Milk production is less seasonable than in the “grazing” system. The income for the sale of suckling goats represents little more than 10% of the total income per goat (Sánchez, 2008).

In Table 2, results of technical indicators in Spanish goat farms obtained from monthly monitoring in two types of systems (SS and GS) are shown.

Most of the Spanish goat raw milk is sold for the making industrial cheese. These cheeses can include only goat milk (“pure goat milk cheese”) or a mixture of cow, sheep or goat milk (“mixture cheese”). However, in recent years, organized goat farmers are promoting traditional cheese, made at farm scale, to reduce dependence on big industry farms. An example of this trend is the publication of the Order in Andalusia regulating artisan food production, including cheese (Orden de 29 de mayo de 2013).

Table 1 - Technical-economic indicators in pastoral dairy goat in Andalusian farms

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cluster 1 Small area farms</th>
<th>Cluster 2 Large area farms</th>
<th>Cluster 3 Farm less dependent on external feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area per goat</td>
<td>0.31b (± 0.10)</td>
<td>0.85a (± 0.10)</td>
<td>1.28a (± 0.26)</td>
</tr>
<tr>
<td>Brush area per goat</td>
<td>0.23c (± 0.07)</td>
<td>0.61b (± 0.13)</td>
<td>0.99a (± 0.16)</td>
</tr>
<tr>
<td>Total labor per 100 goats</td>
<td>0.93b (± 0.15)</td>
<td>0.47a (± 0.06)</td>
<td>0.75ab (± 0.05)</td>
</tr>
<tr>
<td>Total number of goats</td>
<td>189.2b (± 27.6)</td>
<td>546.6a (± 69.5)</td>
<td>302.9b (± 95.9)</td>
</tr>
<tr>
<td>Concentrate consumed per goat</td>
<td>260.0b (± 35.4)</td>
<td>363.6a (± 26.6)</td>
<td>160.2b (± 57.8)</td>
</tr>
<tr>
<td>Forage consumed per goat</td>
<td>76.6a (± 26.3)</td>
<td>55.4ab (± 22.0)</td>
<td>1.1b (± 1.1)</td>
</tr>
<tr>
<td>Net energy from grazing (%)</td>
<td>55.6a (± 5.9)</td>
<td>49.4b (± 3.3)</td>
<td>77.5a (± 7.7)</td>
</tr>
<tr>
<td>Milk produced per goat</td>
<td>328.5b (± 33.4)</td>
<td>463.2a (± 29.9)</td>
<td>366.1a (± 53.4)</td>
</tr>
<tr>
<td>Proportion of milk produced in autumn*</td>
<td>10.3a (± 2.5)</td>
<td>15.0b (± 2.3)</td>
<td>10.4a (± 1.7)</td>
</tr>
</tbody>
</table>

Values with different letters (a-c) on the same row are different (*p < 0.05, **p < 0.01).

Source: Ruiz et al. (2008).
Reliable data collection is mandatory for a proper AM, which can only be achieved if farmers show a real interest in the partnership. Farmers must do data collection, and then technician must revise it (usually every month or every two months).

Farm suppliers should also participate in the data collection, incorporating information on quantities and prices of feed. Farm customers can provide data on quantities and the quality of the acquired product (milk fat and protein). Often errors occur in data collection, which are readily detectable by experts during farming consulting. It is essential to review the data before the following visit, to correct them.

As mentioned above, data collected include the use of land and labor, productive, reproductive and feeding management and incomes and expenditures. Further data collection depends on the system characteristics. For GS, records related to types and uses of grazing areas (scrubland, natural herbaceous pasture, grass cultivated for grazing or subble areas) are very important. Also for these systems, data related to additional (cohabit) types of production (ovine, bovine and extensive porcine) are interesting.

Regarding labor, it is important to get information on the number of workers and the task they performed. Normally, family and hired labor are recorded separately.

Regarding reproductive management, data of goats (pregnant, milking or not milking, etc.) and herd renewal (cull and replacement) are the most important.

The most important feeding management records are concentrate and/or forage consumed indoors by goats, which includes both bought feed and self produced. Knowing this consumption, the percentage of the flock’s net energy requirements obtained from grazing can be calculated (Ruiz et al. 2008) by the difference between the net energy requirements and the net energy provided indoors.

Regarding productive results, the most important data are milk sold monthly and number of kids sold annually. Both are obtained directly from receipts of milk and meat sale. When a high seasonality in sold milk is observed, it is interesting to know how much milk was sold in each trimester. This information allows the calculation of the “production ratio”, which tracks the milk production in its highest and lowest trimesters. Records related to milk quality, such as %fat and % protein, should also be included.

Finally, regarding economic results, it is interesting to establish the cost structure: land rent, feed, labor, energy (fuel and electricity) and amortization costs, among others. If farms have more than one production operation, this has been taken into account and expenses have been shared proportionally. Main incomes are revenue from the sale of milk and meat and EU financial support received.

In order to guarantee reliable data, the following recommendations should be taking into account: (i)
farmers should keep all purchasing and selling bills; (ii) farmers should record each week the number of newborn kids, goats beginning or finishing the milking period and deaths; iii) monthly data must be submitted to comparison; and iv) data provided by each farmer should be contrasted and complemented with those provided by the cooperatives and associations where farmers are integrated finally, if possible, automatic method should be used for further data analysis. There are numerous computerized livestock management programs; most of them use the animal as a reference for data entry, but when farms have a high number of animals in grazing regime, is preferable to use the herd as a working unit. The computer program GESCAPRI v.2 is an example of this type of programs (Mena et al. 2013).

**Appraisal and Monitoring: A Tool to Improve Assessment on the Goat Sector and Increase Its Sustainability**

**Improving assessment**

Whenever possible, simple indicators should be calculated; however, farms are complex, and therefore it is sometimes difficult to choose the most suitable set of indicators (Andersen et al., 2007). International networks have been developed to compare results from different countries; this is the case of FAO-CIHEAM Network for small ruminants, Production systems Sub-Network (Toussaint, 2002; Toussaint et al 2009, 2010).

Using accurate technical and economic information farm management can be improved. Farmers associations can add support by allowing comparisons among farms. Also, government may use the information to better design strategies to assist and regulate each sector. Thus, the purpose of the AM goes from down (farms) to top (government) and vice versa.

Usually, the analysis is referred to a whole year, although some aspects should be analyzed into a shorter period of time (reproductive management, for instance). For decision making, farmers or technicians should be able to link the economic and technical result, which will allow them to establish improvements for the next period. AM is an ongoing process and, whenever possible, should be done for several years. This allows evaluating the consequences of changes planned by farmers or external sources as rules of the CAP from the EU or a special market.

In his work, Ruiz *et al.* (2009) compared pastoral farms of different Mediterranean countries (Spain, France and Italy), which were characterised and classified, searching for common improvement strategies. A total of 21 indicators were chosen and grouped into six categories: surface area, labor, herd, feeding, production and economy. After a cluster analysis, four groups of farms were obtained (Table 3). The technical indicators that determine farm classification are: cultivated pastures, farm size and use of forage. Results show that there is a broad range of feeding managements in France, Italy and Spain.

Through a contingency analysis conducted between groups and regions, it was found a tendency for Spanish farms to be placed in cluster 3, whereas Italian farms would belong to cluster 2, and to a lesser extent, to cluster 1, and French farms would belong to cluster 4, although, again to a lesser extent, could also match cluster 1.

An example of use of indicators to analyze possible trends of production systems is shown in Tables 4 and 5. During 2006-2008, the feed price increase was not compensated by the rise of sold milk price. Although both, the current familiar net margin and the business net margin per liter of sold milk, could improve with the increase of goat
### Table 3 - Technical-economic indicators in pastoral dairy goat Mediterranean farms

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total farm area (ha) ***</td>
<td>53.0±(7.7)</td>
<td>150.0±(22.7)</td>
<td>368.2±(69.8)</td>
<td>86.8±(37.0)</td>
</tr>
<tr>
<td>Proportion of natural pasture area (%) **</td>
<td>39.2±(3.2)</td>
<td>74.5±(6.8)</td>
<td>77.1±(6.2)</td>
<td>81.9±(6.2)</td>
</tr>
<tr>
<td>Cultivated pasture area per goat (ha/goat) ***</td>
<td>0.26±(0.04)</td>
<td>0.03±(0.01)</td>
<td>0.08±(0.02)</td>
<td>0.06±(0.03)</td>
</tr>
<tr>
<td>Number of goats ***</td>
<td>112.9±(14.9)</td>
<td>184.2±(18.1)</td>
<td>540.3±(45.4)</td>
<td>117.4±(24.6)</td>
</tr>
<tr>
<td>Concentrate per goat (kg/goat) *</td>
<td>249.6±(23.1)</td>
<td>171.2±(27.6)</td>
<td>283.6±(31.0)</td>
<td>221.6±(28.6)</td>
</tr>
<tr>
<td>Forage supply per goat (kg/goat) *</td>
<td>232.7±(41.8)</td>
<td>89.16±(12.3)</td>
<td>51.1±(15.4)</td>
<td>398.8±(36.4)</td>
</tr>
<tr>
<td>Milk sold per goat (liters/goat) *</td>
<td>333.5±(59.7)</td>
<td>213.8±(24.1)</td>
<td>316.6±(31.0)</td>
<td>482.3±(74.5)</td>
</tr>
<tr>
<td>Difference between milk income and feed cost per goat (€/goat)*</td>
<td>102.2±(41.4)</td>
<td>55.8±(13.2)</td>
<td>89.0±(11.5)</td>
<td>189.7±(56.5)</td>
</tr>
</tbody>
</table>

Values with different letters (a-c) on the same row are different (*p < 0.05; **p < 0.01).

Source: Ruiz et al. (2009).

### Table 4 - Values (means and standard error) of technical indicators for each year and for the whole of the period 2006-2008

<table>
<thead>
<tr>
<th>Indicadores</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2006-2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of goats</td>
<td>412 (±85)</td>
<td>384 (±77)</td>
<td>391 (±81)</td>
<td>396 (±44)</td>
</tr>
<tr>
<td>Area per goat (ha/goat)</td>
<td>0.8 (±0.1)</td>
<td>0.8 (±0.1)</td>
<td>0.9 (±0.1)</td>
<td>0.8 (±0.1)</td>
</tr>
<tr>
<td>Familiar labor (%)</td>
<td>71 (±14)</td>
<td>71 (±14)</td>
<td>73 (±13)</td>
<td>71 (±7)</td>
</tr>
<tr>
<td>Total labor per 100 goats (YWU1)</td>
<td>0.6 (±0.1)</td>
<td>0.6 (±0.1)</td>
<td>0.6 (±0.1)</td>
<td>0.6 (±0.1)</td>
</tr>
<tr>
<td>Concentrate per goat per year (kg)2</td>
<td>13 (±10)</td>
<td>18 (±12)</td>
<td>10 (±6)</td>
<td>14 (±5)</td>
</tr>
<tr>
<td>Forage per goat per year (kg)2</td>
<td>60 (±2)</td>
<td>61 (±2)</td>
<td>56 (±4)</td>
<td>59 (±2)</td>
</tr>
<tr>
<td>Energy from grazing (%)3</td>
<td>361 (±16)</td>
<td>362 (±17)</td>
<td>324 (±18)</td>
<td>349 (±10)</td>
</tr>
<tr>
<td>Annual sold milk per goat (l)</td>
<td>14 (±2)</td>
<td>10 (±1)</td>
<td>9 (±1)</td>
<td>11 (±1)</td>
</tr>
<tr>
<td>Proportion of milk produced in autumn (%)</td>
<td>1.0 (±0.1)</td>
<td>1.1 (±0.2)</td>
<td>0.9 (±0.1)</td>
<td>1.0 (±0.1)</td>
</tr>
</tbody>
</table>

1 Year worker unit.

2 Concentrate and forage consumed by all farm animals.

3 Calculated based on the difference between estimated energy requirements and energy provided indoors.

### Table 5 - Values (means and standard error) of economic indicators for each year and for the whole of the period 2006-2008

<table>
<thead>
<tr>
<th>Indicadores</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2006-2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentrate price (€/kg)</td>
<td>0.20 (±0.00)</td>
<td>0.24 (±0.00)</td>
<td>0.30 (±0.01)</td>
<td>0.25 (±0.01)</td>
</tr>
<tr>
<td>Cost of sold milk (€/l)</td>
<td>0.42 (±0.03)</td>
<td>0.44 (±0.03)</td>
<td>0.59 (±0.50)</td>
<td>0.48 (±0.03)</td>
</tr>
<tr>
<td>Sold milk price (€/l)</td>
<td>0.47 (±0.01)</td>
<td>0.47 (±0.01)</td>
<td>0.55 (±0.01)</td>
<td>0.50 (±0.01)</td>
</tr>
<tr>
<td>Sold kid price (€/kg)</td>
<td>4.3 (±0.2)</td>
<td>3.8 (±0.0)</td>
<td>4.2 (±0.1)</td>
<td>4.1 (±0.1)</td>
</tr>
<tr>
<td>Familiar gross margin per liter of sold milk (€) 2</td>
<td>0.45 (±0.02)</td>
<td>0.44 (±0.02)</td>
<td>0.40 (±0.03)</td>
<td>0.43 (±0.01)</td>
</tr>
<tr>
<td>Familiar net margin per liter of sold milk (€) 3</td>
<td>0.22 (±0.05)</td>
<td>0.20 (±0.04)</td>
<td>0.17 (±0.04)</td>
<td>0.19 (±0.02)</td>
</tr>
<tr>
<td>Familiar net margin per unit of familiar labor (€YWU4 familiar)</td>
<td>21634 (±3824)</td>
<td>20545 (±4814)</td>
<td>13684 (±2961)</td>
<td>18621 (±3201)</td>
</tr>
<tr>
<td>Business net margin per liter of sold milk (€) 3</td>
<td>0.05 (±0.03)</td>
<td>0.03 (±0.03)</td>
<td>-0.04 (±0.04)</td>
<td>0.01 (±0.02)</td>
</tr>
</tbody>
</table>

1 Include all production costs, even the familiar labor. However, incomes corresponding to sold kids and aids are subtracted from the total costs; 2 Gross margin = Incomes - Operational charges (feeding, etc.); 3 Familiar net margin = Gross margin - Structural charges (external labor, leasing, etc.); 4 Year worker unit; 5 Business net margin = familiar net margin - Familiar work force charges.

productivity, the cited current situation of high feed prices and low milk prices do not allow reaching an acceptable level for the farm survival. The familiar net margin per unit of familiar labor is not enough for farmers to carry out a comfortable life, although in practice, familiar workers use a part of their...
wages to pay the feed charges and contribute to the viability of the farm.

Increasing sustainability

Technicians and researchers have mostly used monitoring data for technical and economic advice, above all, those related to genetic improvement (Serradilla, 2001), the optimization of nutritional management (Morand Fehr, 2003) or the increment of profitability of farms (Ruiz et al. 2008). Although all these are vital to increase the viability of the farm, aspects concerned to the environmental and social issues of livestock, should be also taking account. In this sense, grazing goat systems offer a series of positive environmental and social externalities, such as maintenance of biodiversity, fire prevention, as well as establishing populations in rural areas, which are in high demand in society at present (Calatrava and Sayadi, 2003). The enhancement of these externalities can undeniably contribute to the maintenance, as well as the resurgence, of these types of systems.

Fortunately, in recent years, there is growing interest in analyzing the sustainability of small ruminant operations from a holistic perspective (López-Ridaura et al., 2002; Nahed et al., 2006). Above all, analysis that delves into the environmental and social field itself, studying aspects which hold great significance such as livestock’s contribution to greenhouse gases, water usage and pollution, competing animal and human feed sources, quality of farmer’s life, quality and quantity of farmer’s work or functional and nutritional quality of products obtained, among others (De Vries and De Boer, 2010; Bernúes et al., 2011; Delgado-Pertiñez et al, 2013).

Taking into account the livestock system complexity, it is important to use methodologies and programs that facilitate joint analysis of the three (economical, environmental and sociological) sustainability areas; two examples of this are the application of MESMIS to goat sector (Nahed et al. 2006) or the development of NAIA methodology (Batalla et al. 2013).

Our Experience in Dairy Goat Systems

Research on Andalusia: Evolution, Progress and Challenges

One of the main research areas for the authors of this paper is the development of the methodology for technical and economic performance of dairy goat farms. This group has collaborating partnership with researchers from the FAO-CIHEAM Sheep and Goat Network (Production Systems Sub-Network), Universities and research institutions in Spain, with the common goal of combining methodologies to generate information as a means to support farmers in the entire Mediterranean Basin.

The first task accomplished was a characterization of the goat sector in six regions of Andalusia. This work served to propose improvements (Mena et al. 2005a). Later, a retrospective analysis (using data from the previous year, which included operations’ quantitative data; (Castel et al., 2006)) was carried out. Then, to obtain greater reliability of the information gathered, a specific methodology to monthly data collection was developed by designing the computer program GESCAPRI v.2 (Gutiérrez et al. 2013; Mena et al., 2013). This program allows us to acquire technical and economic indicators for a specific year. At present, taking into account all available information, two new research lines are ongoing: (i) modeling dairy goat systems (Ruiz et al., 2012) and developing a specific methodology to analyze the sustainability of small dairy ruminants and the quality of their products (Batalla et al. 2013; Gutiérrez et al., 2012).

All aforementioned research works allow to: i) better understand pastured dairy goat systems from
the technical-economic point of view, of which little information existed previously (Ruiz et al., 2008, Gutiérrez et al. 2013); ii) involve groups of Andalusia livestock farmers and breed associations in the periodic monitoring of their operations (Ruiz et al., 2012; Gutiérrez et al., 2013); iii) develop a proposal for technical-economic indicators to be used in grazing systems (Mena et al., 2006; Ruiz et al. 2008), and iv) create alliances with other research teams operating along similar lines in dairy goat and sheep (Ruiz et al., 2009; Batalla et al., 2013; del Hierro et al. 2013).

Information transfer to the dairy sector is an important issue. Therefore, the team made great efforts to disseminate results in magazines, as well as conferences and workshops directed to livestock producers and technicians. Indicators resulting from the investigative work have also served to support organizations in their demands for improvements in the economic conditions of livestock operations.

Although there has been some progress, there are aspects that still need to be improved and implemented. Among such aspects there are two to highlights: (i) achieve extended involvement of associations and cooperatives to bring together a monitoring group, and (ii) enlist the support of the Administration in creating a reference center for the analysis and diagnosis of dairy goats systems in Spain. Until now, collaboration with the Administration has been limited to specific cases in selected zones, and as such we see this as essential in moving forward. By contrast, initiatives linked to private enterprise are increasingly emerging; more specifically, feed mills and veterinarian laboratories. Although they have the ability to improve the situation, they also undeniably have their own interests to increase feed or veterinary products sales.

In summary, to move forward, it is absolutely essential that the sector and the administration, in close collaboration with researchers, get involved in providing continuity in collecting data and generating sustainability indicators.

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Literature Cited


and appraisal for development and prospect.


