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SUMMARY – The objective of this paper was the analysis of Palmera goat breed farms in the Isle of La Palma in the Canary Islands and to evaluate the suitability of the survey under these conditions. The study included 46 production variables, and it was performed on 21 farms. Production data were taken from the farmers' records and also by direct observation; however, some of the parameters may have been estimated. It was necessary to adapt the survey to local conditions and use trained people to collect the data. The statistical analysis showed a high degree of homogeneity between the farms, with many aspects in common, and low variation coefficients. Negative correlation was found between the size of herd and the net margin per litre of milk (-0.26) and positive between the same margin and natural grassland area per goat (0.28) and the age of the farm (0.35), the number of years the farm has been functioning. ANOVA analysis showed that the management system only influenced (p< 0.05) milk production per goat (509.81 ± 94.3 l in intensive vs. 422.87 ± 71.8 l in other systems) and the survival of kids per goat (1.69 ± 0.36 kids vs. 1.19 ± 0.40 kids) and, consequently income from kid meat / goat (35.37 ± 9.57 € vs. 23.95 ± 6.9 €).

Keywords: Dairy goats, technical-economic indicators, classification.

RESUME – *"Caractérisation des systèmes de production de chèvres laitières de la Palma". L'objet de ce travail a été l'analyse des fermes de chèvres de La Palma dans les Canaries et l'évaluation de l'efficacité des enquêtes dans ces conditions. L'étude comprend 46 variables de production et a été réalisée dans 21 fermes. Les données de production ont été prises auprès des éleveurs et aussi par observation directe et quelques paramètres furent estimés. On a adapté les enquêtes aux conditions locales et on a utilisé du personnel préparé pour prendre les données. L'analyse statistique présente un degré élevé d'homogénéité dans les différentes fermes, avec beaucoup de caractéristiques communes et des coefficients de variation faibles. On a trouvé des corrélations négatives entre le nombre de têtes et la marge nette par litre de lait (-0,26) et positives entre la même marge et l'aire de pâturage par chèvre (0,28) et l'âge des fermes (0,35). Les analyses ANOVA ont montré que le système d'exploitation influence (p<0,05) seulement la production de lait par chèvre (509,81±94,3 en intensif vs. 422,87±71,8 dans d'autres systèmes) et les chevreaux survivants par chèvre (1,69±0,36 vs. 1,19±0,40) et par conséquent les revenus en viande de chevreau par chèvre (35,37±9,57 vs. 23,95±6,9 €).*

Mots-clés : *Chèvre laitière, indicateurs économiques, classification.*

Introduction

In the last quarter of the twentieth century there was an increased interest in the classification and analysis of goat farms, mainly in Mediterranean areas. Traditionally, goat management systems were based on the use of natural sources of food, but recently a trend of intensification has been observed in dairy goat farms (Dubeuf *et al*., 2001; Castel *et al*., 2003).

The Isle of La Palma has a native dairy goat breed, however in the last twenty years there has been a tendency of changing to intensive management systems, and most of the farmers have the local Palmera breed substituted for the Majorera breed from Fuerteventura, which is easier to handle and has greater milk yield. The milk from the Palmera breed is used for making the local cheese which has an officially recognised Designation of Origin awarded due to the special quality of the milk from both extensive and semi-extensive management systems. It was important to clarify and analyse technical, socio-economic and environmental points of view, using a data-gathering system, developed by Toussaint (2002), in order to anticipate the future trends in these management systems.

Material and methods

Twenty one goat farms from the Isle of La Palma, all of which have been awarded the official "Designation of Origin" and therefore are considered to be of especially high quality despite having different degrees of intensification, were chosen for the study. Quantitative information from the first six months of 2005 was recorded to analyse the technical and economic indicators proposed by Toussaint (2002) and modified by Mena *et al.* (2004). Figure 1 shows the location of the farms and classification by grazing area.

■ Farms with grazing area > 0.2 ha/goat
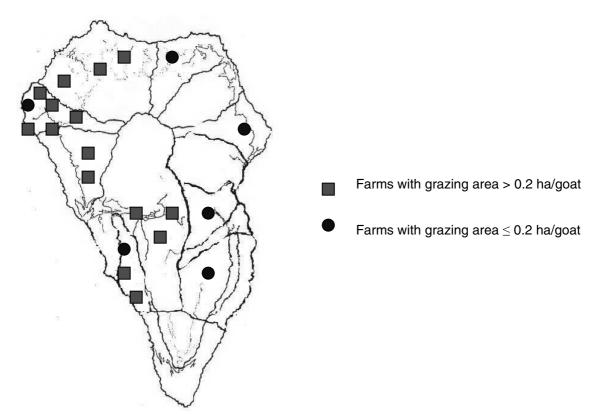
● Farms with grazing area ≤ 0.2 ha/goat

Fig.1. Classification by grazing area per goat and localization of survey farms in La Palma island.

This information was obtained from surveys (each farm being visited by a veterinary surgeon), direct observation, and data recorded by the "Consejo Regulador" (the Designation of Origin's official regulating body). In the Canaries kids are slaughtered when they are very young, typically at 15 days or younger and with a live weight of 5 to 6 kg (Argüello *et al.*, 2005)

The first step was to evaluate the suitability of the methodology under the local field conditions.

The procedure of classifying goat production systems consisted firstly in the elimination of variables whose variation coefficients were less than 50% and presented a reduced differentiation potential. The remaining variables were subjected to a correlation analysis, in order to identify groups of variables which were strongly correlated. Within each group of correlated variables, the most important were selected when they were relevant to the objective of this study. Once the production systems had been identified, an ANOVA was performed with all the variables, to find significant differences between systems (Berdegué *et al.,* 1990).

Results and discussion

Generally speaking, survey models should be adapted as far as possible to the particular circumstances. For example, in the case described here, as the layout had been pre-prepared, the parameters were not in the order that would have been most beneficial for our use; it was easier to find out the consumption of concentrates per goat than total annual consumption, although the latter

parameter would have been more useful. The same occurred with the milk produced, which was placed underneath the milk sold.

However, the calculation of the number of litres produced on each farm and the price obtained may be the greatest difficulties encountered. Despite reports by Mena *et al.* (2004), milk is not sold to the industry, since all the producers in La Palma are craftsmen and there is no official association keeping milk records. The quantity of milk and corresponding revenues had to be estimated according to the cheese sold, estimating the number of litres needed to make a kilogram of cheese and subtracting the value added by the cheese, which is difficult to calculate. Finally, it is important that those conducting the survey have certain experience so that they are capable of estimating and distinguishing certain parameters from others, which is of particular use when there are previous research works on the animals and their products. Once the descriptive statistics was completed, it was noted that there was a great deal of coincidence in certain aspects. For example, all the farms, except one, used only family labour. Only 4 farmers (19%) produced their own forage. It could be said that 15 (71.5%) farms grazed their flock, but 6 of them used less than 0.2 ha per goat, thus, according to Mena *et al.,* (2004), 28.5% of them could be considered intensive farming. Furthermore, all the kids were reared in the natural way, receiving milk directly from their mothers and only one farm marketed its production (cheese) directly. Only one farm did not provide forage. Other descriptive aspects are summarized in Table 1.

Table 1. Main descriptive aspects of farms where the survey was conducted

Human resources			Land resources				
Average age of farmers: 42.50 ± 9.02 years			Average area of farms: 50.61 ± 24.47 ha				
< 35 years old	36 to 45 years old	>45 years old	<30 ha	30 to 60 ha	60 to 90 ha	90 to 120 ha	>120 ha
15%	55%	30%	44%	33%	15%	4%	4%
Percentage of farms by type of labour force			Average grazing area/goat: 0.32 ± 014 ha				
Hired: 4%	Family: 96%						
Goats resources			Feed resources				
Average number of goats/farm:122.33 ± 5.42 goats			Average concentrate consumption/goat: 319.31 ± 22.49 Kg				
Average number of males/farm: 4.14 ± 1.31 males			Average forage consumption/goat: 331.47 ± 91.55 Kg				
Average ratio females/males: 32.75 ± 7.84			Average feed cost /goat: 164.77 ± 32.06 €				
Production parameters			Reproduction parameters				
Milk production/goat: 472.51 ± 44.37 l/goat			Prolificity: 1.76 ± 0.14 kids/goat				

The percentage of animals allowed to graze was 71.4%, which is similar to the 77% observed by Capote *et al.,* in 1992. However, when only semi-extensive farms with more than 0.2 ha of grazing per goat were taken into consideration, this percentage decreased to 57.2%. The number of head per farm was 122±5.42, which is higher than that reported by Capote *et al.* (1992), and is somewhat more than that indicated by Dubeuf *et al.* (2001) in different Mediterranean zones, but less than that observed by Ligios *et al.* (2004) in herds of goats in Sardinia.

When the coefficients of variation were analysed, it was noted that, contrary to that indicated by Castel *et al.* (2003), in goats in the "Sierra de Cadiz", only seven parameters showed a CV greater than 0.50 and eight showed more than 0.30. Parameters such as the number of goats per farm were 122.30±5.42 (CV 0.04), the total consumption of concentrates per head was 319.30±22.50 (CV 0.04), the milk produced per goat was 472.50±44.37 (CV 0.09), the fertility 1.76±0.14 (CV 0.08) and the mortality of kids was 14.4%±1.71 (CV 0.12). These coincidences, together with those stated above, could be due to the fact that only farms with one breed, geographically close and with official Designation of Origin were studied, which ensures a certain degree of homogeneity in aspects such as hygiene and prophylaxis.

The economic reference for the correlations was the net margin per litre produced, without taking into account any subsidies or aspects of meat production, because of their higher variation (CV 0.50). The correlations between this parameter and others (see Table 2), such as total income per milk per

goat (0.46), income for difference in stock (-0.36) or total concentrate costs (0.59), total forage costs (-0.60), total food costs (-0.67) or total cost per goat (-0.80), produced medium and high coefficients as they were parameters which were included in the defined function.

Table 2. Correlation coefficients between the most important parameters

Correlated parameters	r
Net margin (without subsidies and meat production) / litre produced vs. natural grassland area/goat	0.28**
Net margin (without subsidies and meat production) / litre produced vs. size of herd	-0.26**
Net margin (without subsidies and meat production) / litre produced vs. total income per milk/goat	0.46***
Net margin (without subsidies and meat production) / litre produced vs. total concentrate costs	-0.59***
Net margin (without subsidies and meat production) / litre produced vs. total forage costs	-0.60***
Net margin (without subsidies and meat production) / litre produced vs. total food costs	-0.67***
Net margin (without subsidies and meat production) / litre produced vs. incomes for difference in stock	-0.36**
Net margin (without subsidies and meat production) / litre produced vs. total cost/goat	-0.80***
Net margin (without subsidies and meat production) / litre produced vs. interest costs	0.30**
Net margin (without subsidies and meat production) / litre produced vs. age of farm	0.35**
Age of farm vs. farmer's age	0.82***
Age of farm vs. total income/goat	-0.03
Age of farm vs. total cost/goat	-0.34**

*p< 0.05; **p<0.01; ***p<0.001.

However, the bank's interest costs, which should have a negative influence on the margins, were positively correlated (0.30) with the net margin used, and although the coefficient was not very high, it could mean that the farmers with the greatest profit margin were those reinvesting in the farm. Other correlations also show interesting aspects of varying degrees, such as a negative correlation between the size of herd and the above-mentioned margin (-0.26). This could mean that by increasing the herd size there was a tendency to decrease the net margin of the farm. Another showed a tendency of increased profitability when greater area was used for grazing (0.28). There were no differences between intensive and semi-extensive systems regarding the amount of concentrates or forage. This also coincided with the fact that the age of farms was positively correlated with the net margin studied (0.35). This may be due to the fact that grazing is more established in traditional farming practises, where the workforce tends to be older (0.82). Without doubt the greatest profitability of the older farms was not so much related with the total income (-0.03) as in the control of costs, as a coefficient of correlation between the antiquity and the total cost per goat was shown to be -0.34.

The ANOVA results in function of the level of intensification did not present significant differences in most of the parameters studied (Table 3). Only in the case of the production of milk per goat (509.81±94.3 l in intensive farming and 422.78±71.8 l in other management systems), number of survivor kids per goat (1.69±0.36 kids in farms without grazing as opposed to 1.19±0.40 kids in herds with grazing) and consequently for income per kid per goat (35.4±9.57 € vs. 23.9±6.9 €) (Table 4), significant differences appeared (p<0.05) which were not found in other parameters such as replacement rate, % mortality, costs in total concentrates and forage per goat and total costs per goat. It is possible that this low degree of influence in the farm management system could be related to the use of traditional forages, which cost less, in intensive systems.

Table 3. ANOVA analyses in function of the level of intensification of farms

Variable	d.f.	F	p
Total feeding cost/goat	1	0.023	n.s.
Concentrate cost/goat	1	0.875	n.s.
Forage costs/goat	1	2.05	n.s
Total costs/goat	1	0.107	n.s.
Total income/goat	1	1.370	n.s.
Milk income/goat	1	4.470	0.05
Yearly milk production/goat	1	5.320	0.05
Kid meat income/goat	1	9.130	0.01

Table 4. Milk production, number of survivor kids and kid meat income/goat, for the two types of farms (means and standard deviation)

Variable	Farms with grazing (area >0.2 ha/goat)	Farms without grazing (area ≤ 0.2 ha/goat)
Milk production/goat	422.78 [b] ± 71.8 l	509,81[a] ± 94,3 l
Number of survivor kids/goat	1.19 [b] ± 0.40 kids	1.69 [a] ± 0.36 kids
Kid meat income/goat	23.95 [b] ± 6.9 €	35.37 [a] ± 9.5 €

a,b: Values with different letter in the same row indicate significant differences ($p<0.05$).

Conclusions

The survey model should be adapted to each situation and, if possible, be simplified to allow wider use. In the case of the farms studied, a high degree of homogeneity has been observed, and greater profit rate was found in the traditional farms than in the modern ones. This indicated that the introduction of intensification regarding feeding and management should be carefully studied before making recommendations. Finally, the level of intensification had a low impact on parameters, which may be due to goats receiving traditional forage in the manger.

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