Study of Profitability Parameters of Dairy Cattle Farms in the Wilaya of Skikda (Eastern Algeria)

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Abstract

In the Wilaya of Skikda (Eastern Algeria), the bovine dairy chain benefits from financial support from the State, like all the operators concerned. This article focuses on a technical and economic analysis of the dairy production of cattle farms through zootechnical and economic parameters revealed for 0 a sample of 157 dairy farms surveyed in 21 municipalities of the Wilaya of Skikda over two years (2021 and 2022). The great variability of their rearing parameters seems to have repercussions on their yields, their production costs and their profitability. Concentrated feed constitutes a significant part of food costs and the average cost per liter of milk is around 33.3 ±10.4 Algerian Dinars (DA). This study highlighted the need to provide support to dairy cattle breeders for technical and economic management of their herds with a view to collective organization of their dairy profession.

Keywords: _Dairy Chain, Cattle Farms, Milk Price, Costs, Economic Efficiency._

1. INTRODUCTION

In Algeria, the dairy sector is considered strategic because of its economic and social role in meeting local market demand. The State continues to favor the distribution of milk at subsidized prices mainly based on imported powders. Nevertheless, the chronic rise in the prices of milk powders on the international market had led the public authorities to implement in 1995 a program of rehabilitation of local milk production supported by diversified financial support funds granted to main operators of the local dairy sector where cattle farming has long been the main supplier of the dairy industry (Benyoucef, 2005 and 2013). The stabilization of the price of fluid milk by the public authorities thanks to subsidies has made it possible to make it, after cereals, a second product refuge for the vast majority of consumers. But this has benefited city dwellers more than rural dwellers and higher income earners more than those with average incomes. However, the promulgation of Executive Decree No. 20-153 of 8 June 2020 by the government was taken to direct the consumption of packaged milk in sachets (LPS) exclusively to households and prohibit it to establishments of drinking establishments, cafes and restaurants. The support system for the local dairy sector is entrusted to the National Interprofessional Office of Milk and Dairy Products (ONIL) as an instrument for regulating the local milk market as part of a supply policy aimed at reducing the import bill for milk powders. This support system for farm milk production is periodically revised to improve its level of performance but it still depends on the coexistence of two types of raw material supply (milk powder and raw milk) market for household consumption and industrial processing (Benyoucef et al. 2017). Such a dairy policy implemented by the government also aimed at the coordination of milk sector operators and the regulation of the distribution of value added by the price administration (Makhlouf et al. 2015). The upward revision of the incentive measures

for the three main segments of the milk sector (producers, collectors and industrialists), has certainly allowed an increase in the volumes of raw milk produced and collected. Furthermore, the quantity of milk collected should in principle constitute a reduction in the volumes of milk based on imported powders. Indeed, the milk support system takes into account an industrial integration premium for raw milk, which should gradually replace imported powders. The objectives set out in the national dairy policy were to continuously improve the collection of local milk production (Makhlouf et al. 2015). However, the comparison of the production of raw milk and its volumes delivered to the industry shows that the collection progressed weakly with strong fluctuations from one year to the next. This weakness in the effort to collect raw milk explains, in turn, the derisory rate of integration of this milk in the manufacture of all dairies despite the increase in the number of dairy operators resulting from the new financial support system.

The subsidy system also seems to be stalled because of the administered producer prices for raw milk (22 Dinars between 1995 and 2008 and 32 Dinars between 2009 and 2020 without the production premium) and the stagnation of the consumer price at 25 Dinars since 2001, far below the prices of 46 Dinars/liter of raw milk marketed on the informal market. Moreover, fluctuations in feed prices and the impact of imports have a strong influence on local dairy stakeholders (Sraïri et al. 2013). In all cases, the policy adopted by the public authorities continues to favor the maintenance of milk prices, often at low levels, by means of subsidies on imported milk powders for the manufacture of milk bags for mass consumption (Benyoucef, 2017 and Cherfaoui, 2009).

The weak development of the upstream of the local dairy sector would result from its weak dynamics linked to the conditions of the repopulation of the stables which is carried out in a paradoxical situation of the breeding market characterized by a slow supply from two other equally contradictory sources (support for the creation of local heifer nurseries and import of full heifers).

The present study consists in analyzing the parameters of breeding and profitability of dairy farms that carry out their production activities in the Wilaya of Skikda.

2. MATERIALS AND METHODS

The study focuses on the technico-economic conditions of raw milk production and the determination of profitability parameters of dairy cattle farms adhering to the national support program for the local milk sector.

2.1. Location of surveyed holdings

This study was conducted over two successive years (2021 and 2022) on a sample of dairy farmers surveyed in 21 municipalities of the Wilaya of Skikda (Map 1). It involved 157 farms with a combined workforce of 1324 dairy cows. For this purpose, questionnaires and interviews were carried out with farm managers. The data record covered: a) Land structure (categories of agricultural area); b) Farm personnel (Labor expressed in number of man-worker units); c) Characteristics of cattle population (total cattle, number of dairy cows, breed types); d) Milk production (estimated yield per cow per year); e) Breeding and feeding, hygiene and prophylaxis; g) Variable loads (purchase of feed, feed production, artificial insemination and bedding); f) Fixed costs (electricity, water, transport, land rental, labor, rent, insurance and depreciation).
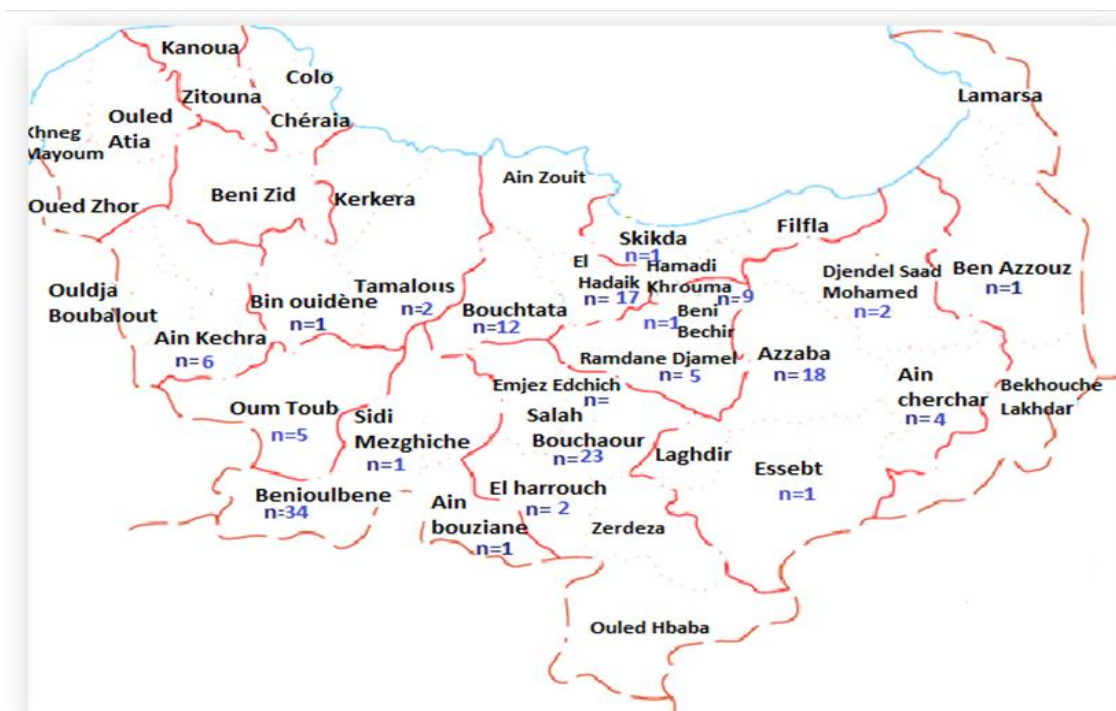
Figure 1: Distribution of 157 farms surveyed in the Wilaya of Skikda

2.2. Variables Analyzed

The study sample is composed of farms with a mixed system (agriculture-livestock) and those with a specialized livestock activity. The size of the dairy cow herd is very variable (2 and 42 dairy cows).

For the purposes of the study, the farms were divided into two categories according to the level of their economic efficiency coefficient (efficient farms and deficient farms).

The zootechnical analysis of these holdings was based on seven variables (Table 1).

Table 1: Variables retained for the analysis of breeding parameters.

Symboles	Variables
SAU	Usable agricultural area (ha) (ha)
SF	Forage area (ha)
EfB	Total cattle population (heads)
NVP	Number of cows (heads)
CcV/J	Kg concentrate/cow/day

For the technical and economic analysis of the holdings surveyed, the coefficient of economic efficiency (EEC) is used as an indicator that provides information on the rate of coverage of total expenses by the value of products knowing that a dairy operation is efficient if the value of its PEC is greater than 1. It is considered deficient otherwise. For this purpose, nine variables developed according to the Lassègue approach (1975) were considered (Table 2) to determine the profitability of the farms surveyed.

Table 2: Variables retained for the analysis of the economic efficiency of farms

Symboles	Variables
CV	Variable loads: Feed loads (feed produced and purchased)+Other loads (bedding + artificial insemination + veterinary care)
CF	Fixed costs: Costs (depreciation + electricity + water + transport + rental + labor + insurance)
RPL	Milk production receipts: Milk produced x (milk selling price + production premium)
VSP	By-product values: Receipts (calves + manure)
RTExp	Total Operating Revenues: RPL + VSP
CPL	Expenses related to milk production: (CF + CV) – VSP
CR	Cost of one liter of milk: MPC/ Milk production/year
MN	Net Margin (NM): RPL – (CV + CF)
CEE	Economic efficiency ratio: [RPL / (CV + CF)] x 100

The descriptive analyses were carried out using the Excel 2007 software to estimate the statistical parameters (mean, standard deviation, minimum and maximum) of the different variables studied.

3. RESULTS

3.1. Production level of the surveyed holdings

The average annual quantity of milk produced by the farms surveyed is highly variable with a relatively low average number of cows per farm (Table 3). The annual number of calves born is on average 7.3 6.7 calf/holding. Only 66.1% of these farms are fed (Table 3).

Table 3: Average production of the surveyed holdings

Technical parameters	average ± σ
Milk production/farm/year (Ton)	50,0±64,3
Number of cows present (heads	8,4±7,8
Number of calves born/farm (heads)	7,3±6,7
Number of fed calves/holding	2,1±2,5
Amount of manure/farm (tone)	104,4±81,4

3.2 Milk production costs and receipts by operating system

Annual variable loads (ChV) per cow are higher compared to fixed loads (ChF) (Figure 2). Fixed and variable expenses represent 38.5% and 61.5% respectively on average of total expenses (Figure 3).

Feed loads (ChA) represent 56.2% of total loads. However, the share of labor costs (MoF), veterinary costs (FVe), depreciation (FAm) and AIF insemination costs) are respectively 19.02%, 3.5%, 12.0% and 0.7% of total costs, ChT, (Figure 3).

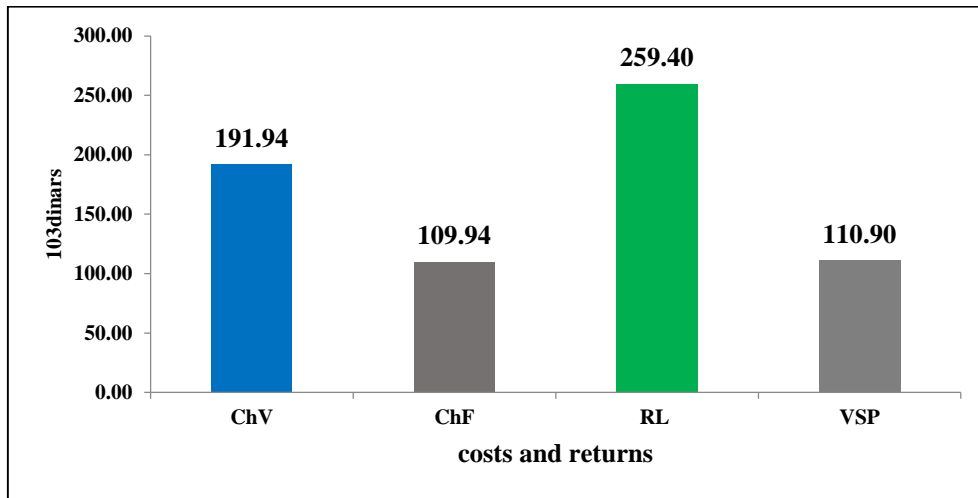Annual milk receipts (RL) per cow from sales represent more than twice that of by-products, LSP (Figure 5).

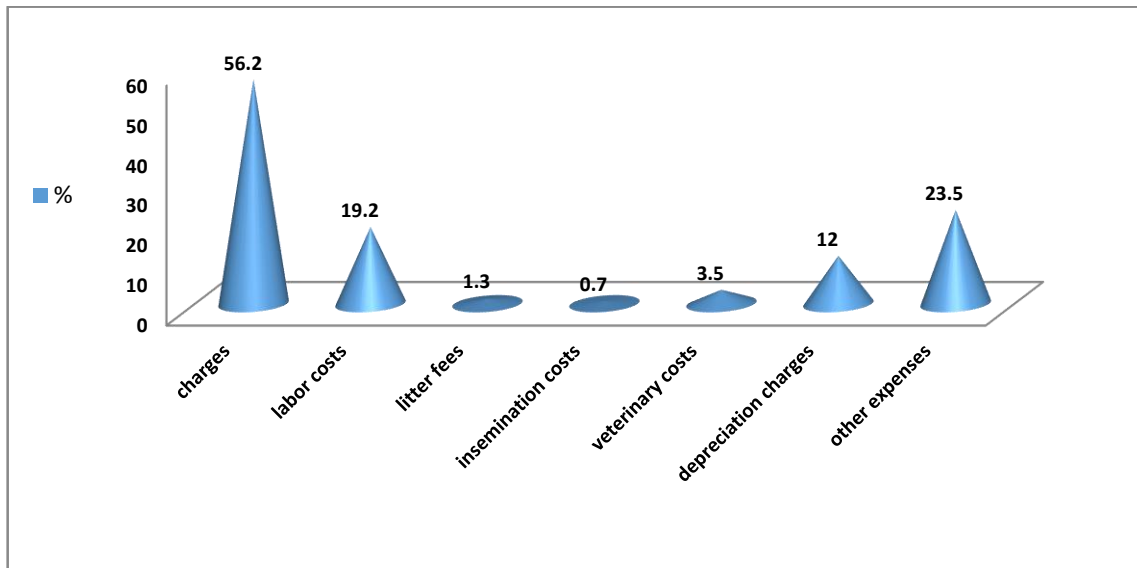**Figure 2: Averages of costs and receipts for all surveyed holdings (n=157)**

Figure 3: Shares of fixed and variable cost components in total farm costs surveyed (n=157)
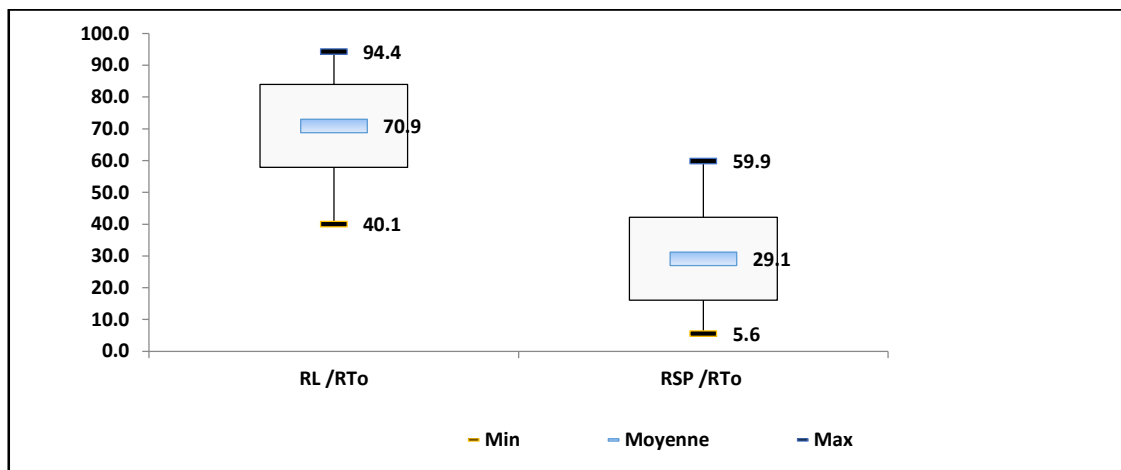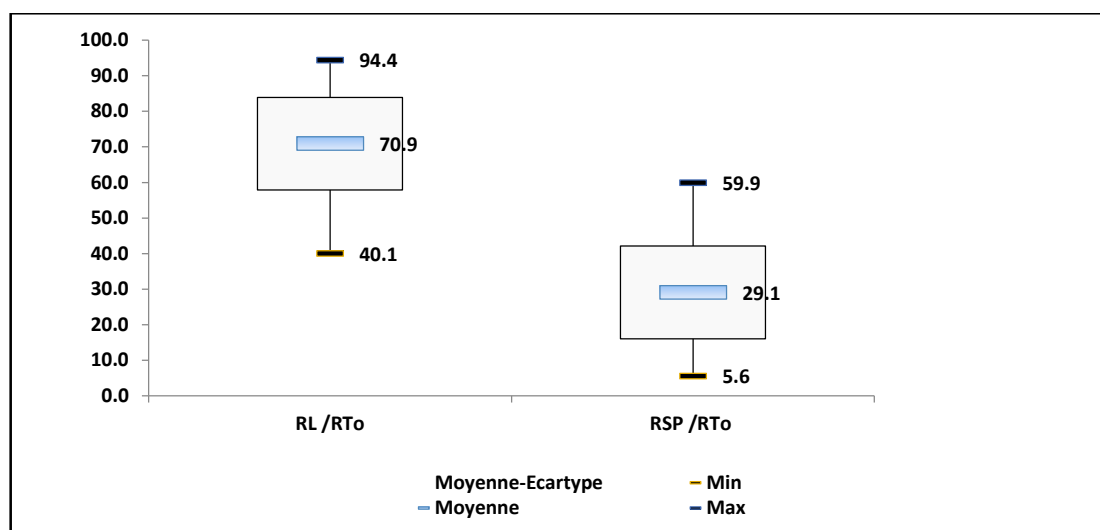

Figure 4: Share of variable and fixed expenses in total expenses

Milk receipts (RL) from sales account for almost three-quarters of total farm receipts (RTo) (Figure 4). The remainder comes from by-product revenue (RSP).

Figure 5: Average % of milk receipts and by-products in total receipts of surveyed holdings (n=157)

3.3. Average values of profitability criteria by production system

For all the farms surveyed, the average cost of a liter of milk is about 35.6 13.34DA/L with a change of 10.9 and 72.7DA/L (Table 4). Therefore, the net result per cow is generally negative with a very variable average value equal to -42.3 110.6 thousand AD per cow per year.

Table 4: Profitability criteria of surveyed dairy farms (n=157)

Paramètres	Average± ϭ	Minimum	Maximum
Cost of one liter of milk (DA)	35,6±13,34	10,9	72,7
Gross margin/cow/year (10^3DA)	67,5±96,3	-300,9	334,5
Net income/cow/year (10^3DA)	-2,3±110,6	-546,7	265,4
Coefficient of economic efficiency (EEC)	0,94±0,4	0,4	2,9

3.4. Economic characteristics of the types of holdings surveyed

The coefficient of economic efficiency (EEC) divides all the farms surveyed into two classes (efficient and deficient).

Deficient farms have a negative net profit/cow/year (-97.1 85.2 thousand DA in contrast to efficient farms with a net profit of 56.4 54.2 thousand DA (Table 5). This appears to be the result of the high annual total costs per cow of the deficient holdings (334.2 125.0 thousand AD). These deficient farms have a low average production of 33.5 36.7 thousand liters compared to efficient farms (85.4 91.4 thousand liters).

The trend in annual volumes of milk produced by the deficient farms results both from their low milk yield levels per cow and from their low herd size compared to efficient farms per year (respectively 6.2 54.7 cows versus 13.1 10.6 cows) (Table 6).

In addition, very different production costs per liter of milk produced (39.7 13.6DA and 26.7 6.9 DA) are found between deficient and efficient farms respectively (Table 5). It is noted that the difference between these two categories of holdings is not the result of the sale price

of milk which is practically the same (34.2 0.4 D/L 34.6 0.5DA/L respectively for the deficient and the efficient).

The comparison of the two categories of holdings indicates that the technical parameters of farming have an impact on their economic results.

The difference in profitability between these two categories of holdings can also be explained by the average size of the land base, which is lower (5.0 6.6 ha) for loss-making holdings compared to that (7.8 8.2 ha) for beneficiary holdings (Table 6).

Table 5: Averages of profitability criteria for the two categories of farms surveyed

Criteria	Deficient (n= 107)	Efficient (n= 50)
Total loads/cow/year (10^3DA)	$334,2 \pm 125,0$	$232,8 \pm 76,0$
%Total feed/load	$57,4 \pm 14,5$	$53,7 \pm 13,5$
% Concentrated loads/feed loads	$67,8 \pm 18,7$	$65,3 \pm 21,8$
Selling price per liter milk (DA/L)	$34,2 \pm 0,4$	$34,6 \pm 0,5$
Cost of one liter of milk (DA/L)	$39,7 \pm 13,6$	$26,7 \pm 6,9$
Gross product/cow/year (10^3DA)	$237,1 \pm 72,8$	$289,2 \pm 85,6$
Value of by-products/cow/year (10^3DA)	$131,1 \pm 82,3$	$67,6 \pm 34,3$
Net income/ cow/year (10^3DA)	$-97,1 \pm 85,2$	$56,4 \pm 54,2$
Coefficient of economic efficiency	$0,74 \pm 0,2$	$1,28 \pm 0,3$

Table 6: Averages of the zootechnical criteria of the two categories of holdings surveyed

Parameters	Deficient (n= 107)	Efficient (n= 50)
Usable agricultural area (ha)	$5,0 \pm 6,6$	$7,8 \pm 8,2$
Cattle population (heads)	$13,8 \pm 9,5$	$22,2 \pm 13,9$
Number of cows (heads)	$6,2 \pm 4,7$	$13,1 \pm 10,6$
kg concentrate/cow/day	$7,7 \pm 3,3$	$8,0 \pm 2,9$
Milk produced/herd/year 10^3L)	$33,5 \pm 36,7$	$85,4 \pm 91,4$
Milk yield/cow/year (L)	$5039,7 \pm 1535,8$	$6081,0 \pm 1753,2$

4. DISCUSSION

Efficient dairy farms have a relatively high average land base size that appears to be correlated with their profitability. Although the analysis of the feeding behaviour of the herd indicates that the feeding load for all holdings is the most important, other authors reported significantly lower values (64% of total expenses by Djermoun et al (2018) and also 77.1 8.9% by Makhlouf and Montaigne (2017). The value observed by Mouhous et al (2012) is even higher (90%). Other authors also reported strong values in the Wilaya of Tizi-Ouzou: 74.0% by Belkhir et al (2011) and 74.6% by Ghozlane et al (2010).

In addition, the profitability survey carried out by Zalani (2014) at the level of 97 farms in the Wilaya of Skikda revealed a lower share of feed in total loads (43.1 12.8%). Similarly, Makhlouf and Montaigne (2017) reported an impact of feeding on total loads in four groups of farmers studied. This could be explained by the share of concentrate distributed per cow, which accounts for 76.0 19.7% of total farm feed loads. It is higher than that observed (55.1 8.1%) by Ghozlane et al (2009) in dairy farms surveyed in the Wilaya of Constantine.

The use of salaried labour was found in only 14.4% of the farms surveyed in the Wilaya of Skikda while Makhlouf (2015) reported a lower value (10%) in the Wilaya of Tizi-Ouzou. In contrast, Makhlouf and Montaigne (2017) report a higher percentage (36%) in other dairy farm surveys. However, the use of large quantities of concentrated feed is more frequent in

deficient farms, this use of industrial feed in the ration of cows is used to compensate for the lack of quality fodder at the level of their farms, which is a constraint for the profitability of dairy farms. Bekhouche and Guendouze (2011) confirm the misuse of concentrated feed (on average 10 kg/day/dairy cow).

The average cost per litre of raw milk observed is close to that reported by Belkheir et al (2011) and Yahiaoui (2013) (respectively 36.5 DA/L and 36.7 DA/L) but higher than that reported by Khekili (2012) (32.39 4.73 DA/L). These high costs compared to the selling prices of a litre of milk (32.7 1.4DA) would explain the low profitability observed in the farms surveyed.

These observations confirm those made by Zoubeidi and Gharabi (2013). Thus, the differences in production costs observed between the farms surveyed can be attributed to poor control of production and herd management techniques. The net result per negative cow, observed on many farms, would be even more important if we subtracted the subsidy of 12 DA/L of milk produced to the farmer by the State and which was observed to the extent of 26.9% of milk production receipts. This proportion is slightly lower than reported (28%) by Makhlouf and Montaigne (2015). Dairy production does not provide producers with positive and satisfactory annual net results per dairy cow despite the premium of 12 DA in 2013 and public aid for investment on the farm (Makhlouf and Montaigne, 2017). Moreover, the rate of coverage of total costs by the value of the gross product of the dairy holdings surveyed is highly variable and has a direct effect on their profitability. The negative economic results of the deficient farms would be explained by the high total costs of low milk receipts. The best profitability of efficient dairy farms would result from the high level of annual milk yield, the size of the dairy herd and relatively low production costs. They manage to cover their total expenses and achieve a positive net result allowing them an investment capacity. In all cases, the dairy farmers surveyed in the Wilaya of Skikda require technical support and a more appropriate regulatory framework allowing on the one hand, to clarify their relations within the dairy interprofession and on the other hand, to foster a professional succession on these farms in order to introduce, in a reasoned way, technical innovations and management tools for dairy farms (Benyoucef et al, 2013).

5. CONCLUSION

The analysis of technical and economic parameters of dairy farms surveyed in the Wilaya of Skikda reveals that the total loads and herd size of these farms are decisive on most of the criteria studied. The values of the coefficient of economic efficiency observed indicate their average level of mastery of the technical route and their financial results. Indeed, the profitability of these farms seems to be affected by the constraints of herd management and the excess of distribution of concentrated feed.

Moreover, the price volatility of production factors at local level requires an emphasis on the organisation of the dairy profession for the improvement of the techno-economic management of dairy farms and the industrial integration of raw milk. While the majority of dairy farmers surveyed are members of the State support program for the raw milk sector, it remains essential to provide them with opportunities in the field of training for the upgrading of their farms. Such technical support should target the promotion of the dairy farm as a whole, taking into consideration all its activities (forage calendar, water saving technique, feed pipe, barn planning and quality milk production). In addition, it seems wise to encourage the collective organization of activities of production, collection of milk to valorize the milk

delivered by farmers often having small herds. In this context, the aim is to make the role of inter-professional spaces more effective in negotiations between stakeholders given the fluctuation in the purchase prices of a litre of raw milk by dairies, which remain well below the real prices of milk production on the farm. Increased industrial integration of raw milk is possible if the dairy industry plays a more logistical and technological role towards dairy farms. Indeed, through the diversification of networks of raw milk collection centres at which adequate production factors and equipment can be made accessible to dairy farmers, dairies would benefit from consistent and regular deliveries of quality milk and dairy farmers could improve the profitability of their farms.

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