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Analysis of the Technical and Economic Performance of Dairy Farms in Algerian Conditions: The Case of the Wilaya of Tizi-Ouzou

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Abstract: The aim of this work is to carry out a comparative study of the costs of milk production for the two zones, plain and mountain, in the region of Tizi-Ouzou. Sixty-four farmers living in both areas were interviewed and surveyed. With an average of 12.5 cows per farm, there was no difference in the number of dairy cows between the two zones ($P=0.586$). Fodder consumption was 24.8 and 30.9 kg/cow/day in the mountain and plain areas respectively, a significant difference ($P<0.0001$). Milk productivity was not significantly different ($P = 0.202$) between farmers in the two areas. The average was 21.7 litres per cow per day. The total cost of producing one litre of milk was 41.05 AD/L and 35.5 AD/L respectively, a significant difference ($P < 0.0001$) between the two areas. The cost of feeding differs significantly ($P < 0.0001$) between the two areas. Feed is more expensive in the mountains than in the lowlands (37.62 vs. 30.81 AD/L). The cost of buying hay was the most significant difference in feeding costs ($P = 0.002$). These costs were 17.43 vs. 12.73 AD/ha, respectively. There is a small difference in the cost of farm labour ($P=0.095$). It is lower in the mountain area (0.64 vs. 1.19 AD/L) than in the plain area. The main item in the total cost of milk production is the cost of feed. It represents 90 % and 85 % respectively in the mountain and in the plain areas. Forage area is a limiting factor for the development of milk production in the Tizi-Ouzou region. In the context of territorial development, it is proposed to develop fodder and silage production in regions of Algeria where there is an abundance of arable land and to transfer this fodder to dairy basins such as Tizi-Ouzou to feed dairy farms.

Keywords: Dairy cattle, Milk production, Production cost, Development

Introduction

In Algeria, milk is considered to be a strategic product. This is due to the importance of milk in the Algerian model of consumption. It has a very high nutritional value. It can be a substitute for other expensive products such as meat (Amellal, 1995). With a consumption of 05 billion litres of milk per year, the dairy sector shows a weakness in the production of milk and in the collection of milk (Bellil, 2018). Cattle farming accounts for most of the national milk production. However, it is still not sufficient to meet the demand for milk and dairy products. Despite the potential of the existing farms, the yield of milk is still very modest (Belhadia, 2016). Disparities between farms in terms of production factors and management practices characterise the dairy sector in Algeria. The majority of farms are small-scale family farms that produce food, while other farms are large-

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scale industrial farms that are more structured. Differences in dairy farm performance can result from this disparity between farms.

In this sense, our work is aimed at calculating the cost price of a litre of milk in the two milk-producing zones: the plains and the mountains of the Wilaya of Tizi-Ouzou. The factors determining the economic performance of these farms will also be identified. There will also be a comparison of the production costs of a litre of milk between the two areas and the identification of constraints.

Method

The study area (wilaya of Tizi-Ouzou) is located in the northern part of the country (www.tiziouzou-dz.com/). It covers an area of 975.79 km². This represents 0.13% of the national territory. The region is mountainous par excellence. There are only a few plains. Almost 52% of the study area has a 12% slope (DPAT, 2010). There are more than 50,000 cows in the region. They produce an average of 100 million litres of milk per year (DSA, 2019). A survey targeted 64 farmers, equally divided between mountain and plains areas. For the analyses, the descriptive method (mean, standard deviation and percentage) was adopted. In addition, a Student's t test was performed. These analyses were carried out in order to compare production and economic performance between the two zones; mountain and plains.

Results and Discussion

The number of animals reared in the plains zone is 1152, compared with 605 in the mountain zone. The average number of dairy cows was 13.2±10.78 head in the plains zone and 11.8±9.73 head in the mountain zone. There was no significant difference between these two areas (P= 0.586), with an overall average of 12.5 cows/farm.

Feed

Concentrates are added to the forage ration to improve milk production. The quantities of concentrates distributed per cow per day varied considerably between farms in the two zones (Table 1). It ranged from 6 kg to 16 kg. However, the average amount of concentrate distributed per dairy cow per day was 9.81±2.59 kg in the plains and 9.24±2.12 kg in the mountains. There was no significant difference (P=0.257). However, in a study of high-performance dairy cattle farming, Si Tayeb et al (2015) report higher quantities of concentrates distributed, averaging 15 kg/head/day. Whereas Gupta et al. (2014) reports that cows receive small amounts of concentrate, on average less than 3 kg / head / day.

Table 1. Distribution of farms according to the quantity of concentrate distributed in kg/cow/day.

Area	Class (VL)	Number of farms	Concentrate type
Mountainous	[3.5-6]	32	Vache laitière, wheat bran,
Plains	[7-10]	32	maize, jeune bovin
Total	[8-16]	64	

Livestock diets are based on roughage in the form of straw, hay, oats, sorghum and meadow grass. The most common fodder on farms in the two study areas are: Sorghum, oats, clover. Straw and hay were also used throughout the year. Silage was only used on 7 farms out of the 64 farms visited (1 farm in the lowlands and 6 farms in the mountains). In addition, natural and natural and artificial grasslands are also an important source of forage. The quantities consumed from these meadows can reach 31±4.80 kg/cow/day and 25±6.16 kg/cow/day respectively in the plains and mountain areas. There was a significant difference between these two areas in terms of forage intake from grassland (P<0.0001).

Milk Production

As none of the farmers have their own milking parlour, most of them (80%) milk twice a day in their own barn. Milking takes place twice a day. The interval between the two milkings is 12 hours. The average milk yield per cow per day on the farms surveyed was 21±4.84 liters in the mountain zone and 22.41±3.80 liters in the plains zone. There was no significant difference (P = 0.202) between the two study areas. In addition, milk production

at peak lactation could reach 26.7 liters/cow/day in the mountain area and 29.8 liters/cow/day in the lowland area.

Milk Production Costs

In the sample surveyed (64 farms), milk is collected twice a day in most cases. This is because they do not have equipment suitable for collecting raw milk. The following table shows that there is a significant difference ($P < 0.0001$) in the total cost of milk production between the two zones. They were 35.50 ± 4.64 AD/L and 41.05 ± 5.75 AD/L in the mountainous and in the plain areas, respectively. Mouhous et al. (2020), in a study on dairy cattle in the same study region, reported a similar production cost of 35 AD/L. This cost is similar to that reported by Yerou et al (2019) in the western region of Algeria, which was 37.1 AD/kg.

The largest item of expenditure in milk production is feed. There was a significant difference ($P < 0.0001$) between the two zones. The cost of feed was 37.62 ± 6.22 AD/L in the plains and 30.81 ± 3.95 AD/L in the mountains (Table 2). Feed accounts for 87% of the total cost in the plains due to successive increases in market feed prices. In mountainous areas, this figure rises to 92%. This situation has also been reported by Ghozlane et al. (2009) for large farms in the eastern part of Algeria and by Srairi et al. (2013) for Morocco.

Regarding feed costs, the significant difference was in hay purchase ($P=0.002$). In the plains, hay purchase costs were 12.73 ± 4.83 AD/L, whereas in the mountains they were 17.41 ± 6.43 AD/L. In plains and mountain areas, the purchase of hay accounted for 41% and 46% of the feed costs, respectively. There were no significant differences in the purchase of other feeds. These included concentrates, straw, oats, lucerne and silage. Paradoxically, concentrates are used more in plains than mountains. In these areas, it accounts for 56.4 % and 49 % of the feed costs, respectively.

Table 2. Cost structure of milk production (AD/L)

Type of cost (AD/L)	Plains area	Mountainous area	P value
Feed	37,62±6,22	30,81±3,95	< 0,0001
Labour	0,47±1,72	1,44±4,90	0,296
Crop work	0,64±1,26	1,19±1,30	0,095
Energy and water consumption	1,08±1,09	0,88±0,59	0,364
Hygiene and health	1,23±0,84	1,18±0,53	0,795
Total cost	41,05±5,75	35,50±4,64	< 0,0001

In addition, there was little difference ($P = 0.095$) in the costs of farm work in the two study areas (0.64 ± 1.26 VS 1.19 ± 1.30) in the plain and mountain areas. These costs include ploughing, seed purchase, treatments, etc. Breeders have small areas of land for cultivation or grazing. There was a significant difference between the two areas ($P=0.006$) with 7ha/farm in plains and 2.5ha/farm in mountains. It should be noted that arable and pasture land is the limiting factor in the study area. Although it is a mountainous area, it has significant potential for milk production skills.

Regarding labour, farms are mainly run by family labour. Paid labour is used on very few farms. Moreover, labour costs represent only 0.47 ± 1.72 AD/L and 1.44 ± 4.90 AD/L of the total cost of milk production in the plain and mountain areas, respectively.

Conclusion

Overall, dairy farms tend to be family-owned with little paid labour. The farms are small. In general, there are no more than 15 cows per farm. Production resources, in particular pasture and arable land, are not the same in the two zones (plains and mountains). There is a significant difference between the plains and the mountains (7 hours compared with 2.5 hours). The most important item in the total cost of milk production is animal feed. These costs (92% vs. 87%) are higher in mountainous areas than in plain areas. Most of the feed costs are for the purchase of concentrates and hay.

Other expenditure in the plain and mountain areas is negligible (8% vs. 13%). This means that there is a significant difference in the costs of producing milk between the two zones. For the plain and mountain areas these costs are 35 AD/L, 5 AD/L and 41 AD/L respectively. With a low fodder base, the study area cannot

develop its milk production. It has considerable potential for milk production skills, despite being a mountainous area.

Recommendations

In order to achieve this purpose of development, it is necessary to put in place sustainable mechanisms for the supply of fodder between mountainous areas and other regions with a high potential fodder base. In some regions with a high potential for arable land, dairy farming is not the main activity. However, it can be a source of fodder in mountain regions where dairy farming is predominant.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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