Comparative Study of Economic Diversification of Dairy Farmers with Special Reference to Pune, Maharashtra

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Abstract

India being majorly an agrarian economy primarily has farmers with very small landholdings. Hence, along with agriculture, dairy farming plays an important role in providing livelihood and employment. Especially in the rural areas, the farmers have been completely dependent on rain for their agricultural activities; dairy farming serves as a real savior. As per the statistics, India ranks first in the world as the largest milk-producing country contributing 19% (150 million tons per year) of the total milk production in the world (FASAR AND YESBANK, 2016). Maharashtra is the 7th largest milk-producing state in India and produces about 11.6 million tons per year (Shah, 2014). The present study work was carried out in 4 talukas viz., Purandhar, Bhor, Baramati, and Shirur of Pune district of Maharashtra. The cluster of three villages was selected from each taluka. Further, 120 farmers were randomly selected following the simple stratified random sampling considering the herd’s size as strata. The farmers were further divided into three classes based on herd size of 1-2 herds as a small-sized farmer, 3-5 as a medium-sized farmer, and more than 5 herds as a large farmer. From these 120 dairy farmers, 50 small farmers were selected, followed by 35 farmers, each under medium and large farmers. The main purpose of this research was to find out the difference in the pattern of cost, profit, and gap behind that small and large size dairy farmer. The questionnaire was prepared, and quantitative data were collected from the random farmers to analyze their capital investment, costs, and profitability in the year 2019-20. Qualitative data were also collected to support the quantitative data of dairy farmers. Of the total selected farmers, 65% of farmers had pure cows, 16.7% of farmers had pure buffalo, and 18.3% had mixed cows and buffaloes. The benefit-cost ratio was higher for the large-sized farmers, which was 1.70, while 1.62 and 1.50 for small and medium-size farmers. The average cost incurred per liter of milk production was Rs. 17.76, Rs. 20.37, and Rs. 19.55 for small, medium, and large size farmers, respectively. The total cost incurred for dairy farming majorly contributes to the feed and fodder cost, which was about 74% of the total cost. The study results showed that the large-sized farmers were getting 18.8% and 27.4% more profit per liter than small and medium-size farmers, respectively.

Keywords

Dairy Farmers, Cost, Profitability, Feed and Fodder, Cows, Buffalo, Pune

Imprint


1. Introduction

The farming system in India is a combination of fruits and vegetables, Arable farming, dairy farming, and animals. Talking about the dairy sector, India is the leading country for milk production in the world. On average, India produces approximately 19% of the world’s milk. India can produce about 187.7 million MT of milk, which is continuously growing at 4% of the annual growth rate (FASAR AND YESBANK, 2016) [1]. The initial per capita of milk availability has also risen from 217 grams per day in 2000-01 to 394 grams per day in 2018-19. There are around 60 million dairy farmers, and the maximum share is of small and medium-sized farmers. From the total GDP of India, the dairy sector contributes up to 5.3%. The estimated vision of increasing milk production is about 300 million MT by 2024 (National Action Plan for dairy Development, 2018 Report).

From the total employment, approximately 8.47 million of the population is employed in the Indian dairy sector. About 46% of the milk in India is consumed directly in the liquid form, and 47% and 7% resp. As traditional and western dairy products, including dairy products such as Paneer, Ghee, Curd, Buttermilk, Yoghurt, Butter, Lassi, Milk powder, Cheese, Ice cream, Kefir, etc. (NSS 64th round). These milk products are consumed by 77.5% and 88.7% of
Rural and Urban households. The average per capita expenses on milk and other dairy products is Rs. 60 and Rs. 107 for Rural and Urban areas respectively for a month [2].

Maharashtra, the 7th largest milk-producing state in India, has produced around 11.65 million MT of milk in 2018-19. Pune, Nashik, Aurangabad, Ahmednagar, and Kolhapur are the major milk-producing districts with 36% of milk production in the state (FASAR & YESBANK, 2016). The organized sector supplies and produces around 20% of milk production. The contribution of indigenous cows, crossbreeds, and buffaloes is 14%, 41%, and 42%, respectively. (FASAR & YESBANK, 2016) About 31.9 million liters of milk per day is the processing capacity of registered companies, while 58% were in the private sector. 52% of labor works in the agriculture sector from the total labor workforce in Maharashtra and ranks 5th in the states for the total number of people working in the dairy sector [3]. Small farmers have one or two milch animals for their income through the dairy sector and their mixed farms. The total number of buffaloes is about 55, 94,392, while the total number of cows is about 1,54,84,207 (20th Livestock Census, Report).

Pune district is a western region of Maharashtra. There are about 1,912 total villages in Pune. There is a sequence of functional activities carried out in the dairy value chain from farm to plate. Different operations are performed: farmers producing the milk, Milk processors, Traders, and Milk suppliers in the milk column, a common supply chain where milk is first collected by a registered milk vendor or contractor from respected villages. After that, milk is further supplied to the chilling centers or directly to the milk processing industries. The milk is processed and delivered to wholesalers and then further to retailers. Then it is delivered to the customers. In this whole process, there is a huge change in the milk price, i.e., from production until the delivery to the end customer [4].

Most small farmers having less than 2.5 acres are based on dairy farming for their extra income. The study has also shown that the cost of milk production per animal includes Feed cost, Human labor, Medical cost, and other miscellaneous costs. The studies by Chand et al., Pant and Karanjkar and Shergill, have also shown that feed cost contributes to the more cost from the total cost of the dairy farmers. The small and medium farmers do not keep labor for their dairy farming, so labor cost is almost negligible. In contrast, large farmers may have some farm labor. Small and medium farmers having hilly regions and plain areas graze their animals in the Kharif & Rabi season. Due to the rainy season, green fodder was available like grasses all over the farm's side. At that time, they incur a very low cost for the dry and green fodder [5]. Observing the cost of production, it is essential to increase the farmer's profit by minimizing the cost and maximization of the revenue. The cost incurred per liter of milk production in urban areas is generally high compared to rural areas. This higher cost is due to the higher feed, labor cost, and non-availability of green fodder for grazing. Minimizing the cost and maximizing profit is the major tool for dairy farmers, mostly for farmers with very small land [6].

2. Review of Literature

In India, around 60 million farmers are engaged in dairy farming, in which most of our small and medium-sized farmers. The farmers having about 2 to 8 cattle on their farm contribute about 80% of the milk production. In India's consumption pattern, about 60% of the milk is directly consumed by the people and 40% in the by-product. From all the milk supply from farmer to consumer, about 70% is going through an unorganized chain, and only 30% of the milk is through an organized structure. From the other states, Maharashtra ranks 7th in milk production producing about 9.43 million MT of milk [7]. In Maharashtra, only 20% of milk is supplied from farmers to consumers in an organized way. Both cooperative processors and private processors process the total milk produced in a state with 30% and 70% milk. Indigenous cows, crossbreeds, and buffaloes with 14%, 41%, and 42%, respectively (R. Eweg et al., 2017) produce this total milk. There is a risk for crop cultivation for most of the farmers in India who depends on rainwater. Also, the risk may be due to market price uncertainty, and there must be some other income source. Thus dairy farming plays a key role in the farmers for additional income [8].

There are four different types of dairy farmers who supply milk to cooperatives, second who sell milk to the organized private sector, third who supply their milk to a vendor, sweet shops, and contractor or directly to the customer, and the last who supply their milk to multiple channels. From these traditional channels supply modern channels supply 70% of the milk and 30% of milk. The flow of this milk was from producer
members to village dairy cooperative society, which was further supplied to Dairy Processing Plants, then to the State Co-operative Milk Marketing Federation, and finally to the market. The dairy cooperatives in India are a three-tier structure, which is followed by the Anand pattern [9]. It includes dairy farmers producing the milk, cooperative societies, district and state-level milk producers, cooperative unions, and cooperative federation. The major problem in milk marketing is the involvement of the unorganized sector in the supply chain. There are different constraints, which are faced by the farmers in most of the regions. They lack green fodder, low productivity of breeding, low price of milk as a marketing problem, veterinary facilities, etc. From all the above problems availability of green fodder were seen to be a major problem, along with the lack of concentrated feed at low prices and lack of dry fodder. To overcome these problems, the plantation of fodder trees should increase fodder resources and grazing areas. Farm's literacy status is an important variable influencing the farmers to use innovative ways in livestock production [10].

For the cost-benefit analysis of dairy farming, the total investment, feeding, and milk supply patterns of the selected dairy farmers and the cost components, Total milk production, Investment, Consumption, has to be analyzed using the simple tabular form, percentages, averages, and ratios. The variable cost, Gross maintenance cost, Net Return, and Gross return also need to be calculated for cost-benefit analysis of dairy farmers. For calculating the dairy farm cost, the cost of feed, fodder, concentrates labor, veterinary, etc., were taken into consideration along with interest in fixed investment, sheds, and dairy equipment have taken into consideration. For the dairy income, the value of milk and the value of dung is taken into consideration [11]. It is quite possible by replacing some of the costlier ingredients with relatively cheaper feed like barley, maize, linseed, oat, sunflower cakes, and molasses. This cost of production can be decreased by increasing the volume of cows and buffaloes. The selection of farmers can be done in the three stages wherein the 1st stage district has to be selected. In the second stage, tehsils have to be selected. In the last stage, villages need to be selected. The farmers can be selected for the study with the highest milk producers and a multistage random sampling procedure. Farmers were categorized into four classes having 1-3, 4-6, 7-9, and 10-12 milch animals where the cost of milk production was observed lower in the 4th category while higher in the 1st category of farmers. A multistage stratified sampling technique is used to select dairy farmers. They were divided into three herd sizes, i.e., small having 1-2 milch animals, medium having 3-4 milch animals, and large having more than 5 milch animals. Profit maximization can be done by maximizing the returns or minimizing the cost of production. The feed cost is considered as the major cost in the total expense. Also, there were large variations seen in the cost of different farmers. The commercial dairy farms based on the size of herds were categorized into small farmers, medium farmers, and large farmers [12].

Knowledge of the farmer also impacts the profit generation, the health of the animal, nutrition provided to animals, etc. Therefore, the knowledge of the farmer also plays a key role in the dairy farmers. The low milk production per animal may be traditional management practices and less knowledge about innovative dairy practices. Education, herd size, annual income, source of information has a highly significant correlation with the cost of production. Developing peoples were more concerned about their health. They need a good quality of food. In the same way, people prefer the good quality of milk, which does not have, and contamination, any harmful residues, or various chemicals [13]. People preferred organic milk and milk products, which were more health-conscious. About 45% of the farmers were involved in dairy farmers for 20 years, and from that, 65% of the farmers had less than 5 cows. 78% of farmers were satisfactory with dairy farming, and 26% of farmers were facing problems. TANUVAS mineral mixture supplement was an innovative product. The research was conducted to see whether farmers using this product get more benefits. It was observed that there was a 16% rise in the yield of the milk that fed the cows with a mineral mixture. The milk production of buffaloes is higher as compared to the cows by 9.4%. It was recorded that from the total cost, 80% was the variable, and 20% was the fixed cost for both. The maximum returns in large-sized farmers were due to a high volume of crossbreed cows and good quality feeds and fodders to the cattle. They also stated that fodder is the important constituent of animal feed, which contributes 2/3rd of the animal feed requirements where grazing and stall feeding is also practiced. There can also be an opportunity cost to other inputs produced and used: Cow dung, milk used, and feed produced [14]. The analysis for Bene-
fit-cost ratio, Break Even & Sensitivity, was done based on a single cow in Microsoft excel and SPSS, where small-sized farms spend 38% more cost than large-sized dairy farms. The milk production per animal per year was also low, and farmers were not aware of animal nutrition, health, cattle shed management, and hygienic milk production. The landless dairy farmers equally contribute to dairy farmers having land. It was also observed that a single-family cared for the animals more properly than a joint family.

The existing literature review found that there is much diversification in the cost and profit from dairy farming. Also, the cost incurred depends on the farmer to farmer, and the profit generated through the selling of calves varies majorly [15]. There was also a gap in understanding the diversification of dairy farmers living in different environmental conditions in Pune. There was a lack of proper understanding of the reason for such a huge variation. In the present study, the reason for economic diversification has been focused on along with the diverse farmers, which were in dried and rain-fed regions. Also, there is much diversification in the Pune district farmers, which were also considered during this research.

3. Objectives

The following objectives have been considered for the study, with the scope of the study being limited to the Pune District, Maharashtra state.
- To study different costs required in dairy farming
- To study different ways of revenue generation through dairy farming
- To carry out a comparative study on the difference between the cost of small, marginal, and large farmers
- To suggest a way to increase revenue to the dairy farmers

4. Materials and Methods/Methodology

4.1. Selection of the Study Area

Maharashtra state has been purposively selected for researching dairy farmers. Maharashtra is one of the leading states in India for the dairy sector, which has larger livestock. According to the livestock Census of Maharashtra, there are about 55 lakhs of buffalo and 1.5 Crore of total cows (20th Livestock Census). Maharashtra is 7th in the ranking state for the total amount of milk production in India, with 11.65 million tons of production. Pune is one of the largest metropolitan cities where there is the highest want for milk and dairy products. Pune also ranks 2nd in the milk production after the Ahmednagar district during 2015-16 [16].

4.2. Sampling

The present research was carried in the Pune district of Maharashtra. There are about fifteen total talukas in the Pune district, along with the two city talukas. There are a total of 5 districts under which these 15 talukas are subdivided. The major talukas were Pune, Baramati, Bhor, Shirur, and Maval. The three-stage sampling process was employed for selecting the dairy farmers. For the present research purpose, Purandhar, Bhor, Baramati, and Shirur talukas were randomly selected based on the average rainfall in the region and the number of cows and buffaloes. After that, the cluster of three villages from each selected talukas was identified with the maximum numbers of commercial dairy farmers. Further, 500 farmers were randomly selected following the simple stratified random sampling considering the herd's size as strata [17]. These commercial dairy farmers were further divided into three classes based on the herd size. From these 500 farmers, 120 farmers have responded with the complete information, which I had selected for further study. These three classes were small farmers with 1 to 2 herds, medium farmers having 3 to 5 herds, and large farmers with more than 5 herds. From these 120 dairy farmers, 50 small farmers were selected, followed by 35 farmers, each under medium and large farmers.

4.3. Data Collection and Analysis

Primary data were on different aspects is important for the research work and was collected from each farmer by taking the personal interview. Detailed information about the total area of the farmer along with the yearly cost and revenue generated was collected from the farmers. The data was collected properly every month. The previous year's data were also taken into consideration for the season-wise uninformed data [18]. In the interview, qualitative data were also collected, like problems of the dairy farmers throughout the year for supporting the quantitative data. The data which were collected were further tabulated in the Microsoft Excel sheet for the analyses. All the analyses were made based on a single cow by taking an average. The data pertained to agriculture was collected for the year 2019-20.
4.4. Capital Investment

The fixed investment required for the dairy farmers in the business was not considered in the research. The farmers who were selected were engaged in dairy farming for more than 5 to 6 years. So, there was no cost incurred for the particular cattle as they use the calf of the previous cow and grow it younger. Also, the other fixed cost which is required for the cattle, like sheds, stores, machinery, and equipment, were old, and most of the farmers were not using the equipment [19].

Variable cost:

The variable cost can be defined as the cost incurred on the different factors required for production and is changed along with time. Variable cost includes various costs: feed and fodder cost, Labor cost, Veterinary cost, and miscellaneous expenditure.

Feed and Fodder Cost:

It includes the cost incurred on feeding the cattle with green and dry fodder and supplements or concentrates on the animals. The cost was calculated by simply multiplying the total quantities of different feeds and fodder, devoured by the number of animals with their respective prices for total feed cost. If the animal is given home-grown feed and fodder, then relevant prices were taken into consideration. For such a case, the cost of seeds, fertilizers, and other costs like electricity bills required for watering the crops, labor required, etc., was considered. Moreover, if that cost is not known, then the market price of the green fodder was taken. When the concentrated feed was prepared at home, the cost of inputs or ingredients required for the preparation was taken into calculations [20].

Labor cost:

In this cost only, the outside hired labor was included. All the farmers already have a farm, and dairy farming acts as an extra business opportunity. The hired labor cost was calculated by the average yearly salary paid to him or her. The labor rate was taken according to the prevailing wage rate in that particular region of study.

Veterinary Cost:

It includes all the costs required for individual cows or buffalo throughout the year for their health. It includes Artificial Insemination, vaccinations, medicines, breeding cost, and other charges charged by the veterinary doctor.

Miscellaneous Cost:

It includes all the expenses required for the repairs, water charges, electricity charges for cattle shed, other charges required for cattle throughout the year like ropes, decoration during festivals, etc.

Division of Joint Cost:

As discussed in the above costs, some other costs were incurred for all cattle as a whole. Various items like cattle sheds, buckets, pans, sanitization of the shed, etc., were jointly used together in the entire herd. This joint cost incurred throughout the year was then equally divided into the number of herds present in the group [21].

Gross Cost:

Gross cost is the total cost, which is obtained by including fixed cost and variable cost.

\[
\text{Gross Cost (GC)} = \text{Total Variable Cost (TVC)} + \text{Total Fixed Cost (TFC)}
\]

Net Cost:

The net cost for dairy farmers was calculated by simply deducting the imputed money generated from the dung or earned through the dung produced by cattle by the gross cost.

\[
\text{Net Cost (NC)} = \text{Gross Cost (GC)} - \text{The imputed value of dung}
\]

Total Cost per Liter of Milk Production:

The total cost per liter of milk was calculated by net maintenance cost or gross cost required per day per animal. It divided it by the average liter of milk produced per day by the animal. The cost and return of milk production were important to understand the economic efficiency of the milk producers.

\[
\text{Total Cost per Liter in Rs. } = \frac{\text{Net maintenance cost per day per animal}}{\text{Total milk produced per day per animal}}
\]

Gross Return:

Gross return was calculated by multiplying the total returns per animal multiplied by the milk price in a particular research region.

\[
\text{Gross Returns (GR)} = \text{Quantity of milk } \times \text{Market price of milk}
\]

Net Return:

Net returns were simply calculated by deducting net costs from gross returns.

\[
\text{Net returns (NR)} = \text{Gross Returns (GR)} - \text{Net Cost (NC)}
\]

Gross Margin:

The gross margin is counted by deducting or subtracting the total variable cost from the calculated...
gross returns. The gross margin is not the actual profit as it does not include any initial cost or fixed cost that has to be incurred. Gross margin is used to calculate the individual performance of the dairy farmer. This figure was also used where fixed capital was very much less or negligible in dairy farming. Here the fixed cost was not included because it does not affect much in the total contribution for dairy farming.

\[
\text{Gross Margin (GM)} = \text{Gross Return (GR)} - \text{Total Variable Cost (TVC)}
\]

**Benefit-Cost Ratio:**
The benefit-cost ratio was calculated by gross return divided by total variable costs. If the ratio was less than one, then the cost incurred was more than profit, and if the ratio were more than one, then the benefit exceeds the cost.

\[
\text{Benefit-cost Ratio (BCR)} = \frac{\text{Gross Return (GR)}}{\text{Total Variable Cost (TVC)}}
\]

**Revenue from Calf and Home-Made Dairy Products:**
Apart from selling the milk of cow and buffalo, revenue was also generated by selling the calf of the cattle. The price of the calf completely depends on the number of days the calf is kept and sold at what age. If the calf was immediately sold within a month, then the cost behind it was very less than the profit. However, if the calf were kept for a year, then the profit was also higher depending on the calf’s health. This revenue was calculated by subtracting the total cost required to grow the calf until it was sold by the total price earned from selling the individual calf. Some farmers can also generate revenue for selling home-made dairy products [22].

\[
\text{Revenue from calf} = \text{Total price of the calf} - \text{Total cost incurred till selling}
\]
\[
\text{Revenue from dairy product} = \frac{\text{price of the dairy product}}{\text{Cost incurred for preparation}}
\]

5. Results and Discussions

5.1. Characteristics of Dairy Farmer
In this section, a brief description was given of the analyzed data collected from the selected farmers. In Table 1, the distribution of farmers is based on the herd size of cattle and the number of farmers in each category. The type of herd adopted by the dairy farmer was as important for the comparison. Of the total sample selected for the research, 40% were small-sized farmers, 30% were medium-size farmers, and 30% were large-sized farmers. More small-sized farmers were concerned about medium and large farmers, so small farmers were considered more.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category of sample farmers with herd size</td>
</tr>
<tr>
<td>Taluka</td>
</tr>
<tr>
<td>Small (1-2 milch animals)</td>
</tr>
<tr>
<td>Medium (3-5 milch animals)</td>
</tr>
<tr>
<td>Large (6 and above)</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: Primary farmers survey result, 2019-20

5.2. Farmers’ Distribution
In Table 2, small, medium, and large farmers were further divided into cattle having pure cows, pure buffalo, and mixed cows and buffalo. The result observed that farmers preferred to keep pure cows more instead of keeping buffalo or mixed cattle. From the selected farmers for the research, about 65% of farmers only had a pure cow on their farm. 16.67% of farmers have pure buffalo, while 18.33% of farmers preferred mixed cows and buffalos for their dairy farming. It was seen that a smaller number of farmers preferred to keep the only buffalo. In comparison, slightly a greater number of farmers preferred to keep both. From the total small farmers, 62.5% had only cows, and 18.8% of farmers were having pure buffalo and mixed cattle. In medium farmers, 72.22% of farmers have the only cow, 19.44% of farmers have only buffalo, while 8.33% have both cows and buffaloes. In large-sized farmers, 61.11% of farmers have the only cow, 11.11% of farmers have only buffalo, while 27.78% of farmers have both cows and buffaloes [23].

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of farmers holding particular cattle</td>
</tr>
<tr>
<td>Categories</td>
</tr>
<tr>
<td>Pure Cows</td>
</tr>
<tr>
<td>Pure Buffalo</td>
</tr>
<tr>
<td>Mixed Cows &amp; Buffaloes</td>
</tr>
</tbody>
</table>

Source: Primary farmers survey result, 2019-20
5.3. Landholdings and Total Area under Cattle Fodder

The average landholding was 16.94 acres by the small-sized farmers, 11.83 acres by the medium-size farmer, and 20.15 acres by the large-sized farmer. It was observed that large farmers have more land as compared with small size and medium-size farmers. Moreover, from Table 3 we can see that small-sized farmers had more land than medium-size farmers. The qualitative data observed that farmers have fewer areas with cows and buffalo for their additional income. As farmers having an average acre of 16.94 has only 1 or 2 dairy cattle. They need only one or two cattle for milk purposes and gather cow dung, which would be required in the field. Small farmers were cultivating the green fodder for the cattle in 3.88% of the total land they have, followed by 10.27% by medium farmers and 15.92% by the large farmers. Interestingly the number of cattle increases the area under land cultivation for fodder crops also increases. The green fodder was cultivated separately for the cattle on the farm. In contrast, dry fodder was cultivated from the by-products of Bajra, Jowar, and Wheat. These crops were taken for income generation, but their by-products, like straws, were used as dry fodder to cattle throughout the year.

<table>
<thead>
<tr>
<th>Categories (size of holdings)</th>
<th>Landholding per farm (Acres)</th>
<th>Percentage of land harvested for fodder crops (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small farmer (1-2 milch animals)</td>
<td>16.94</td>
<td>3.88%</td>
</tr>
<tr>
<td>Medium farmer (3-5 milch animals)</td>
<td>11.83</td>
<td>10.27%</td>
</tr>
<tr>
<td>Large Farmer (6 and above)</td>
<td>20.15</td>
<td>15.92%</td>
</tr>
<tr>
<td>Average</td>
<td>15.85</td>
<td>9.15%</td>
</tr>
</tbody>
</table>

Source: Primary farmers survey result, 2019-20

5.4. Distribution of Cows and Buffaloes in Each Category with Average Number

The category-wise distribution of cows and buffaloes with the average number of cattle was given in Tables 4 and Table 5. In the total selected sample of 120 farmers, there were a total of 675 cows and buffaloes. From this, 534, i.e., 79.11%, were cows, and the remaining 141, i.e., 20.89%, were buffaloes. We can observe that farmers preferred more cows as compared to buffaloes. Looking at the figures of the average number of cattle, individual farmers held a greater number of cattle on an average of 4.81. In contrast, they hold only 0.92 average numbers of buffaloes. We can predict that medium farmers preferred more buffalo compared with the small and large size farmers. In contrast, medium-size farmers alone have 44% of the total buffalo, followed by 41% large farmers. We can also observe that the standard variation of the number of cows and buffaloes was higher for the larger farmers than small and medium-sized farmers. The standard variation for small, medium, and large-sized farmers was 0.5, 0.64, and 6.42.

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Cows</th>
<th>Total Buffaloes</th>
<th>Total Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>57</td>
<td>21</td>
<td>78</td>
</tr>
<tr>
<td>Medium</td>
<td>99</td>
<td>62</td>
<td>161</td>
</tr>
<tr>
<td>Large</td>
<td>378</td>
<td>58</td>
<td>436</td>
</tr>
<tr>
<td>Total</td>
<td>534 (79.1%)</td>
<td>141 (20.9%)</td>
<td>675</td>
</tr>
</tbody>
</table>

Source: Primary farmers survey result, 2019-20

5.5. Cost of Dairy Farmers

Cost included for the production of milk was Feed and Fodder, Labor, Veterinary, Miscellaneous and Joint cost.

**Feed and Fodder cost:** Feed costs were the highest cost, which was incurred in dairy farming. These include dry fodder, green fodder, and concentrates. Farmers fed different types of feed to the cattle and were also slightly change according to the area. Farmers mostly feed the dry fodder available in the field, including hay of Jowar, Bajra, and wheat. Farmers store these hays after harvesting the grains from it and are dried naturally and stored as the dry feed, given to the cattle throughout the year. They also grow green grasses like Alfa-Alfa, Ginni grass, Elephant grass, maize, and silage, etc. The total feed cost incurred
was 82.57% for small-sized farmers, 77.51% for medium-sized farmers, and 81.86% for larger-sized farmers. The total cost incurred for variable cost, concentrated feed cost was the highest, which might be due to less cost incurred for dry and green fodder as they were grown on their farm. Moreover, only the cost incurred for that is the cost of seeds, fertilizers, pesticides, electricity bill for watering, etc. The cost of small farmers was less as many of the small farmers graze their cattle on mountains or plane land in the rainy and winter season, which reduces the cost of fodder, is shown in Figure 1.

**Labor Cost:** Labor cost for the family workers was considered very low or negligible after interviewing the farmers. It was observed that most of the farmers were engaged in crop farming. Dairy farming does not take much effort and requires very little time in its engagement. Almost 95% of small farmers do not prefer outside labor, only in some cases of exceptional. The labor cost for the medium farmer is higher, which may be due to the smaller number of cows than the large farmers.

**Veterinary Cost:** Veterinary cost includes total health cost, which the individual animal incurred. This cost differs from area to area and also on the environmental conditions [24]. The type of feed given to the cattle also relates to the health of the cattle, where it was observed that cattle feeding with nutritious feed were healthier. Small farmers incur more costs of Rs. 5.95 as compared to large farmers incurring Rs. 5.79 and then the medium farmer who incur Rs. 4.21.

**Miscellaneous cost and Joint cost:** The result of the study showed that miscellaneous cost was highest for the small size farmers (Rs. 5.25), followed by large size farmers (Rs. 4.91) and then medium size farmers (Rs. 4.58). This higher cost for small-sized farmers may be due to the higher prices for the single items used for the cows, while large-sized farmers can buy it in the bulk quantity with discount prices. The larger-sized farmer has more expenses to maintain the shed and other things than medium-size farmers. Small farmers’ joint cost was always high compared with medium and large size farmers due to less distribution of cost in cattle. From Table 6, we can say Labor, Veterinary, Miscellaneous highest followed that feed & fodder cost, and Joint Cost is shown in Figure 2.

**Gross Cost:** In this research, the total fixed cost is considered zero. All the farmers were engaged in dairy farmers for more than 5 years, and their break-even point has been reached previously. Also, there was no fixed cost for the purchase of cows or buffalo as they were the calves of their previous cows and buffaloes.

![Figure 1: Distribution of fodder cost in % /animal/day](image1)

![Figure 2: Distribution of Total Variable Cost In % /Animal/Day](image2)
The feed and other costs were incurred in the variable cost. The gross cost for the small, medium and large size farmers was Rs. 85.06, 93.30, and 97.34, respectively, while the average gross cost was Rs. 91.90 [25].

Mean Returns from Manure: Manure generated from the cows and buffaloes were stored on the farm throughout the year. All the farmers use this manure in their field, while some large farmers who generate excess manure, which was not required in their field, and were, sold out to other farmers. They get higher revenue as the quality of manure was also good for the large farmers. I have considered an average imputed value of dung, which can be generated. After collecting the qualitative data from farmers, it was clear that a single cow or buffalo can generate about two trolleys of dung per year. The price for it varies from Rs. 2,200 to Rs. 4,000 depending on the quality of the manure. The imputed value for dung was Rs. 11.98, Rs. 12.73, and Rs. 13.55 for the small, medium, and large size farmers, respectively.

Net Cost: The net cost was the remaining cost after subtracting the imputed revenue from the gross cost. The net cost for the small, medium, and large size farmers were Rs. 73.08, Rs. 80.57, and Rs. 83.79 respectively. Thus, the net cost for the large-sized farmers was high compared to small and medium-size farmers, which may be due to higher expenses for large farmers while small and medium farmers save the other expenses. Medium farmers incur 9.3% more net cost than small farmers, while large farmers incur 12.8% of higher costs than small farmers.

Returns/Revenue from Dairy Farming: This includes the total revenue earned by the farmer through the selling of milk and calves of the cattle. The returns from the milk were different in different talukas due to the variability of the prices of milk. The lowest price was found to be Rs. 24 and highest of Rs. 44 depending on the quality of the milk. The average milk production was around 9 to 10 liters per day but only for 6 to 8 months, while others are kept as a dry period. The average production of milk per day for an individual animal was 4.75 liters for all the farmers by slight variations in different categories of farmers. After converting this into per day throughout the year, the average milk production was 4.79, 4.58, and 4.98 liters for small, medium, and large-sized farmers. The average price for the small, medium and large-sized farmers was Rs. 26.65, Rs. 28.32, and Rs. 30.50 respectively. Thus, the revenue from milk was Rs. 127.65, Rs. 129.71, and Rs. 151.89 for the small, medium, and large size farmers, respectively. Revenue generated from calves of cattle was having a huge variation depending on selling the calves. Usually, large farmers prefer to keep the calves for more months and then sell them at higher prices. Farmers generally sell bull calf after 1 month of its birth at an average price of Rs. 500 to Rs. 1,000. The heifer calf if sold at Rs. 5,000 to Rs. 7,000 on an average after 2 months of its birth, while at Rs. 50,000 to Rs. 70,000 on an average after 2 to 3 years of birth. After adding all these returns, the total gross return for small, medium, and large-sized farmers was Rs. 137.94, Rs. 140.21, and Rs. 165.14 respectively. The total difference of 16.5% was seen between the large farmer and the small farmer is shown in Figure 3.

Net Return: Net returns generated by subtracting gross cost from the gross returns were Rs. 64.86, Rs. 59.64, and Rs. 81.35, respectively. The net returns were seen to be highest in large farmers and lowest in medium farmers. The result shows a total difference of about 26.7% between the net revenue of large farmer and medium farmer while 20.3% between the large and small farmers.

Gross Margin: The result showed that the gross margin for small, medium and large-sized farmers was Rs. 52.88, Rs. 46.91, and Rs. 67.80 respectively. Medium farmers have the lowest gross margin as compare to small and large farmers. The total difference between the gross margin of a medium and large-sized farmer was 30.8%, which was very high, while 22% in between small and large-sized farmers.

Benefit-Cost Ratio: The benefit-cost ratio was 1.62, 1.50, and 1.70 for small, medium, and large-size dairy farmers, respectively. It means that all types of farmers were getting the profit from dairy farming. Large-sized farmers were generating higher profit after per day per animal. The larger-sized farmer has an 11.8% more benefit-cost ratio than the medium farmer, while only 4.7% more than the small farmer.
Cost and Return per Liter of Milk Production:

It was evident from Table 6 that the average cost per liter of milk was low in small farmers, average in medium-size farmers, and higher in larger-sized farmers Rs. 17.76, Rs. 20.37, and Rs. 19.55 respectively. It was observed that medium farmers were incurring more cost, i.e., 12.8% and 4% more than small and large size farmers. The result also showed that returns generated per liter were Rs. 8.89, Rs. 7.95, and Rs. 10.95 respectively. Large farmers were generating more returns per liter of milk as compared with small and medium-size farmers. Large-sized farmers may get higher returns because of the high price of milk due to higher fat quality and higher milk production due to the good quality of feed. Medium farmers were getting the lowest return per liter of milk, which may be due to the high cost of production and lower yield of milk. Large farmers were getting 18.8% and 27.4% higher returns than the small and medium farmers shown in Table 6.

Note- All the analyses were done in Indian Rupees per animal per day. The below brackets are the percentage of the various cost incurred for dairy farming.

From the study, it was observed that the value of dung was higher for the selected farmers than the previous studies, which leads to an increase in the farmer’s profit. Also, the profit generated by selling the calf

Table 6
Average cost and return on different categories of dairy farmers (*rs/animal/day)

<table>
<thead>
<tr>
<th>Components</th>
<th>Small Farmer(Rs)</th>
<th>Medium Farmer (Rs)</th>
<th>Large farmer (Rs)</th>
<th>Overall (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 Green Fodder</td>
<td>2.39 (2.81)</td>
<td>2.58 (2.77)</td>
<td>4.99 (5.13)</td>
<td>2.75 (2.99)</td>
</tr>
<tr>
<td>F2 Dry Fodder</td>
<td>2.54 (2.99)</td>
<td>2.73 (2.93)</td>
<td>2.8 (2.88)</td>
<td>2.61 (2.84)</td>
</tr>
<tr>
<td>F3 Concentrate</td>
<td>39.65 (46.61)</td>
<td>42.48 (45.53)</td>
<td>45.5 (46.74)</td>
<td>43.25 (47.06)</td>
</tr>
<tr>
<td>F4 The cost required to grow the fodder</td>
<td>25.65 (30.16)</td>
<td>24.53 (26.20)</td>
<td>26.39 (27.11)</td>
<td>25.38 (27.62)</td>
</tr>
<tr>
<td>V1 Feed &amp; Fodder cost</td>
<td>70.23 (82.57)</td>
<td>72.32 (77.51)</td>
<td>79.68 (81.86)</td>
<td>74.08 (80.61)</td>
</tr>
<tr>
<td>V2 labor</td>
<td>2.35 (2.76)</td>
<td>11.21 (12.02)</td>
<td>6.41 (6.59)</td>
<td>7.86 (8.55)</td>
</tr>
<tr>
<td>V3 Veterinary</td>
<td>5.95 (7.41)</td>
<td>4.21 (5.43)</td>
<td>5.79 (6.87)</td>
<td>5.28 (5.75)</td>
</tr>
<tr>
<td>V4 Miscellaneous</td>
<td>5.25 (6.17)</td>
<td>4.58 (4.91)</td>
<td>4.91 (5.04)</td>
<td>4.58 (4.98)</td>
</tr>
<tr>
<td>V5 Joint Cost</td>
<td>1.28 (1.50)</td>
<td>0.98 (1.05)</td>
<td>0.55 (0.57)</td>
<td>0.93 (1.01)</td>
</tr>
<tr>
<td>A = F1+F2+F3+F4+F5 Total Variable Cost</td>
<td>85.06 (100%)</td>
<td>93.30 (100%)</td>
<td>97.34 (100%)</td>
<td>91.90 (100%)</td>
</tr>
<tr>
<td>A' = A –Fixed cost(0) Gross Cost</td>
<td>85.06</td>
<td>93.30</td>
<td>97.34</td>
<td>91.90</td>
</tr>
<tr>
<td>B Value of Dung</td>
<td>11.98</td>
<td>12.73</td>
<td>13.55</td>
<td>12.71</td>
</tr>
<tr>
<td>C = A - B Net Cost</td>
<td>73.08</td>
<td>80.57</td>
<td>83.79</td>
<td>79.15</td>
</tr>
<tr>
<td>D Total production of milk/animal/day</td>
<td>4.79</td>
<td>4.58</td>
<td>4.98</td>
<td>4.75</td>
</tr>
<tr>
<td>E Price of Milk</td>
<td>26.65</td>
<td>28.32</td>
<td>30.50</td>
<td>28.06</td>
</tr>
<tr>
<td>F = D x E Revenue from milk</td>
<td>127.65</td>
<td>129.71</td>
<td>151.89</td>
<td>133.29</td>
</tr>
<tr>
<td>G Revenue from calf and dairy products</td>
<td>10.29</td>
<td>10.50</td>
<td>13.25</td>
<td>11.90</td>
</tr>
<tr>
<td>H = F + G Gross Return</td>
<td>137.94</td>
<td>140.21</td>
<td>165.14</td>
<td>145.15</td>
</tr>
<tr>
<td>I = H - C Net Returns</td>
<td>64.86</td>
<td>59.64</td>
<td>81.35</td>
<td>66.04</td>
</tr>
<tr>
<td>J = H - A' Gross Margin</td>
<td>52.88</td>
<td>46.91</td>
<td>67.80</td>
<td>53.29</td>
</tr>
<tr>
<td>K = H / A' Benefit-Cost Ratio</td>
<td>1.62</td>
<td>1.50</td>
<td>1.70</td>
<td>1.58</td>
</tr>
<tr>
<td>L = A' / D Cost per liter of milk production</td>
<td>17.76</td>
<td>20.37</td>
<td>19.55</td>
<td>19.35</td>
</tr>
<tr>
<td>M = E - L Return per liter</td>
<td>8.89</td>
<td>7.95</td>
<td>10.95</td>
<td>8.71</td>
</tr>
</tbody>
</table>

Source: Primary farmers survey result, 2019-20
was seen higher due to calf selling after 2 to 3 years have given more prices to the farmers, which were selected in this study, which ultimately have increased the farmers’ income in the selected area.

6. Conclusion

The result of the research indicated that the farmers prefer more cows in comparison with buffalo. Of selected farmers, 79% were cows, and 21% were buffaloes from the total milch cattle. Of the total selected farmers, 65% of farmers had pure cows, 16.7% of farmers had pure buffalo, and 18.3% had mixed cows and buffaloes. The landholding of small dairy farmers was found to be higher than the medium farmer. On an average of overall farmers, almost 9% - 10% of the land was used for growing the cattle feeds. The high share went to feed and fodder for all small, medium, and large size farmers from the total variable cost. It was observed that the highest share of the cost was for the concentrates, followed by the cost required to grow the fodder. The cost incurred for feeds and fodder was highest to the larger farmers than medium and small farmers due to the high amount of concentrates and green fodder. The cost incurred for green fodder was very less for the small farmers as most of them graze their cattle in the rainy and winter season on the public land. The total variable cost for small, medium and large size farmers is Rs. 85.06, Rs. 93.30, and Rs. 97.34, respectively.

The study also revealed that the highest returns are generated from the milk followed by returns from the dung. Also, the benefit-cost ratio calculated was higher for the large farmers, which was 1.70, while 1.62 and 1.50 for small and medium-size farmers. The large farmers are getting 18.8% and 27.4% more profit per liter than small and medium-size farmers, respectively. The cost per liter of the medium farmers was high, maybe because of the low yield of milk and high variable cost. The milk production per animal per day was also higher in large-sized farmers than small and medium-sized farmers in that order. The average milk production per animal was Rs. 4.79, Rs. 4.58, and Rs. 4.98 for small, medium, and large size farmers, respectively. Also, farmers having crossbred cattle were more productive than the normal cows, and farmers preferred more crossbred cows.

Thus, for increasing farmers’ profitability, the cost of concentrates should be minimized and minimizing it home-made alternatives for concentrates should be used. Preparation of Azolla and spirulina, which contains 45% and 70% protein, could help reduce the cost of feed and improve the health and milk quality of dairy animals, observed Volkmann et al. Also, small farmers can form a group from the same village and purchase the materials or equipment required together in bulk for cheaper prices can reduce production costs.

As demand for milk and other dairy products increased rapidly, the milk price was also increasing due to higher dairy farming costs. There is much scope for finding the constraints for reducing the cost of different categories of dairy farmers. Minimizing dairy farmers’ costs will also lead to low milk and dairy milk products for the consumers and more profit for the dairy farmers. Minimizing the cost was very difficult but can be implemented if there was proper research on the nutritious feeds and fodder at a lower cost suitable for milch animals.

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Conflict of Interest

There is no conflict of interest among the authors

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References


