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in

Bernués A. (ed.), Boutonnet J.P. (ed.), Casasús I. (ed.), Chentouf M. (ed.), Gabiña D. (ed.), Joy M. (ed.), López-Francos A. (ed.), Morand-Fehr P. (ed.), Pacheco F. (ed.). Economic, social and environmental sustainability in sheep and goat production systems

Zaragoza : CIHEAM / FAO / CITA-DGA
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 100

2011
pages 277-282

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Abstract. Cooperative association is increasing among goat farmers to merge the goat-milk supply for trading, in order to establish fixed cost advantages and to obtain more added value from the milk along its marketing channel. This study seeks to identify factors related to cooperative marketing among goat-milk producers of south-eastern Spanish mountainous areas. From a sampling survey of 156 goat farmers, a third of whom have already joined cooperatives in order to sell their milk, different farm and farmer features have been considered in order to test the relationship with the fact of belonging, or not, to a trading cooperative. These features include: farm size, land use, breeder livestock training, type of labour employed, perspective of having continuity on farming, certain farm-management features. A binomial probit model has been formulated to identify factors related to the use of the cooperative trade. Finally, some conclusions have been drawn in this respect.

Keywords. Cooperative association – Milk trade – Goat breeders – South-eastern Spanish mountainous areas.

Facteurs déterminants de l´adoption de formes coopératives pour la commercialisation du lait de chèvre en Espagne

Résumé. *L'association coopérative est devenue de plus en plus une stratégie institutionnelle pour les agriculteurs producteurs du lait de chèvre destiné au commerce, afin d'avoir certains avantages de coûts fixes et de faire plus de valeur ajoutée à partir du lait le long de ses canaux de commercialisation. Cet article tente d'identifier les facteurs liés à l'adoption de la forme coopérative parmi les producteurs de lait des zones montagneuses du Sud-Est espagnol. A partir d'une enquête par sondage auprès de 156 éleveurs de chèvres, dont un tiers ont déjà adopté la formule coopérative pour la vente de leur lait, différentes caractéristiques des fermes et fermiers ont été considérées pour tester la relation avec le fait d'appartenir, ou non, à une coopérative de commerce, dont les suivantes: la dimension de la ferme, l'utilisation des terres, la formation des éleveurs du bétail,le type d'activité occupée, la perspective d'assurer la continuité dans l'agriculture, certaines fonctionnalités de gestion des exploitations, etc. Un modèle Probit binomial a été spécifié, et son estimation permet d'identifier les facteurs liés à l'adoption du commerce coopératif. Certaines conclusions ont, enfin, été établies à ce sujet.*

Mots-clés. *Association coopérative – Commerce de lait – Éleveurs de chèvres – Zones montagneuses du Sud-Est espagnol.*

I – Introduction

Agricultural association presents competitive advantages, particularly in depressed zones and or in mountainous areas, where rural exodus has enormously diminished the potential of human resources and business initiative as well as individual initiative. Attempts by local farmers and livestock raisers to establish local associations as an economic solution to the problem of marginalization is also a way of forming pressure groups to defend collective interests and attain services (credit, grants, subsidies, etc.) and greater added value for products that might not be achieved individually. In addition, associations can also give the members greater participation in local planning. However, individualism, inadequate associational training, a lack

of foresight and analysis, rash decision making, the absence of leadership, and the lack of means to design policy strategies suitable to these zones comprise the causes that stifle cooperative initiatives in the rural setting.

In Andalusia, the development of cooperatives in the goat-raising sector is still emerging, with 12 cooperatives currently operating in relation to goat breeding. Despite the interest in associations in the goat-raising sector, few works have analysed the cooperative as a business option in this sector (Sayadi and Calatrava, 1996; Castel *et al.*, 2009, Ruiz, *et al*., 2009).

The present work seeks to identify the factors related to livestock and its exploitation that determine the establishment of cooperatives to market goat milk and related products.

II – Materials and methods

The data used in this paper were collected from the information gathered in a survey of 156 goat farmers operating in the mountainous rural districts of the provinces of Granada and Malaga (south-eastern Spain). This survey was conducted in the autumn of 2007. The farms surveyed were representative of the different production systems and herd sizes in the area.

To identify and analyse herd and breeder characteristics related to linked to the establishment of cooperatives to trade milk, a binomial Probit model was specified as follows: (i) "COOP" = 0: Not belonging to a milk-trading cooperative; and (ii) "COOP" = 1: Belonging to a milk-trading cooperative.

The initial independent variables included in the model were: farm type (Typefarm), distinguishing between goat only and mixed goat and sheep or other farms; goat breed (Breed); years employed in farming (Yearsfarming); part-time farming (Dedication); farm size: no. of breeding females (Herdsize); access to land (Landpos); possession of milking machines (Milkmach); housing (Housing); type of labour used in the production process: family/hired (Labour); farmer's age (Age); educational level (Educ); marital status (Mstate); no. of children (Child); attendance of agricultural training courses (Agrtrain); and intention of continuing with goat farming over the long term (Contfarm). Table 1 lists these variables, as well as the different levels taken by the multinomial variables.

III – Results and discussion

1. Cooperativism in goat livestock sector

Nowadays (2009) some 30% of the goat herders are members of cooperatives to market their milk. Non-associated breeders use to sell their milk to private factories. In this sector, the level of cooperativism is not high compared to that of other sectors. Goat herders are often independent and hesitant to join associations. This is due largely to the traditionally marginal character and isolation of this activity. The trend (1995-2006) is nevertheless growing, as reflected in Fig. 1, according to survey data.

Those who have not marketed milk through some cooperative either feel that cooperatives do not work well or state that they are doing well individually and do not need an association.

Nevertheless, there are forms of associations that join together a large number of farmers, such as the associations of Defensa Sanitaria Ganadera (ADSG, Livestock Health Defence), which represent 92.3% of the farmers surveyed. These associations carry out mandatory health controls for brucellosis in addition to providing technical and sanitary support to the herders to take care of different health problems of the animals.

Table 1. Definition of the explanatory variables of the binomial probit model (Dependent variable "COOP": Joining cooperatives to sell goat milk)

Variables	Description
Constant	Constant term
Typefarm	1, if the farm is goat only (monoactivity) and 0, otherwise
Breed	1, if the breed is Murciano-Granadina, and 0, otherwise
Yearsfarm-1	1, if the goat farm has been in operation for less than five years, and 0, otherwise
Yearsfarm-2	1, if the goat farm has been in operation for 5 to 10 years and 0, otherwise
Yearsfarm-3	1, if the goat farm has been in operation for over 10 years and 0, otherwise
Yearsfarm-4	1, if stockbreeder has always kept goats, and 0, otherwise
Dedication	1, if stockbreeder is the only full-time employment, and 0, otherwise
Herdsize	Size of goat farm (no. of breeding females)
Landpos	1, if stockbreeder has land, and 0, otherwise
Milkmach	1, if stockbreeder has a milking machine, and 0, otherwise
Housing	1, if there is full housing, and 0, otherwise
Labour-1	1, if goat keeper has no hired labour (farmer only), and 0, otherwise
Labour-2	1, if goat keeper employs permanent or part-time family labour, and 0, otherwise
Labour-3	1, if goat keeper employs permanent or part-time hired labour, and 0, otherwise
Age-1	1, if aged $\leq$ 35 years and 0, otherwise
Age-2	1, if aged from 35 to 45 years and 0, otherwise
Age-3	1, if aged from 45 to 55 years and 0, otherwise
Age-4	1, if aged ≥ 55 years and 0, otherwise
Educ-1	1, if stockbreeder is uneducated or has primary education, and 0, otherwise
Educ-2	1, if stockbreeder has secondary education, and 0, otherwise
Educ-3	1, if stockbreeder has university education, and 0, otherwise
Mstate	1, if goat keeper is married and 0, otherwise
Child	Number of children
Agrtrain	1, if the farmer regularly attends agricultural training courses, and 0, otherwise
Contfarm	1, if the farmer intends to continue with goat farming over the long term, and 0, otherwise

Other associations represented in the area are the professionals such as the Asociaciones Españolas de Criadores de la Cabra Murciano-Granadina (AECCMG, Spanish Associations of Murciano-Granadina goat breeders) and Malagueña (AECCM, Association of Malagueña goat breeders). These associations work for genetic improvement and to verify the milking quality of these breeds. Paradoxically, in this area, less than 20% of the goat herders interviewed belong to both associations.

2. Characteristics of goat breeders related to the adoption of cooperative to trade milk

A binomial Probit model has been fitted to identify the farm- and farmer-related characteristics that most influence the joining of cooperatives to sell goat milk. The specification of this model has been detailed in the Materials and methods section. The results of this model, confined only to the significant variables, are shown in Table 2.

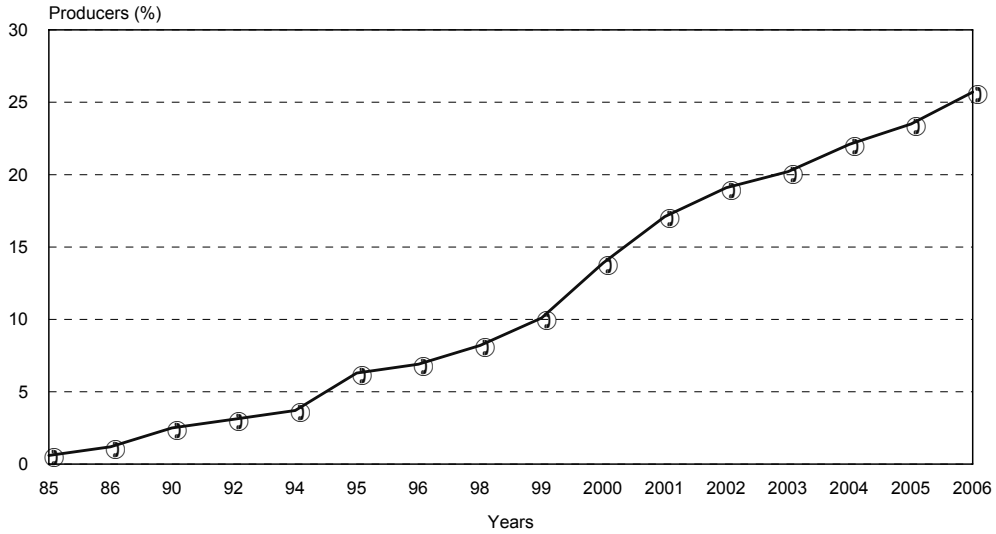

Fig. 1. Time course of goat herders that have joined the cooperative marketing of milk (Source: Survey, 2007).

Table 2. Results of the "Joining cooperatives to sell goat milk" binomial Probit model

Variables	Coefficients	t	p
Constant	0.308610	8,.7048	0.0000
Herdsize	0.107887	2.334	0.0196
Housing	0.826135	2.959	0.031
Milkmachine	0.941760	3.076	0.0021
Agrtrain	0.481100	2.298	0.0215
Cont	0.826135	2,959	0.0031
Dedication	0.438723	2.451	0.0142
Labour_1†	-2.64752081	-2.840	0.0045
Labour_2	-.295700614	-1.576	0.0115
Age-1††	0.7548635150	2.856	0.0043
Age-2	0.561264840	2.312	0.0208
Age-3	0.396431916	1.528	0.1264

Log likelihood function:	- 247.587
Restricted log likelihood:	- 220.208
Chi-squared:	55.757
Degrees of freedom:	11
Significance level:	$p \leq 0.001$
PCC:	68.11%

†Labour_3 reference variable (farming with permanent and/or casual hired labour).
††Age_4 reference variable (farmer > 55 years).

There is a direct relationship (p = 0.0196) between the size of the herd and the adoption of cooperative to trade milk. Also, a higher stock-housing level (p = 0.031) on these farms implies a greater likelihood of marketing milk through cooperatives. Stockbreeders that have a milking machine and full time employment are significantly more likely to join cooperatives for trading (p=0.002 and p=0.0142 respectively).

Attendance of agricultural training courses is also directly related to the dependent variable (p = 0.02) in the sense that the belonging to a cooperative to trade milk is significantly greater among farmers participating in agricultural training courses (goat operation start-up and herd modernisation, etc.) than those who do not regularly attend. In some cases, farmers participate in these courses to get European aids and subsidies for which they qualify by attending. These aid packages help in the modernisation of farms, encourage investments in plant and equipment, and thus tend to foment more ambitious plans for the future with a view to amortising the expenses incurred. Therefore, marketing strategies and belonging to a cooperative can help to increase income for breeders.

Additionally, the goat herders with the greatest prospects for continuing with the their business join more milk marketing cooperatives (p = 0.003). Long-term planning among breeders implies more memberships in cooperatives.

With respect to the multinomial variables included as independent variables in the model (owner's age and farm type by labour) that proved significant for explaining the adoption of cooperative milk trading, and after making the respective adjustments by changing the reference levels, we found that: (i) more entrepreneurial farms (employing part-time and/or permanent hired labour) have a significantly ($p \leq 0.01$) greater likelihood of cooperativism than do farms without such labour (herds tended by just the farmer or possibly with family help); (ii) farmers aged over 55 years are more sceptical about the effectiveness of cooperatives to trade milk than are farmers under 35 years of age.

Apart from identifying the factors related to cooperative membership to sell goat milk, the estimated Probit model can be used to calculate the likelihood of a given farmer and farm joining a cooperative to trade milk. Therefore, for example, the probabilities of a part-time goat herder aged over 55 years, who not intend to continue with goat farming over the long term, does not regularly participate in agricultural training courses, has an extensive farm with a small herd (under 100) and employs no labour apart from his or her own work, and without a milking machine would be as follows:

P (0)= 0,72
P (1)= 0,28

On the other hand, the probabilities for a 35-year-old goat keeper, employed full time, intending to continue with long-term goat farming , regularly participates in agricultural training courses, has a big herd (over 300-400 head) of fully housed goats, employs hired labour, and has a milking machine, are as follows:

P (0)=0,21
P (1)=0,79

IV – Conclusions

Despite the importance of cooperativism for milk trading, the level of cooperative membership is still low, not reaching 30%. The fact of belonging to a cooperative or not is influenced by certain factors and characteristics of the goat breeder and herd: the number of reproductive female goats, the level of management intensity, the possession of a milking machine, the type of dedication of the goat-raising activity, the intention of continuing with stock raising, the regular participation in farm-training courses.

It appears from the above that to belong to a cooperative is linked to more modern herds, with younger and more technically trained owners, herds of a certain size and a certain technological level as opposed to the more traditional herders who resist market cooperatives. This has been also pointed by Sayadi and Calatrava (2008) and Calatrava and Sayadi (2006).

Strategies to increase cooperativism in the goat sector require modernization of the herds, the rejuvenation and training of the stock raisers.

Acknowledgements

The authors wish to acknowledge the financial support received from the regional Ministry of Agriculture "Consejería de Agricultura y Pesca" of Andalusia for the project nº 92462/43, Junta de Andalusia (Spain).

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