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# Sustainability of dairy sheep farming: Examples from Greece and Spain

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**Abstract.** In the European Union (EU), the European Commission has included in its Europe 2020 strategy the ‘Sustainable growth: promoting a more resource efficient, greener and more competitive economy.’ The EU has also recognized the positive role of agriculture and livestock in rural areas in delivering ‘multiple economic, social, environmental and territorial benefits.’ In the framework of the research project FLINT (‘Farm Level Indicators for New Topics in Policy Evaluation’), one of the main aims was to provide a review of indicators and to collect the related data from farms to determine the level of sustainability. The concept of *sustainability* refers not only to the triple-bottom-line approach – Profit (economic), Planet (environmental) and People (social) - but also to other issues like innovation, risk management, market outlets and quality labeling, advisory services, and climate change. The small ruminant sector was one of those that included this, as its contribution to the strategy of sustainable growth has recognized. In this paper, we present two cases referring to the dairy sheep sector in Greece (Ipeirus) and Spain (Navarra). A collection of core indicators will be presented to describe the sustainability level for dairy sheep farming between the two countries. Due to the small sample size, dairy sheep farming in both countries shows a high degree of heterogeneity and diversity. Only qualitative factors, like the use of processing at the farm level, the use of short supply chains and qualitative labels could be derived to support the sustainable view of traditional producing systems. The assessment of the sector’s sustainability level helps to develop the appropriate decisions/policies either at the local farm or larger territorial level.

**Keywords.** Sustainability – Dairy sheep – Greece – Spain.

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## I – Introduction

In the Mediterranean region, sheep and goat farming is an important and well-established activity. It is characterized as a significant provider of income, employment, environmental protection, and social cohesion for rural areas. At the European level, sheep and goat farming is a minor agricultural activity, but agricultural policy measures always give priority to small ruminant livestock farming which employs a significant percentage of the work force. In the EU, the sheep population is on a declining trend. The evaluation of sustainability will play a significant role in the future of the latter, in order to halt its decline via appropriate management, support decisions, and appropriate policies.

Greece and Spain are among the six leading sheep-producing countries. In both countries, the sheep sector accounts for a significant contribution to the gross animal production value. Sheep holdings differ greatly concerning size, structure and applied production systems. Both countries face similarities and differences, characteristics like herd liquidation in small farms, and a significant increase of larger holdings in professional and commercial livestock farms. Moreover, the sector faces the significant effects of the lack of intergenerational succession.

Case studies from Greece and Spain were presented in the framework of the Farm Level Indicators for New Topics in policy evaluation or “FLINT” project (EU FP7 ) in order to assess the sector’s sustainability attributes. The overarching objective of the FLINT project was to explore not only the economic indicators but also the environmental, social, and other factors that support the dynamism of farms. This study tries to present the status and the diverse points between the two countries in the small ruminant sector according to their sustainability attributes.

## II – Methodology – Theoretical Issues

This analysis was conducted through the FLINT project, which aims to extend the traditional Farm Accountancy Data Network (FADN) database to include information on environmental, social and other issues like innovation, risk, and quality aspects (Poppe *et al.*, 2016). In line with the regular FADN data collection, following the same stratification based on the farming type and farm economic size classes, at least 25 observations were collected per principal type of farming. Data for the sheep sector were collected in Greece and Spain via face-to-face interviews and relate to the accountancy year 2015. The analysis is based on data from 30 farms in Ipeiros-Greece and 24 farms in Navarra-Basque country (one farm was excluded from the analysis due to its large number of animals, as an outlier).

At first, FLINT analyzed the needs of Common Agricultural Policy (CAP) and related environmental policies for information gaps. The development of new indicators was introduced to provide information on farm-level sustainability. The development of a farm-level dataset will support the assessment of policy incentives in agricultural sectors and decision-making processes from the farmers' point of view. Moreover, farm-level sustainability information will determine the factors that affect their performance and long-term dynamics. An extensive literature review made a selection of core variables and concluded on 33 sustainability themes (Latruffe *et al.*, 2016). The themes cover the three pillars of Triple P: People, Profit, and the Planet. Through a stakeholder analysis, the number of indicators was reduced according to their usefulness and effectiveness (Hererra *et al.*, 2016).

In Greece, the survey took place in the northern region of Ipeiros, which is among the most significant livestock Greek areas. It is considered to be a less favoured area, and sheep-goat farming plays a major role in the livelihoods of farmers. In Ipeiros, sheep farms account for 11% of Greek sheep farms with a falling trend. Farm structures have changed; while the number of small sheep farms has decreased, the number of large flocks has increased. Sheep and goat farming is the main source of income for the rural population, and this is a traditional farming practice passed on from father to son. Most of the milk produced by sheep and goat animals are turned to cheese in dairy industries in Ipeiros, a self-sufficient region of 97.5% of the goat-sheep milk production. Dairy industries produce a variety of traditional products, which are both PDO (officially designated) and conventionally manufactured. Cheese production in the farm is illegal according to the Greek manufacturing legislation. However, all farmers produce cheese, yogurt, and other traditional products for domestic consumption.

In Spain, data were collected from northern Spain, in Navarra. In this area, sheep farming is one of the most common sectors of animal production in the territory. Around 22% of livestock farms are sheep farms with the main specialization being that of milk production. Sheep milk production is the most traditional livestock system in the territory with a strong emphasis on using the natural pasture uplands (Batalla, *et al.* 2014). Permanent grasslands are a major nutritional source for sheep farms during the summer season. There are 275 farms producing sheep milk, of which 84% use indigenous breeds, 9% use foreign breeds, and the remaining employ mixed breeds. Farmers who use native breeds and natural food produce higher quality products and place greater importance on the quality of milk than farmers who produce PDO cheese products (PDO Idiazabal cheese and PDO Roncal). 54% of cheese production is made directly by farmers in farms (Batalla *et al.*, 2014).

## III – Results

### 1. Economic Pillar

The evaluation of economic sustainability is focused on viability, productivity, and dependence. An overall assessment showed that from the economic point of view, dairy sheep farms in Spain showed better economic results. Spanish farmers maximized their value, using the production indi-

cators in an efficient and productive way. Specifically, the number of livestock unit (LU) per utilized agricultural area (ha) and the number of livestock unit per annual working unit (AWU) is higher in Spain in comparison with the corresponding numbers in the Greek sheep farms (Table 1). Spanish farms have better productivity either for labor or animal factor of production. However, the level of specific livestock costs is the same for both countries (Table 2). Spanish dairy sheep farms show a strong relationship between the score obtained for the productivity and the intensification level (land and labor). The evidence for this improved economic performance can be explained with reference to the added value of Spanish output. It is the defining difference between the two countries. In Spain, farmers produce traditional cheese at the farm level. Moreover, the innovation of using alternative market channels, direct sales, offers them higher margins. On the contrary, in the Ipeiros area prices for both sheep and goat milk are higher than the mean average of Greece, the economic performance of Greek sheep farmers is quite poor. Traditional cheeses are produced outside the farm. Therefore, the two countries showed differences in the management strategy. Finally, economic results for both countries rely on subsidies received from the EU under CAP provisions as these constitute an important part of their total earnings which means a lower level of economic sustainability for them.

**Table 1. Structural Characteristics of sheep farmers (FADN principal type of farming: specialist sheep, goats, and other grazing), Ipeiros-Greece and Navarra-Spain**

	Ipeiros, Greece	Navarra, Spain	t-test
Total Livestock units (LU)	29.92	57.07	*
Land, number of UAA (ha)	25.34	37.91	*
Number of heads LU Sheep and Goats	29.84	53.82	*
Labour, number of annual working units (AWU) on the farm	1.80	2.05	
Successor (%)	40%	56%	
Sheep and Goat Production (€)	9,256	15,103	*
Ewe's and goat milk (€)	35,342	132,327	*

Source: the authors, based on FADN and FLINT data.

## 2. Environmental Pillar

Ruminant agriculture is more emissions-intensive than other forms of agriculture (Ryan *et al.* 2015). Environmental farm level indicators are derived at the farm gate level. The farm gate approach uses nutrients in imports and exports over which the farmer has direct control, and this helps to assess the environmental pressure (Buckley *et al.*, 2015). Two indicators were estimated at the farm gate level. The first refers to the N balance and presents the pressure on environmental quality. It is derived by subtracting the total quantities of N exported from the total quantities imported. The second refers to the GHG emissions per farm (tons of carbon dioxide equivalent, tCO<sub>2</sub> eq). It is estimated using the Tier 1 and Tier 2 procedure (Intergovernmental Panel on Climate Change IPCC). Results showed that both countries have similar levels of GHG emissions per LU, and output (Table 2). However, results for N revealed that in Greece the level of N is lower than in Spain.

## 3. Social Pillar

In both countries, farmers have the same level of overall quality of life (Table 2). Satisfaction with work balance is higher in Spain (6,3) than in Greece (4,6). The level of satisfaction regarding the quality of life is almost at the same level (6,1 for Greece and 6,3 for Spain). The indicator satisfaction with respect to freedom of making decisions is held at a high value among Greek farmers (9,1). On the other hand, stress perception is significant among Greek farmers. More than half of Greek farmers do not recommend sheep farming activity for their children in contrast to Spanish farmers. All the social indicators above indicate better social sustainability in the Spanish sheep sector in comparison with the corresponding Greek farms.

**Table 2. Sustainability Indicators of sheep farmers (FADN principal type of farming: specialist sheep, goats, and other grazing), Ipeiros-Greece and Navarra-Spain**

	Ipeiros, Greece	Navarra, Spain	t-test
Total farm output in value related to utilized agricultural area (€/ha)	2,853	11,415	*
Total farm output in value related to the number of livestock units (€/ LU)	1,930	2,681	*
Total farm output in value related to total farm labor (€/AWU)	32,270	70,104	*
Operational costs on the farm related to total farm output (%)	0,47	0,49	
Farm net value added related to total farm labor (€/AWU)	15,176	26,063	
Farm income related to family labor (€/FWU)	14,188	26,092	*
% Subsidies per LU related to gross Farm Income	0.05	0.12	*
Total livestock output (€)	45,225	149,643	*
Total livestock output /LU	1,569	2,649	*
Subsidies sheep and goat (€)	1,048	7,052	*
<b>Environmental Indicators</b>			
The quantity of greenhouse gases (GHG) emitted by farms measured at the farm level (t eq CO <sub>2</sub> )	87	162	
The quantity of GHG emitted by farms at farm level per livestock unit (LU) (t eq CO <sub>2</sub> per LU)	2.85	2.91	*
The quantity of GHG emitted by farms measured at farm level per Euro of output t eq CO <sub>2</sub> /€	0.0001	0.0013	
N balance at the farm level (kg/ha)	97	173	
<b>Social Indicators</b>			
Satisfaction with job (0 - 10)	7.7	7.4	
Satisfaction with work-life balance (0 - 10)	4.6	6.1	*
Satisfaction with being a farmer (0 - 10)	6.8	7.8	*
Satisfaction with quality of life (0 - 10)	6.1	6.2	
Satisfaction with freedom of making a decision (0 - 10)	9.1	7.4	*
Stress perception (0 - 10)	8.1	5.3	*

Source: the authors, based on FADN and FLINT data.

## IV – Conclusions

The comparative cross-country analysis (Greece and Spain) undertaken is a pilot study to present some core sustainability indicators in the dairy sheep sector. Due to the small sample size, dairy sheep farmers in both countries show a high degree of heterogeneity. There is diversity across and within dairy sheep farmers in both countries. The indicators we proposed for sheep farmers, show a better economic profile for Spain than for Greece. While environmental sustainability was better for Greek farms, it was observed and documented that social indicators provide a higher level of satisfaction to Spanish farmers. However, due to the limited size of the sample, it is not possible to extrapolate the results obtained from the case studies. Therefore, the comparison of sustainability efforts between the two countries does not apply for the entire sector. The qualitative inference of the two case studies could refer to factors like the use of processing at the farm level, the use of short supply chains and qualitative labels with a high social diversification index. These might give a more sustainable view of traditional producing systems that support areas with limited opportunities and valuable natural resources.

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