*Research Journal of Agriculture and Forestry Sciences* _____ISSN 2320– 6063
Vol. **11(2),** 21-27, July **(2023)** *Res. J. Agriculture and Forestry Sci.*

# *Profitability and productivity analysis of dairy cattle in Gihanga, Buringa district- Burundi, Turkey*

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**Available online at:www.isca.in, www.isca.me**
Received 30th June 2022, revised 16th February 2023, accepted 17th April 2023

## Abstract

*This study was carried out with the aim of evaluating the profitability and productivity of dairy enterprises in Buringa. The study covered the 2020 production year, the survey was conducted using KoBo Collect on 75r and only selected enterprises and the analysis was performed using Excel 2013 and SPSS 25.0 software. It was determined that the variable costs of milk production constituted 82.5% of the total costs and the feed costs constituted 55.9% of the total expenses. Depreciation and labor represented 16.9% and 8.8% of total expenditure, respectively. Milk in come was 87% of total income and the unit cost of milk was determined at $0.35. The average annual gross profit per farm was calculated at $13,643 and the small dairy enterprises recorded an annual loss of $2,177. Equity capital was 98% of total capital and live stock capital ratio represented 45.1% of active capital. The financial and economic profitability of these enterprises was calculated at 11.3% and 10.9%, respectively and the profitability factor was calculated at 14.8%. It was concluded that despite being profitable, Buringa farms face a lack of equipment, modern infrastructure, technical expertise and sufficient training in livestock management. It is necessary to strengthen the farmers' technical capacities and put in place the financing structure in order to ensure the development of the dairy sector in Burundi.*

**Keywords**: Dairy Cattle, Production Cost, Profitability, Productivity, Burundi.

## Introduction

In Burundi, it is estimated that there are approximately 1,752,764 farm households and 70% of them practice agriculture and animal husbandry. It is known that 20% of them have at least one cattle, 41% have at least one goat, 19% have at least one pig and 27% have poultry together[1]. Agricultural enterprises in the country generally practice a polyculture. Plant and animal productions are generally carried out together[1]. Livestock production is the most important economic activity in Burundi after crop production. Considering all animal by-products, the added value of livestock is estimated at 14% of national GDP and 29% of agricultural GDP. Cattle are also an important source of taxes in the Burundian economy. In the cattle market, cow traders pay a tax of $1.8 per cow and there is also a slaughter tax of $2.5 per cattle[2]. Leather is an important source of income among Burundi's exports of animal products and leather exports are estimated at 2.7 thousand tons[3].

Milk and dairy products occupy an important place in Burundi's animal products' imports. It constitutes about 62% of total imports. The import of milk and dairy products is about 5,600 tons per year. It is estimated that 72% of these imports are liquid milk, 20% powdered milk, 9% cheese and 1% yogurt. Meat imports, on the other hand, represent around 34% of the total food imports recorded at customs. Burundi has officially recorded no exports of food from animal sources[4]. It is estimated that 20% of the country's meat consumption and 5% of milk consumption areprovidedbyimports[5].

In 1996, the United Nations Development Program (UNDP) revealed that Burundi's population required 265,000 tons of milk / year, and production was only 16,500 tons[6]. According to the research report of the Institute of Statistics of Burundi (ISTEEBU), the evolution of milk production from 2007 to 2018 is summarized in Figure-1.

Although there are years of declining milk production, milk production has continued to increase in Burundi. The highest production was recorded in 2017 at 88,517,475 tons. In studies by National Agricultural Survey of Burundi (ENAB), it is estimated that current milk production and self-consumption are less than 5 litres per citizen per year[7].

Rural development is based on agricultural and livestock activities. Livestock husbandry in Burundi is mainly made up of dairy cattle. In this study, an economic and technical analysis of milk production was carried out, the basic profitability and the milk production costs were also determined.

## Materials and methods

The study was conducted on dairy cattle enterprises operating in the Buringa district of Gihanga, which is known as one of the intensive livestock areas of Burundi. Primary data was collected

by carrying out a survey on 75 farms in Buringa and data covered the 2020 production period. Secondary data obtained from various institutions and organizations were also used in the study. The survey was conducted using a Kobo Collect app for data collection in the field. The questionnaire focused on the socio-economics tatus of farmers, farm expenses and income, family and foreign labour and other relevant question to assess the economic, physical and technical structures of the enterprise. Dairy enterprises were classified into small (1-20 head), medium (21-50head) and large (51+) enterprises according to the number of animals. In this study, a techno-economic analysis of dairy cattle enterprises in the Buringa region was carried out.

Microsoft Excel and Statistical Packages for the Social Sciences (SPSS 25.0) software were used to analyze data. In the analysis, the calculation of dairy income, variable costs and fixed costs were inventoried. In this research, the combined cost calculation method was used. From the data obtained, the fixed and variable cost elements of milk production in Burundi were calculated and their proportional values were determined. The unit cost of milk was calculated taking into account the production income and costs determined in these dairy cattle enterprises, and the formula below was used to calculate the unit cost of milk[8].

$$\text{Unit cost}\left(\frac{\text{BIF}}{\text{kg}}\right) = \frac{(\text{Total Milk Production Costs (BIF)} - \text{Secondary product income (BIF)})}{\text{Total milk production (Kg)}}$$

From the data obtained, the inventory of capital, profits and losses of dairy farming enterprises in Buringa were calculated according to the method indicated using these formulas, between the capital used in the enterprises and the profitability obtained[9].

$$\text{Financial profitability} = \frac{\text{Net profit}}{\text{Equity capital}} * 100$$

$$\text{Economic profitability} = \frac{(\text{Net profit} + \text{Passive capital})}{\text{Active capital}} * 100$$

$$\text{Profitability factor} = \frac{\text{Net Product}}{\text{Gross Product}} * 100$$

## Results and discussion

In this section, the results of the study are briefly summarized and discussed.

**Operating costs:** The operating costs incurred to obtain the gross product of dairy farming enterprises in Buringa district are shown in Table-1.

The total cost of milk production was calculated at BIF 60,890,492. According to the same calculations, the variable costs were determined at 82.5% of the total costs while the fixed costs were determined at 17.5% of the total costs. Among these expenses, feed costs constituted 55.92% of total costs and 67.8% of variable cost elements, which reveals that feed expenses greatly affect the operating profitability of dairy production. Food expenses were followed by labor expenses with an average of 16.9% of total costs. Depreciation of equipment and buildings is one of the most important fixed cost elements and has been determined at an average of 8.81% of total expenditure. In his study, Kumawat et al[10] found that in the economic analysis of dairy farms in Bikaner District in Bangladesh, the feed has a significant 59.52% share in the total cost of production, labor cost accounted for 33.95%, the total fixed cost was calculated as 25.31%, and miscellaneous cost was only 1.15% of the total cost. The analysis of the cost of milk production of dairy cattle from the Bafra in Turkey studied by Gündüz and Dağdeviren[9] showed that 75% of the total costs were variable costs and that the fixed costs were 25%. The highest share of variable costs was made up of feed costs (70%). In all of these researches, feed costs are high and in general feed costs account for over 50% of total operating costs.

**Operating income of the dairy enterprises studied:** The incomes of the enterprises examined in the dairy production study and their proportional distribution were calculated and are presented in Table-2.

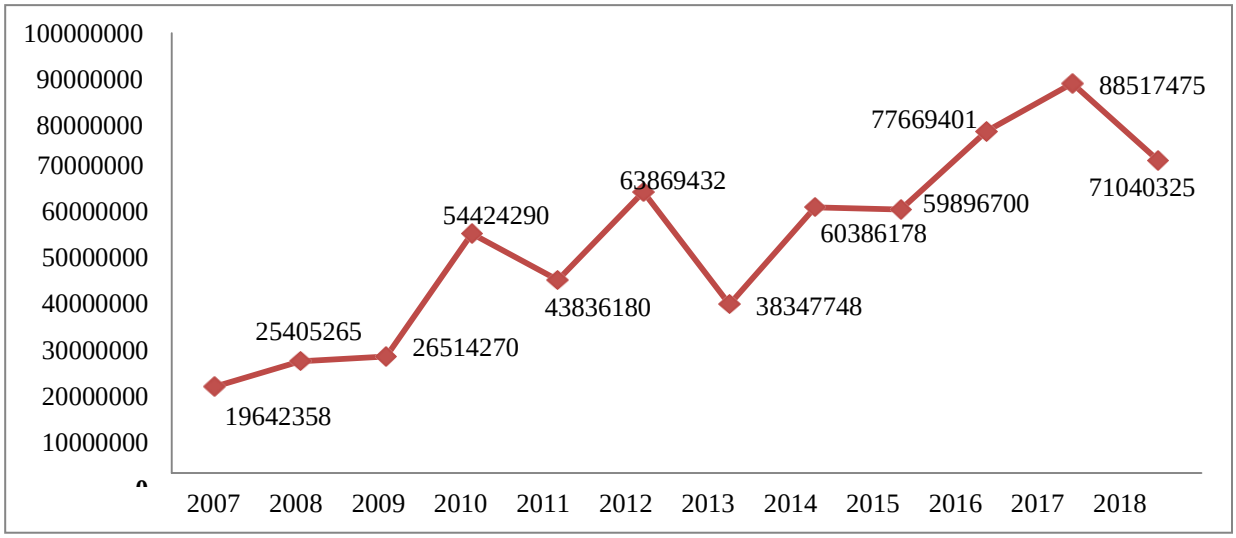

**Figure-1:** Evolution of milk production in Burundi (2007-2018) (tons).

**Table-1:** The breakdown of Buringa dairy farming expenses.

| Cost elements | Size of the enterprise | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Small scale | | Medium scale | | Large scale | | General average | |
| | BIF* | % | BIF | % | BIF | % | BIF | % |
| Feed costs(fodder) | 14 599 250 | 57.8 | 27061 765 | 54 | 60052 061 | 55.9 | 33904 359 | 55.9 |
| Veterinary costs | 398 000 | 1.58 | 1 764588 | 3.52 | 3 256363 | 3.03 | 1806317.2 | 2.71 |
| Labour costs | 5 362500 | 21.2 | 8 858529 | 17.7 | 12602 424 | 11.7 | 8941151.1 | 16.9 |
| Fuel, electricity, water | 437 500 | 1.73 | 2 397059 | 4.79 | 3516121.2 | 3.28 | 2116893.4 | 3.26 |
| Transportation and fuel costs | 277 500 | 1.1 | 2 194118 | 4.38 | 5213636.4 | 4.86 | 2561751.5 | 3.45 |
| Interest on credit | 0 | 0 | 0 | 0 | 172 727.3 | 0.16 | 57575.75 | 0.05 |
| Land rental | 0 | 0 | 11764.71 | 0.02 | 0 | 0 | 3921.57 | 0.08 |
| Others | 100 000 | 0.4 | 44117.65 | 0.09 | 46969.697 | 0.04 | 63695.782 | 0.18 |
| Total variable costs | 21 174 750 | 83.8 | 42331 941 | 84.5 | 84860 303 | 79.1 | 49455 665 | 82.5 |
| Depreciation costs for Buildings and equipment | 1 159461 | 4.59 | 2 325245 | 4.64 | 6770333.3 | 6.31 | 3418346.4 | 5.18 |
| Maintenance and repair Costs of equipment-buildings | 270000 | 1.07 | 154 367.6 | 0.31 | 1904090.9 | 1.77 | 776 152.83 | 1.05 |
| Depreciation of real assets | 2 025000 | 8.02 | 4 005882 | 8 | 11163 636 | 10.4 | 5 731506 | 8.81 |
| General administrative costs | 635 242.5 | 2.51 | 1 269958 | 2.54 | 2621263.6 | 2.44 | 1 508821.4 | 2.49 |
| Total fixed costs | 4 089704 | 16.2 | 7 755453 | 15.5 | 22459 324 | 20.9 | 11434 827 | 17.5 |
| Grand Total Expenses | 25 264 454 | 100 | 50087 394 | 100 | 107 319 627 | 100 | 60890 492 | 100 |

*$ 1 =1,990 BIF during the research period.

**Table-2:** Operating incomes on the dairy cattle enterprises examined.

| Items of Income | Size of the enterprise | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Small scale | | Medium scale | | Large scale | | General average | |
| | BIF | % | BIF | % | BIF | % | BIF | % |
| Calf income | 1 546250 | 7.4 | 820 588.2 | 1.3 | 1797272.7 | 1.01 | 13 88037 | 1.6 |
| Manure income | 856 250 | 4.1 | 1 549412 | 2.4 | 5 495757,6 | 3.09 | 2 633806 | 2.9 |
| Increase in inventory value | 1 908750 | 9.1 | 8 470588 | 13 | 11957 576 | 6.72 | 7 445638 | 8.5 |
| Total income of subsidiaries | 4 311250 | 21 | 10840 588 | 17 | 19250 606 | 10.8 | 11467 481 | 13 |
| Total revenue from milk sales | 16620 875 | 79 | 54445 529 | 83 | 158 574667 | 89.2 | 76547 024 | 87 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total income | 20932 125 | 100 | 65286 118 | 100 | 177 825273 | 100 | 88014 505 | 100 |

By examining the gross output value of Buringa's dairy enterprises activities (Table-2), it was determined that the highest income was obtained from milk and it accounted for 87% of the total income. Milk income was followed by the increase in inventory value with a rate of 8.5% of the total operating income, the income from the sale of manure and calves represented 2.9% and 1.6% of total dairy incomes respectively. In research conducted by Günlü and Sakarya[11] in Konya Province of Turkey, the income of calves was 25.27% and the manure's one was 1.7% of total income. Compared to the results of this study, the manure income of Buringa enterprises is higher than the income from calf sales. This can be justified by the fact that there is a company at the study location called FOMI that produces chemical fertilizers and uses farm manure as araw material. Aktürk et al[12] determined in their study conducted in Çanakkale district of Turkey that dairy income is 76.31% and fertilizer income is only 2.7% of total farm income. Income from livestock activities according to this study is slightly lower than milk income from Buringa enterprises.

**Unit cost of milk:** Table-3 illustrates the costs of milk production as well as the profitability of dairy enterprises in Buringa.

The average cost of milk production in dairy farming enterprises was determined to be BIF 726.6 / liter. The average profit was calculated at BIF 27,124,013 / year / enterprise. As the Table-3 shows, small dairy enterprises lose on average BIF 4,332,329 per year. Large and medium-scale enterprises make a profit of BIF 70,505,646 and BIF 15,198,723 / year, respectively and the income/cost ratio was greater than 1. Similar results were observed in the study of Uddin et al[13] carried out in Bangladesh. According to their study, small enterprises generally operate in a traditional and extensive system. Dairy cattle enterprises that record huge losses practice extensive farming, as in the case of the study conducted in Bangladesh. It has been reported that these enterprises generally suffer losses.

**Capital structure of dairy enterprises:** Every business needs a certain amount of capital during its creation and its periods of operation. Although capital can be classified in different ways, when analyzing the economics of dairy farming enterprises, the classification of capital is usually done according to its functions Açıl and Demirci[14], Karagölge[15]. In this research, the distribution of capital according to its functions was taken into account and the capital structures of enterprises are presented in Table-4.

All of the enterprises examined operated with equity of around 98% of total capital (Table-4). Animal capital occupied on average 45.1% of active capital. Debts represented only 1.95% of the total capital of the enterprises examined. The rate of 26.27% of animal capital reported by Oğuz and Yener[16] in the dairy enterprises of Konya in Turkey is lower than the value obtained in the enterprises of Buringa. This can be explained by the high level of fixed capital of the examined enterprises of Konya and the high level of modern investments in these enterprises. On the other hand, the rate of animal capital obtained in this study turned out to be close to the value reported by Tokmak et al[17] in his study made in the Niğde province of Turkey and the animal capital was calculated at 39.29%. The high capitalization of animals in Buringa dairy enterprises closely related to the fact that a significant amount of capital is allocated to livestock and finally explains the lack of advanced investments in buildings and equipment for dairy cattle.

**Table-3:** Milk production costs of dairy cattle.

| Cost elements | Size of enterprises | | | |
|---|---|---|---|---|
| | Small size | Medium size | Large size | General average |
| Grand Total Expenses | 25264 454 | 50087 394 | 107 319627 | 60890 492 |
| Total income of subsidiaries | 4 311250 | 10840 588 | 19250 606 | 11467 481 |
| Total cost | 20953 204 | 39246 806 | 88069 021 | 49423 011 |
| Costofproducing1 liter of milk | 1 214.7 | 829.3 | 631.4 | 726.6 |
| Total amount of milk produced | 17 250 | 47326.5 | 139 493.9 | 68 023.5 |
| Total revenue from milk sales | 16620 875 | 54445 529 | 158 574667 | 76547 024 |
| Net Profit-Loss | -4332 329 | 15198 723 | 70505 646 | 27124 013 |

| | | | | |
|---|---|---|---|---|
| Revenue/cost ratio | 0.8 | 1.3 | 1.7 | 1.4 |

**Rate of return:** The main objective of businesses is to make a profit. In this regard, profitability is one of the indicators of business success. Profitability is defined as the ratio between the profit made by the firm during a certain period and the total capital participating in the production of the firm[14]. In Table-5, depending on the scale of the enterprises, the financial profitability, the economic profitability and the profitability fact or were determined.

The average overall income per dairy farm is 88,014,505.1 BIF (Table-5). The average gross profit was calculated at BIF 27,588,537.3, the financial rate of return was calculated at 11.3%. The economic profitability ratio and the profitability factor were 10.9% and 14.8% on average, respectively. In his study in Balıkesir, Turkey, Mat[8] reported that the profitability factor of enterprises was determined to be 14.09% in 2017 and 4.18%in 2018. Small enterprises have been shown to operate at a loss. In this study, the problems related to food, technicality, management, animal husbandry and productivity, lack of drugs and funding, etc., were determined. Similar problems were reported by Diro et al[18] in their study of dairy farms in the high mountains of Ethiopia. Table-6 shows milk production and consumption on farms in Buringa.

**Table-4:** Capital structures of dairy cattle farms.

| Types of capital | Dairy enterprises groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Small scale enterprises | | Medium scale enterprises | | Large scale enterprise | | Overall average | |
| | BIF | % | BIF | % | BIF | % | BIF | % |
| Real estate capital | 3 771250 | 5.8 | 18 345 588.2 | 15.2 | 43937878.79 | 14.9 | 22018239.01 | 12 |
| Animal capital | 26 333 750.4 | 40.8 | 54 045 588.2 | 44.8 | 146 636060.6 | 49.8 | 75671799.74 | 45.1 |
| Working Capital (1+ 2 +3) | 34 501 223.7 | 53.4 | 48 227 378.1 | 40 | 104 072545.5 | 35.3 | 62267049.09 | 42.9 |
| Equipment capital | 5 228750 | | 5145 588.24 | | 19531818.18 | | 9 968718.806 | |
| Material capital (a+ b) | 15036 750 | | 29 255 882.4 | | 65265696.97 | | 36519443.14 | |
| a. Feed | 14599 250 | | 27 061 764.7 | | 60052060.61 | | 33904358.44 | |
| Liquid fuel | 437 500 | | 2194 117.74 | | 5213 636.36 | | 2615084.7 | |
| Cash | 14 235 723.7 | | 13 825 907.5 | | 19 275 030.3 | | 15778887.15 | |
| Active capital (A+B+C) | 64 606 224.1 | 100 | 120 618554.6 | 100 | 294 646484.8 | 100 | 159 957087.8 | 100 |
| Debts | 0 | 0 | 0 | 0 | 17272727 | 5.86 | 5757575.67 | 1.95 |
| Equity | 64 606 224.1 | 100 | 120 618554.6 | 100 | 277 373757.8 | 94.1 | 154 199512.1 | 98 |
| Passive capital (D+E) | 64 606 224.1 | 100 | 120 618554.6 | 100 | 294 646484.8 | 100 | 159 957087.8 | 100 |

**Table-5:** Profitability ratios in Buringa dairy enterprises.

| Profitability ratios | Small scale enterprises | Medium scale enterprise | Large scale enterprise | Overall average |
|---|---|---|---|---|
| Gross income (BIF) | 20932 125 | 65286 118 | 177 825273 | 88 014 505.1 |
| Gross profit (BIF) | -4 332328.2 | 16516 840 | 70581 100 | 27 588 537.3 |
| Financial profitability (%) | -6.7 | 15.5 | 25.3 | 11.3 |

| | | | | |
|---|---|---|---|---|
| Economic profitability (%) | -6.7 | 15.5 | 23.8 | 10.9 |
| Profitability factor (%) | -20.7 | 25.3 | 39.7 | 14.8 |

**Table-6:** Annual milk production of the dairy enterprises examined.

| Dairy enterprises examined | N | Minimum | Maximum | Average |
|---|---|---|---|---|
| Number of cows | 75 | 10 | 298 | 35,00 |
| Number of cows milked (head) | 75 | 2 | 298 | 28,53 |
| Annual milk production (liter) | 75 | 2400 | 432 000 | 84672,00 |
| Amount of milk consumed (liter) | 75 | 0 | 7200 | 1 040,93 |

The results presented in Table-6 show that there was an average of 35 cows per farm examined. The average number of cows milked was 28 and the minimum number of cows milked was 2 cows. The average annual quantity of milk consumed in the dairy enterprises was 1,040.93 liters. Based on these results, milk production was estimated at 9.7 liters per cow per day. The studies by Shittu et al[19] in Sokoto State in Nigeria showed that annual milk production ranged between 7,815 and 8,442 kg per cow. Semerci et al[20] in their study in Hatay province in Turkey, reported that milk production per cow was 5.6 tons per lactation. Although the production of dairy cows in Buringa is low compared to previous studies, the results of the study by Datta et al[21] in Bangladesh, the milk production per day per cow is determined to be 1.9 liters. Even if Buringa's milk production is low, itremainss lightly higher than 1.9 liters per and per cow observed in the study by Dattaetal[21].

## Conclusion

The insufficient development of dairy cattle in Burundi shows that the consumption and total demand for milk in the country cannot be met in terms of quantity and quality required for adequate and balanced nutrition. The productivity performance of dairy cows in the country is quite low. A series of measures should be taken in order to improve the current situation of dairy cattle by carrying out technical, financial and economic studies which are very important for the development of the sector.

Since animal husbandry is a profitable industry, dairy enterprises must be supported materially and financially to develop and increase investments to ensure sufficient production. Information and awareness-raising studies should be carried out so that enterprises improve their traditional farming and feeding methods with modern farming techniques in the short and medium term. Breeders have a serious problem of recording activities and calculating the cost of production of livestock products, so training sessions and support for breeders can be beneficial for the development of the dairy sector. From this, it is clear that intense support is necessary for this sector to develop immediately in order to contribute to the development of the country. It should be emphasized that the development of animal production is the dynamic of the country's development.

Investments in fixed capital in the region are insufficient. It is clear that there is a need and a lack of infrastructure in this district. In this regard, R&D studies taking into account the geographical structure of the country, its level of development and the structure of its capital will be recommended.

Finally, the Ministry of Agriculture and Livestock should define a policy aimed at promoting the creation of private services which will gradually replace the public structures responsible for supporting dairy farming. ISABU (Institute of Agronomic Sciences of Burundi) will have to improve its research to ensure the transfer of appropriate technologies.

## Acknowledgement

This research article was summarized from the first author's Master thesis. It was approved by the Scientific Research Project Coordination Unit of Selçuk University. The authors would also like to acknowledge and commend the efforts of the authors whose journals, survey reports and publications were used in the writing of this article.

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