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in

Chentouf M. (ed.), López-Francos A. (ed.), Bengoumi M. (ed.), Gabiña D. (ed.). Technology creation and transfer in small ruminants: roles of research, development services and farmer associations

Zaragoza : CIHEAM / INRAM / FAO
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 108

2014
pages 49-53

Evolution and efficacy of use of indicators for improving goat pastoral farms

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Abstract. Dairy goat grazing systems in the Mediterranean basin are in recession due to the lack of profitability. An improvement of farm management could contribute to optimize the use of resources and to decrease the farm production costs. On the other hand, information based on environmental and social externalities of the farms and the quality of their products, can increase farm incomes. According to that and in order to generate information which can be used for developing strategies to ensure goat pastoral farms continuity, a team of researchers from the Animal Production Area of the University of Seville in 2001 started a colaborative work with the FAO-CIHEAM Subnetwork on Sheep and Goat Production Systems. Researchers of IFAPA were also incorporated in 2005. From 2001 to 2012 relevant information was generated and several improvements of the methodology were done. Initially, retrospective analysis were used. After that, monthly monitoring was employed for collecting information. At the end, environmental and social indicators, which also include information about quality of the products, were incorporated. This paper aims to show the evolution of the methods and tools used, as well as the results obtained and the relationship among researchers, farmers and financial supports.

Keywords. FAO-CIHEAM network – Systems – Data collection – Sustainability.

Evolution et efficacité de l'utilisation des indicateurs pour améliorer les exploitations pastorales caprins

Résumé. *Les systèmes de pâturage des chèvres laitières dans le bassin méditerranéen sont en récession, à cause du manque de rentabilité. Une amélioration de la gestion pourrait contribuer à optimiser l'utilisation des ressources et de réduire les coûts de production. D'autre part, l'information basée sur les externalités environnementales et sociales des exploitations et la qualité de leurs produits, peut augmenter ses revenus. Selon cela et afin de produire de l'information qui peut être utilisée pour développer des stratégies pour assurer la continuité des systèmes pastoral, une équipe de chercheurs de l'Université de Séville, en 2001, a commencé un travail collaborative avec le Sous-réseau FAO-CIHEAM sur les Systèmes de production ovins et caprins. Les chercheurs de l'IFAPA ont également été intégrés en 2005. De 2001 à 2012, des informations ont été créés et plusieurs améliorations de la méthodologie ont été effectuées. Initialement, l'analyse rétrospective a été utilisée. Après cela, un suivi mensuel a été usé pour collecter des informations. A la fin, les indicateurs environnementaux et sociaux, qui incluent également des informations sur la qualité des produits, ont été incorporées. Cet article vise à montrer l'évolution des méthodes et des outils utilisés, ainsi que les résultats obtenus et les relations entre les chercheurs, les éleveurs et les soutiens financiers.*

Mots-clés. *FAO-CIHEAM réseau – Systèmes – Collecte des données – Durabilité.*

I – Introduction

Raising small ruminants in extensive grazing systems plays an essential role in many areas of the Mediterranean Basin. Nevertheless, this husbandry practice presents a series of problems that threaten its very continuity. One of the most significant is the lack of profitability of such operations. Other factors related to specific husbandry practices, especially concerning pasture, as well as social factors, such as the physical demands of the work and the lack of farm generational succession, also present a hazard.

In addressing these weaknesses, it is vital to work on the overall management of the operation to increase its economic viability. This must be accomplished, however, while farming with the greatest respect for the surrounding environment. The direct environmental impact of animal husbandry, as has been shown in numerous environmental forums, is of growing concern. In this sense it is important to note that pasture methods offer a series of positive environmental externalities, such as fire prevention, as well as positive social externalities, such as establishing populations in rural areas, both of 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.

Developing specific, comparable, and easy to use and understand indicators and indices becomes essential for improving the viability of pasture operations, as well as to quantify the environmental impact of livestock operations.

The initial indicators that technicians and researchers began to use widely were those related to the technical aspects of the operation; above all, those related to genetic improvement (Serradilla, 2001) and/or the optimization of an operation's nutritional management (Morand Fehr, 2003).

Numerous studies highlighting economic indicators and the necessity to establish coordinated calculation methods, thereby assuring comparability, emerged later (Toussaint, 2002, Mena *et al*., 2006a, Ruiz *et al*., 2009, Usai *et al*., 2006) in various regions of the Mediterranean Basin.

Nevertheless, 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 field itself, studying aspects which hold great significance such as livestock's contribution to greenhouse gases, water usage and pollution, and competing animal and human feed sources (De Vries and De Boer, 2010; Bernúes *et al*., 2011).

One of the primary areas of research for the authors of this paper is increasing awareness about the sustainability of pasture systems for dairy goats, along with their improvement. Thus, since 2000 we have been collaborating with researchers from the FAO-CIHEAM Sheep and Goat Network, and the FAO-CIHEAM Production Systems Sub-Network, with the goal of developing a common methodology for technical and economical analysis of small ruminant farms.

This paper presents our latest results as well as the challenges ahead, which may be of interest to other areas of the Mediterranean Basin intending to carry out similar work.

II – Evolution of research on dairy goat systems in Andalusia

The first task accomplished by our research team was a qualitative characterization of 120 goat farms in six regions of Andalusia. It consisted of a diagnosis of the goat sector and its evolution, with the goal of making a series of proposals to improve the sector (Mena *et al.,* 2005).

Later, efforts focused on adapting technical-economic indicators proposed by the FAO-CIHEAM Production Systems Sub-Network (Toussaint, 2002) to dairy grazing systems (Ruiz *et al*., 2008) and the creation of a technical-economic zone of reference for pastured dairy goats (Castel *et al*., 2006).

During these years we achieved some significant advancements: (i) better understanding of pastured dairy goat systems from the technical-economic point of view, of which little information existed previously (Castel *et al*., 2003; Ruiz *et al*., 2008; Gutiérrez *et al*., 2013); (ii) involving groups of Andalusia livestock farmers and breed associations in the periodic monitoring of their operations (Ruiz *et al*., 2012; Gutiérrez *et al*., 2013); (iii) putting forth a proposal for technical-economic indicators to be used in grazing systems based on indicators proposed by the FAO-CIHEAM group

(Mena *et al*., 2006b; Ruiz *et al*., 2008); and (iv) create alliances with other research teams working on similar lines in dairy goat and sheep (Ruiz *et al*., 2009; Batalla *et al*., 2013; del Hierro *et al*., 2013).

The methods utilized to obtain and analyze the information have been evolving, along with the involvement of livestock farmers and technicians, selected funding to carry out further study, and a change in the demand for information from the scientific community and society as a whole.

The initial tasks were based on characterization surveys from qualitative data (Mena *et al*., 2005). Subsequently, we moved onto carry out retrospective analysis, collecting information from the previous years, which included operations' quantitative data (Castel *et al*., 2006). Then, to obtain greater reliability of the information gathered, we developed a specific methodology to collect information monthly, 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, a new line of research based on modeling dairy goat systems has been launched (Ruiz *et al*., 2012).

Also in the last two years, within the framework of a national research project in collaboration with other Autonomous Communities, we have been working on the development of 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), which will also be accompanied by a software tool.

Something that has occupied the minds of the research team from the beginning has been the transfer of information to the producer sector, as, from the beginning, it has been at the basis of the study. We therefore have made great efforts to disseminate results in magazines, as well as at conferences and workshops directed at livestock producers and technicians. The objective at hand is to discuss specific problems centered on economics, feed, and marketing products (Ruiz *et al*., 2011; Gutiérrez *et al*., 2013). Indicators resulting from the research work have served to support organizations in their demands for improvements in the economic conditions of livestock operations. We have carried out comparisons between countries and regions (Ruiz *et al*., 2009), as well as participated in networks and working groups. Finally, we have brought training based on all of these results to young livestock producers who are part of this action.

Although there has been some progress, there are aspects that still need to be developed and put into place. Two of these aspects are to be highlighted: (i) achieve prolonged involvement of associations and cooperatives of livestock producers to bring together a monitoring group, and (ii) enlist the support of the Administration in creating a reference center. 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 short, moving forward, it is absolutely essential that the sector and the administration, in close collaboration with researchers, be involved in providing continuity in collecting data and generating indicators. It becomes a challenge to guarantee this continuity when relying on research projects, which until now have virtually been the only source of funding for the work.

III – Strategies and guidelines for the development of small ruminant systems in Andalusia

The scientific activity carried out over this period highlights several aspects which, with the goal of improving farms viability, will continue to work, as well as create tools that enhance the key attributes of pastured dairy goat systems.

First, since the technical-economic management of small ruminant farms continues to run a deficit, it is essential to inform and provide training to technicians and livestock farmers about the importance of proper farm management in order to identify problems, propose solutions and, ultimately, improve their viability. Creating pilot zones to host seminars and meetings where technicians and farmers can discuss concrete management problems can serve as a model for other zones, farmers and technicians. Nevertheless, lack of economic viability is not only a matter of good management of farms; farm structures and sectorial organization, and external factors are of great importance such as prices, access to land, capital and markets, multiple legislative restrictions, etc; those should be tackled at political level.

This activity focused on improving the management should be articulated by the Administration through the creation of a reference center that manages a global database on small ruminant systems in Andalusia. This reference center would also function as a significant source of data to aid in decision-making at the farm, district and regional levels. To carry out this plan, involving the diverse agencies that make up the Andalusia goat sector is essential: breed associations, cooperatives, professional associations, industry, and above all, the Administration. At present, the industry coalition "Interprofessional Láctea" (INLAC) now exists at the national level, where producers (through cooperatives and professional associations) and industry have the opportunity to carry out actions to help improve the goat sector, not only at the Andalusia level, but at the national level as well.

As for more concrete details of pastured dairy goat systems, it is vital to optimize feed handling and increase, in so far as possible, the feed self-sufficiency of pasture-based farms. If we have technical data on feeding, we then know the needs of those animals on pasture, including those related to locomotion. It is, however, necessary to focus on the botanical characteristics of different grazing areas (specifically mountains), capacity utilization and the mode of rational utilization, without imposing excessive travel costs and energy consumption. In addition, it is necessary to know the overall fiber and nutrient composition that the goats are obtaining from pasture to properly quantify the straw, hay and concentrates ration provided at the manger. Given the great diversity of ecosystems present in the Mediterranean Basin, the creation of interdisciplinary groups with the participation of researchers and technicians of diverse areas of expertise (veterinary, agronomy, ecology, botany, etc) is essential.

Lastly, the enhancement of qualities of pasture-based farms, specifically the nutritional and functional attributes of their products, as well as their environmental contribution, can contribute to the maintenance of such type of systems. In this sense, developing appropriate indicators, that allow us to differentiate pastoral from more intensified systems, is necessary.

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