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in

Baumont R. (ed.), Carrère P. (ed.), Jouven M. (ed.), Lombardi G. (ed.), López-Francos A. (ed.), Martin B. (ed.), Peeters A. (ed.), Porqueddu C. (ed.).
Forage resources and ecosystem services provided by Mountain and Mediterranean grasslands and rangelands

Zaragoza : CIHEAM / INRA / FAO / VetAgro Sup Clermont-Ferrand / Montpellier SupAgro
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 109

2014
pages 651-654

Diversity of efficient dairy farming systems in the PDO Saint-Nectaire cheese area

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Abstract. The abolition of the milk quota system in 2015 raises issues for the future of mountain dairy farms if they do not improve their economic efficiency. The interbranch organization of Saint-Nectaire cheese (PDO) wishes to support farmers in improving the food self-sufficiency of their farms. The aim of the study was to describe the diversity of production conditions of 33 efficient dairy farms. Farms were chosen according to their technical and economic results. A multivariate analysis identified four production systems. They are mainly characterized by the management of the dairy herd and grassland and by the product sold (milk or cheese). C1 and C2 groups included farms with high milk yield, a large amount of homegrown harvested feed and high stocking rates. They are mainly distinguished by the herd breed and their farm product. C3 and C4 included mainly dairy farms with less productive herds. They differed among themselves mainly by the contribution of dairy cattle to the total livestock unit, the stocking rate on the fodder area, the place of milking during the grazing period, and the winter cows' basic diet. This work has confirmed the wide variability of production means, management and technical performance of the dairy herds. In particular, some farms maximize the use of local resources (grassland) while reducing inputs. For others, the high value of the cheese compensates for the high feeding cost.

Keywords. Farming system – PDO cheese – Saint-Nectaire – Milk cost of production.

Diversité des systèmes d'élevage laitiers dans la zone AOP Saint-Nectaire

Résumé. *La suppression prochaine des quotas laitiers pourrait remettre en cause la pérennité des exploitations laitières de montagne si elles n'améliorent pas leur efficacité économique. L'interprofession de l'AOP Saint-Nectaire souhaite donc accompagner les éleveurs dans l'amélioration de l'autonomie alimentaire des exploitations. Le but de cette étude était de décrire la diversité des conduites de 33 exploitations laitières d'avenir selon des critères de performances techniques et économiques. Une analyse multivariée a permis d'identifier 4 groupes d'exploitations. Ils se différencient principalement sur la conduite du troupeau laitier et des surfaces en herbe ainsi que sur le type de produit vendu (lait ou fromage). Les groupes C1 et C2 rassemblaient les exploitations avec un niveau de production laitière par vache élevé, une surface récoltée importante et le plus fort niveau de chargement. C1 et C2 se distinguaient par la race du troupeau et le type de produit (lait ou fromage). Les groupes C3 et C4 rassemblaient principalement les producteurs de lait avec des troupeaux moins productifs. C3 et C4 différaient principalement par leur degré de spécialisation laitière, le chargement de la surface fourragère, le mode de traite en été et la nature de la ration de base hivernale. Ce travail a confirmé la grande variabilité des moyens de production, des modes de conduite et des performances techniques du troupeau laitier. En particulier, certaines exploitations maximisent l'utilisation des ressources herbagères locales tout en réduisant les intrants. Pour d'autres, la bonne valorisation du fromage compense des charges alimentaires élevées.*

Mots-clés. *Système de production – Fromage AOP – Saint-Nectaire – Coût de production du lait.*

I – Introduction

The abolition of the milk quota system raises issues for the future of mountain dairy farms if they do not improve their economic efficiency. The strength of the link between dairy products and their area of origin provides a lever for adapting to this new situation (Farruggia *et al.*, 2009). The PDO Saint-Nectaire cheese area is one of the smallest in Europe (1,900 km^2), with a variety of soils and micro-climates. The farm fields are distributed at altitudes from 800 to 1886 m a.s.l, with fertile volcanic or, to a lesser extent, granitic soils. The average annual rainfall is abundant, with more than 1,200 mm per year on 70% of the territory; the lower altitudes receive less rain. In 2012, 690 dairy farms were involved in the supply chain: **MP** farms produce milk which was then transformed into "Factory cheese" by dairies located in the PDO area; **CP** farms produce milk and transforme it (wholly or partly) into "Green cheese", twice a day, directly after milking. "Green cheese" is either matured on farm or sold to industries for ripening. This diversity leads to different types of managements and contrasted economic results which can be amplified by climatic events and extreme input prices. In 2007, the interbranch organization (IO) modified its specifications in order to strengthen the exploitation of the available local resources while reducing production inputs in farming practices (Ministère de l'Agriculture et de la Pêche, 2007). In order to provide tools to support farmers to achieve food self-sufficiency on their farms, an inventory of the diversity of production conditions and technical/economic performance of the dairy units was carried out on farms considered to be efficient according to farm advisors.

II – Materials and methods

1. Study design

Thirty three dairy farms spread out over the area of the Saint-Nectaire cheese PDO and involved in the supply chain were selected by farm advisors. Among farms belonging to accounting and milk recording organisations, the advisors chose farms considered to be efficient. Technical and economical criteria were used: annual milk yield, gross operating income per 1000 L of milk produced or amount of the investment. MP and CP farms were equally represented. The dairy cows are mainly fed with local permanent grassland forage and concentrates. Of the 15 MP farms, 8 fed haylage or silage together with hay (FF) and 7 fed just hay (DF). Of the 18 CP farms, 8 used FF and 10 farms only DF.

2. Data collection

The milk recording organization provided data on the technical performance of the dairy herds in 2010 and 2011. The accounts recording organization provided the economic performance of the dairy units for 2011. Information related to the description of the farm practices was collected by on-farm surveys in autumn 2012. The information collected was mainly related to dairy herd characteristics and management, forage supply management, type of livestock farming and workforce.

3. Data analysis

To identify relationships between the conditions of milk production, a multicomponent analysis (MCA) was carried out (Spad 7.4.56 software for Data Analysis). It was based on 14 quantitative variables and the 8 qualitative variables describing the management and operating costs of the dairy herd, the forage area and workforce (table 1). A hierarchical cluster analysis (HCA) was performed on the farms coordinates on the first six factors of the MCA, which explained 53 % of the data variability. The HCA separated the farms into 4 production systems (C1 to C4). The system's characteristics were compared using the ANOVA procedure; multiple comparisons were performed by Fisher's least-significant-difference test on quantitative data. The Fisher's exact test was used in the analysis of contingency tables for qualitative data.

III – Results

1. General description

The farms were managed by 1-4 associates. On average the youngest was 35. The labour productivity varied from 18 - 77 LU per annual work unit. The useable agricultural area was 115 ha on average and varied from 42 to 195 ha. The number of dairy cows per farm varied from 20 to 92.

2. Production systems

The production systems differed mainly in their milk yield level, stocking rate, relative area cut for conservation or grazing, winter cows' basic diet and feed costs. C1 and C2 included farms with the highest milk yields (table 1). A large portion of the meadow area was reserved for harvested feeds. The home-grown harvested feed cost and the stocking rate were high. The size of the building for forage storage was often too small. These two classes distinguished themselves by the type of milk product, the cow breed and the winter basic diet. Therefore, in C1, MP and CP farms fed Holstein herds with hay and fermented grass in winter. In C2, CP farms fed Montbeliarde herds mainly with hay during winter and had high purchased feed costs. They employed a large farm workforce and paid salaries.

Table 1. Characteristics of dairy farms according to their production system (indicators used in the MCA: quantitative data in normal font; *qualitative data in italic)*

	C1 n=11	C2 n=12	C3 n=4	C4 n=6	*P* [1]
Milk yield (kg/cow/305 days of lactation)	7,310 [a]	6,807 [a]	5,539 [b]	5,374 [b]	***
Contribution of dairy cattle to total livestock unit (%)	93 [a]	88 [a]	56 [b]	91 [a]	**
Age at first calving (months)	32	32	34	33	NS
Proportion of primiparous births for the herd (%)	99	96	99	97	NS
Winter cows diet only based on hay (DF) (nb of farms)	0	10	2	6	***
Calves born within a 3-month period (nb of farms)	4	4	0	4	NS
Outdoor milking (nb of farms)	1	3	0	6	***
Animal given into agistment (nb of farms)	4	2	1	1	NS
Stocking rate on forage area (LU/ fodder area)	1.0 [a]	1.0 [a]	0.9 [a]	0.5 [b]	***
Proportion of permanent grassland (% usable agricultural area)	92 [b]	100 [a]	98 [ab]	100 [a]	*
Areas cut for conservation / main fodder area (%)					
- First cut areas	51 [a]	51 [a]	34 [b]	31 [b]	***
- Second cut areas	40 [a]	36 [a]	8 [b]	5 [b]	***
Storage of forage: too small building size (nb of farms)	8	6	1	3	*
Fraction of hay in total stock (%)	67	84	72	88	NS
Length of grazing without supplementation (days)	54 [b]	90 [ab]	103 [ab]	152 [a]	*
Feed costs for milk production (€/1,000 L)					
- Purchased feeds (concentrates and/or forage)	118	151	128	133	NS
- Homegrown harvested feed	22 [a]	29 [a]	12 [b]	7 [b]	***
Other operating costs (veterinary, custom services...) (€/1,000 L)	63	66	60	50	NS
Labour productivity (nb LU/annual work unit)	43	40	41	39	NS
Employment of paid or voluntary labour (nb of farms)	1	10	2	4	*
Type of farm product (nb of farms)					+
- MP (only milk produced)	6	2	3	4	
- CP (milk transformed into farmhouse cheese)	5	10	1	2	

[1] + P < 0.10; *P < 0.05; ** P <0.01; *** P < 0.001.

Data within the same row and season and not sharing a common superscript are different (p < 0.05).

C3 and C4 included farms with the less productive herds. Most were MP farms. The area of harvested grasslands and the home-grown harvested feed cost was lower than in C1 and C2. C3 and C4 differed mainly in the contribution of dairy cattle to the total livestock unit (reflecting the presence or absence of a suckling herd), the stocking rate on the fodder area, the place of milking during the grazing period, and the winter cows' basic diet. Therefore, in C3, all dairy herds were associated with suckling herds. In C4, all the winter diets were based only on hay and the stocking rate was the lowest. Most of calves were born over a 3-month period; all cows were milked outdoors during the 5-month grazing season without supplementation.

III – Discussion and conclusion

This work has allowed us to quantify and evaluate the very large variations in technical performance of these mountain grassland farms, members of an AOP. The differences turn out to be considerable between the most productive farms using a lot of inputs and more grazing-orientated ones, and also between the products sold. Certain farms maximise the use of local herbage resources whilst reducing inputs. For others, the profitability of cheese makes up for the high feeding costs.

The changes to the specification (stopping of the feeding with fermented forages) will have different consequences according to the production system and the current farm management. There will be no impact for producers who comply with current specifications. However, the abandonment of wet forage could require heavy investment in new building for stocking dry forage. Farmers could increase the proportion of milk produced during the grazing season by making more use of grazing. In some cases, complying with the specification will not result in a reduction of inputs. The abandonment of wet forage could be associated with an increase in the amount of purchased feed because the diet could contain 30% of concentrates over a year. One of the missions of the IO would be to support breeders in bringing back grazing to the heart of their AOP farm.

Acknowledgments

This work was carried out as part of a training module involving research, created for final-year agronomy students at VetAgro Sup. It was funded by the Interbranch organization of Saint-Nectaire cheese and carried out under the supervision of the "Pôle fromager AOP Massif Central". The authors thank dairy producers involved in this study for their welcome and students of VetAgro Sup for conducting surveys.

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