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Jeanneaux P., Dakpo H., Blasquiet-Revol H.

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The performance of the strategy of differentiation of dairy farms in France

P. Jeanneaux*, H. Dakpo and H. Blasquiet-Revol

UMR Métafort 1273-89, avenue de l'Europe, 63370 Lempdes (France)
*e-mail: philippe.jeanneaux@vetagro-sup.fr

Abstract. In France, the dairy sector in mountain areas is largely oriented to producing cheese with quality signs such as the Protected Designation of Origin (PDO). Despite this strategy of differentiation, a strong disparity concerning efficiency exists between French dairy farms. The objective of this paper is to highlight the economic performance of dairy farms involved in the differentiation strategy compared to those which are massively engaged in a cost leadership strategy. We show the performance of these two case studies by analysing Farm Accountancy Data Network with the Data Envelopment Analysis (DEA). This non-parametric method helps carrying out a diagnosis of farm performance dissociating the pure technical efficiency and the scale efficiency, both components of the measured levels of the total efficiency. Farmers from the plains are more efficient than those from mountain areas. However, when considering the performance including real milk price and not only physical outputs, farmers from Franche-Comté (massively engaged in the PDO Comté) are as efficient as farmers from Bretagne unlike farmers from Auvergne and Rhône-Alpes regions.

Keywords. Dairy farm – Efficiency – Mountain areas – Data Envelopment Analysis – Strategy of differentiation.

Performance de la stratégie de différenciation des exploitations laitières en France

Résumé. *En France, le secteur laitier des régions de montagne s'est largement orienté vers une stratégie de production de formage sous signe de qualité comme les appellations d'origine protégées (AOP). Malgré l'adoption de cette stratégie de différenciation, de grands écarts existent en termes de d'efficience des exploitations laitières. Cette communication propose d'avancer quelques éléments de réflexion sur la performance des exploitations engagées dans une stratégie de différentiation par rapport à celles engagées dans la stratégie de domination des coûts. Nous analysons ces deux situations par la méthode DEA sur la base du traitement de données du RICA. Cette méthode non paramétrique nous permet de réaliser un diagnostic de la performance des exploitations en distinguant leur efficience technique pure de leur efficience d'échelle. Nous montrons que les exploitations de plaine sont plus efficientes que celles des zones de montagne. Toutefois, si l'on calcule les scores d'efficience totale en tenant compte des valeurs réelles des outputs, alors les exploitations laitières de Franche-Comté se rapprochent des niveaux d'efficience des fermes bretonnes à la différence des exploitations des autres régions de montagne.*

Mots-clés. *Analyse d'enveloppement des données – Efficience – Exploitations laitières – Stratégie de différenciation – Zones de montagne.*

I – Introduction

In France, numerous dairy-processors and cheese makers have developed their competitive advantage through a cost leadership strategy. Dairy Farmers, especially located in plain areas, engaged in this kind of dairy chain, have also developed a strategy based on cost leadership through rationalization of the production process, production volume expansion and modernization. However, at the same time, cheese-makers and farmers from mountain areas turned strongly to a strategy of differentiation based on Protected Designation of Origin (PDO). Even if they adopted a strategy of differentiation, over a long time, in average, the economic performance of the dairy sector in mountain areas is lower than in plain areas (Agricultural Income per dairy

farmer is closed to 24,900 € in mountain area than 32,600 € in plain area (RECP, 2012). Thus, the relevant questions we would like to discuss in this paper are: How to explain these differences in performance levels? Are the more competitive the more technically efficient?

So, this paper highlights the determiners of the economic performance of the dairy farms observed on six French contrasted cases studies, three located in mountain areas and three in plain areas. In a first part, we develop the theoretical framework and the methods. In a second part, we describe the data and the results. The discussion concludes by giving some reasons to explain why there are disparities of efficiency.

II – Theoretical framework and methods

1. The efficiency measurement with the DEA method

The researches in farm competitiveness are mainly oriented on the analysis of the efficiency of the strategy based on cost leadership (Latruffe, 2010). At the opposite, researches based on the strategy of differentiation are very scarce. Differentiation is a way to get a competitive advantage. It is the ability of designing a set of meaningful differences to distinguish the company's supply from competitor's supply (Kotler *et al.*, 2009). This work is included in the general research on economic efficiency (Battesse, 1992) which was initiated by Farrell in 1957. The inefficiency of a farm indicates that is possible to produce the same level of outputs with fewer inputs or more outputs with the same amount of inputs. In this paper, we only evaluate total efficiency. Total efficiency combines pure technical and scale efficiencies. Pure technical efficiency corresponds to the ability of the farmer to make the best choice in a way to reduce the inputs and still produce the same outputs without taking into account the price of the inputs and the outputs, and conversely. Scale efficiency corresponds to the ability to have the relevant scale. We have to precise that the measure of the total efficiency is made with outputs in quantity of goods (milk, meat, cereals) and inputs in quantity. The price of the milk for example is not taken into account in a first step to determine the total efficiency, but in a second step we take into account the real milk price at farm gate to evaluate if the scores of efficiency change due to the ability to dairy farmers involved within the strategy of differentiation to capture added value. It is the specificity of our approach.

To evaluate total efficiency of the dairy farms we use the Data Envelopment Analysis (DEA). It is a nonparametric approach for the estimation of production frontiers. The DEA approach to pure technical and scale efficiencies measurement leads to a mathematical optimization. Our study uses benchmarking to make inter-farm comparisons of the performance. We consider with the DEA method that if a farm can produce a level of multiple outputs utilizing a level of multiple inputs, it is possible for another firm of equal scale of doing the same (Berg, 2010). We carried out the evaluation of efficiency to search for the points with the lowest unit cost for any given output, connecting those points to form the efficiency frontier. Any farm not on the frontier is considered inefficient. A score (numerical coefficient) is given to each firm, defining its relative efficiency. A dairy farm is efficient if the coefficient is equal to 1. Controversy, inefficient farms are identified by an efficiency rating of less than 1. We need to collect data to describe the farms concerning 6 French regions: 3 concern plain areas (the study concerned only the dairy farms (Otex n°45, ex n°41) located in mountain areas (down to 600m) (Bretagne, Lorraine, Nord-Pas-de-Calais), 3 concern mountain areas (up to 600 m) with PDO Cheeses (Auvergne, Franche-Comté and Rhône-Alpes). For estimating the efficiency of the dairy farms one major source is used to: the FADN database (Farm Accountancy Data Network) for the year 2011.

III – Empirical application

1. Data description

The empirical application is on a sample of 417 dairy farm observations for year 2011. The farms are specialized in milk cattle production and are located in six regions of France. In the efficiency models, the economic (good) outputs are the quantity of meat production and the milk production. Five inputs have been retained for the construction of the frontier: land [Total Utilized Agricultural Area in hectares (ha)], labour [annual work unit (AWU)], herd size (in livestock units), capital (depreciated and financial charges) and intermediate consumptions.

2. Analysis of the efficiency of dairy farms in six regions

A. Evaluation of the efficiency by taking into account physical outputs

We analyse the economic performance of dairy farms by measuring efficiency scores given by the DEA. The total efficiency is presented and broken down in scale efficiency and pure technical efficiency.

In a first step, all calculations have been carried out with physical outputs: amount of milk, amount of meat. This evaluation allows to measuring the ability of dairy farmers to be efficient, *i.e.* by producing physical outputs with minimum inputs (see Table 1 "physical output" column).

Table 1. Efficiency Scores of dairy farms in the six regions of the sample (2011)

	Total efficiency (physical outputs)	Total efficiency (output in real monetary value)	Scale efficiency (physical outputs)	Scale efficiency (output in in real monetary value)	Pure technical efficiency (physical outputs)	Pure technical efficiency (output in real monetary value)
Auvergne	0.77	0.76	0.87	0.89	0.89	0.87
Franche-Comté	0.72	0.88	0.89	0.95	0.81	0,93
Rhône-Alpes	0.74	0.77	0.87	0.88	0.86	0.89
Bretagne	0.92	0.90	0.97	0.97	0.95	0.93
Lorraine	0.84	0.84	0.96	0.96	0.88	0.88
Nord-Pas-de-Calais	0.89	0.88	0.96	0.95	0.93	0.93

Source: Treatment FADN Data (2011) from authors – Input Orientation.

Indeed, if we calculate the total efficiency scores from the outputs by volume, the total score concerning Franche-Comté dairy farms is 72%. This result deviates strongly from the best score (Bretagne region with a total efficiency close to 92%) and it is exceeded by the scores from Auvergne (77%) and Rhône-Alpes (74%) regions which are both involved in PDO cheese productions. This result means on average that the dairy farms located in Franche-Comté could have reduced their inputs by 28% (1–0.72) for the same output level, if they have adopted the best combination of inputs. If we decompose the total efficiency, one the one hand, a better management of the use of the multiple inputs could explain 19% (1-0.81) this progress towards the benchmark. On the other hand, if the dairy farms have been adapted to their optimal size (scale efficiency), the progress towards the benchmark could be in order to 11% (1-0.89).The total efficiency concerning dairy farms located in mountain areas are lower than those located in plain areas as if the strategy of

differentiation would not be a relevant choice. To discuss this issue, we have to take into account in the analysis the real monetary value of the outputs instead of their physical nature.

B. Evaluation of the efficiency by taking into account the real monetary value of the outputs

In a second time, all calculations have been made with the value of the outputs to their market price (milk and meat products in Euros). We thus try to intersect these measures of the total technical inefficiency with previous results. The least total efficiency scores are represented by the dairy farms from Rhône-Alpes and Auvergne (respectively 0.77 and 0.76) (see Table 1. below column "output in real monetary value"). They are distant from another group of four regions in which we find three plain areas and one mountain area (Franche-Comté). For these four areas, we observe a larger share of the pure technical inefficiency in the total efficiency, as if the farms were close enough to the optimal size. By taking into account the real milk price at farm gate, the performance of dairy farms in Franche-Comté has been improved, whereas efficiency of the dairy farms in Auvergne, Bretagne and Nord-Pas-de-Calais has been decreased slightly (see Table 1) compared to the previous results (section A.). The case of dairy farms from Franche-Comté is interesting to discuss the performance of the strategy of differentiation. The total efficiency has increased from 72% to 88% and allows these farms to reach the efficiency level of dairy farms involved in the cost leadership strategy concerning the three plain areas. Farms from Franche-Comté have gone up sharply their pure technical efficiency (from 81% to 93%) and their scale efficiency (from 89% to 95%).

IV – Discussion

By analyzing the efficiency from the real monetary value of the outputs, it appears that farms succeed in capturing added value by implementing a strategy of differentiation to bridge the gap efficiency, like farms of Franche-Comté which are involved in PDO Comté. However, these results do not apply in the same terms in Auvergne and Rhône-Alpes whereas they are characterized by many PDO cheese productions. Their scores of total efficiency remain stable after taking into account the real value of the milk price at farm gate as if they cannot capture added value from the PDO cheese market. We assume that dairy farms of Franche-Comté have developed their practices and their assets in order to distinguish the final product (PDO Comté) to improve the willingness to pay from the final consumer and thus to capture this added value. It means the performance gap must also be caused due to higher milk prices for the Franche-Comté region that reaches a milk price at farm gate to 0,413 €/l (for 2011). It is clear that only the Franche-Comté manages to achieve its strategy of differentiation through a milk prices 20% higher compared to other regions (Bretagne and Nord-Pas-de-Calais: 0.340€/l; Lorraine: 0.338€/l). Among these, we find the Auvergne and Rhône-Alpes, which despite producing many PDO have milk prices to producers fairly close to the regions involved in the cost leadership strategy (Auvergne: 0.337€/l; Rhône-Alpes: 0.362€/l). The milk price depends as well on the bargaining skills of the dairy farmers (as they also control most of cheese-making cooperatives) when discussing within the collective organization about the calculation ratio for fresh cheeses they sell to the ripeners (Barjolle *et al.*, 2012). The differentiation we analyse above appears as a relevant strategy to improve the total efficiency of dairy farmers.

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