

# Comparative economic analysis of local and crossbred cow rearing in rural areas

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## Abstract

Dairy farming is an integral part of the farming system. The income generated through livestock rearing has been the basis for a majority of the landless and the small farmers. The present study aims to make a comparative economic analysis of crossbred cows and local cows in rural Punjab. The study is based on primary data, collected through a detailed schedule from 420 dairy farmers belonging to different farm size categories from 21 villages situated in three different agro-climatic zones (Shivalik-Foothills, Central Plains and South-West Dry zones) of Punjab state. The average milch herd size is 2.26 for crossbred cows and 1.48 for local cows. The crossbred cows show higher significant total fixed costs of milk production as compared to the local cows due to the high initial investment and maintenance expenditure of the crossbred cows. The net returns from milk production calculated based on ₹ per day per cow significantly differ between crossbred cows and local cows. The net returns per litre from the milk production of local cows are worked out as negative.

**Keywords:** crossbred cow; dairy farming; herd size; net returns; rural

## Introduction

Indian economy is predominantly the rural economy. A vast majority of the population of the country is residing in rural areas. Dairy farming is an integral part of the farming system. During the past several years, there has been an increasing awareness that the high expectations from the so-called Green Revolution are not about to be met (Nyholm et al., 1974). The Green Revolution has benefitted only medium and large farmers. However, dairy farming can be seen as a means of fulfilling the social justice objective of the planning commission as it is more suitable for marginal and small farmers. Dairying has provided strong support to stabilise the Indian economy by ensuring a certain degree of diversification and flexibility. Dairying provides the benefit of nutritive food, supplementary income and employment to around 80 million farm households (Toor and Kaur, 2022).

Livestock rearing has been considered a significant activity in the rural areas of the country. The income generated through livestock rearing has been the basis for a majority of the landless and the small farmers. It has been found that the families with a land holding size of fewer than 4 hectares, own around 88 per cent of the livestock (Livestock Census, 2020). The cattle play a significant role in the economy of people where a majority of the population is dependent mainly upon agriculture. From subsistence to commercial farming, cattle form an integral part of farming, providing draught power for various phases of agricultural operations from ploughing, irrigation, harvesting and transportation to supplying manure, fuel and milk (Chakravarti, 1985). The Indian indigenous humped cattle mainly belong to the Zebu species which are best suited to the physical environment and economic conditions of the country. The Indian Council of Agriculture has made systematic studies and recognises 25 important cattle breeds in India.

The cattle population was 2427.71 thousand and were nearly 30 per cent of the total livestock population in Punjab in 2012. In 2019-2020, milk production in the state was 13347 thousand tonnes and the growth rate was about 5.60 per cent per annum. In 2017-18, the share of livestock in net state value-added was 8.83 per cent at constant prices of 2011-12 (Statistical Abstract of Punjab, 2020). A good number of studies, such as Islam et al. (2008), Mondal et al. (2010), Ghosh et al. (2015), Jadav et al. (2016), Lal and Chandel (2016), Kumari et al. (2020) and Sharma et al. (2020), have been undertaken to analyse the cost and return structure from milk production. Feed cost captures a large portion of the total variable costs of milk production. There has been found regional variations in milk yield of local as well as crossbred cows. Moreover, the milk price also varies from state to state. Economic analysis of milk production is very important to know about its economic viability. Hence, the present study aims to conduct a comparative economic analysis of crossbred cows and local cows in rural Punjab.

## Materials and Methods

The present study is based on primary data, collected through a detailed schedule from 420 dairy farmers belonging to different farm size categories from 21 villages situated in three different agro-climatic zones (Shivalik-Foothills, Central Plains and South-West Dry zones) of Punjab state. A multi-stage sampling technique has been used to select the villages and dairy farmers in the study area. Standard statistical tools like mean values and proportions have been used for analysis. The significance of results have been tested by using t-test.

## Results and Discussion

### *Herd Size*

A dairy herd is a group of cows and buffaloes kept together for milk production. It contains both milch animals and dry animals. Milch animals are those who are currently producing milk. Animals which have calved at least once but are at present not in production, are described as dry animals. Table 1 contains data regarding the average dairy herd size among the dairy farmers. The number of milch crossbred cows and local cows is 377 and 132 respectively. The average milch herd size is 2.26 for crossbred cows and 1.48 for local cows. The herd size is influenced by the value of the milch animal, productivity of the milch animal, the sale price of milk, feed requirement and veterinary expenses. The crossbred cows are preferred over the local cows due to their higher milk productivity and better reproductive efficiency. This, in turn, helps in augmenting the income of the dairy farmers.

### *Total cost of milk production (₹ per day per milch animal)*

The total cost of local cow milk production is decomposed into two parts: fixed cost and variable cost. Table 2 provides a handful of information about the total costs of milk production of crossbred cows as well as local cows. The variable costs of milk production include feed and fodder cost, labour cost, veterinary cost and miscellaneous expenses (such as expenses on electricity, fuel, etc.). The variable costs of crossbred cow milk production are worked out as ₹154.02 per day per cow which is ₹127.44 per day per cow for local cow milk

production. The variable costs of milk production differ significantly between the breeds of the cow as indicated by  $p < 0.05$ . For the components of variable cost, it is found that feed cost and veterinary costs have a higher average value for crossbred cows than local cows. This is due to the reason that feed and fodder requirement of the crossbred cows is higher than the local cows. With less availability of good quality feed and fodder, the crossbred cows are more vulnerable to the diseases than local cows and hence, increasing the veterinary expenses on crossbred cows. The results are in line with the study of Jadav et al. 2016, in which they have shown that feed and fodder costs constitutes more than four-fifth of the total variable costs in rural areas. Labour cost constitutes the second major component of total variable costs in both breeds of cows. However, it does not show any significant difference between the breed types. Moreover, Patel et al. 2016 have raised the issue of costly hired labour as a major constraint faced by dairy farmers in rural areas.

**Table 1:** Herd Size in the surveyed area

Breed type of Cows	Herd size			
	Milch	Dry	Total	Average milch herd size
Crossbred	377 (79.87)	95 (20.13)	472 (100)	2.26
Local	132 (93.62)	9 (6.38)	141 (100)	1.48

Source: Field Survey, 2019. Note: Figures in parentheses indicate percentage

**Table 2:** Total Costs of Milk Production (₹ per day per milch animal)

Description	Cow Breed Type	Average	t-value	p-value
Feed Cost	Crossbred	121.09	7.46	0.000*
	Local	88.63		
Labour cost	Crossbred	32.31	1.83	0.06
	Local	39.5		
Veterinary Cost	Crossbred	0.99	4.27	0.000*
	Local	0.62		
Miscellaneous cost	Crossbred	3.4	0.81	0.42
	Local	3.93		
Interest on working capital	Crossbred	1.88	1.5	0.14
	Local	2.21		
Total Variable Cost	Crossbred	154.02	5.8	0.000*
	Local	127.44		
Depreciation on animals	Crossbred	4.28	2.38	0.02*
	Local	2.27		
Depreciation on building	Crossbred	5.03	3.93	0.000*
	Local	2.98		
Depreciation on equipment	Crossbred	3.33	3.79	0.000*
	Local	1.74		
Interest on fixed capital	Crossbred	15.21	8.39	0.000*
	Local	8.65		
Total Fixed Cost	Crossbred	27.82	6.71	0.000*
	Local	16.2		
Total Cost	Crossbred	181.83	7.07	0.000*
	Local	143.64		

Source: Field Survey, 2019, \*Significant at  $p \leq 0.05$

The total fixed costs of milk production are found to be ₹27.82 and ₹16.2 per day per cow for crossbred cows and local cows respectively. There are found significant differences in the total fixed cost between the breed types as the p-value is worked out to less than 0.05. The crossbred cows show higher significant total fixed costs of milk production as compared to the local cows. The crossbred cows require high initial investment and maintenance expenditure than the local cows. All the components of the total fixed costs of milk production, such as depreciation on animals, depreciation on buildings, depreciation on equipment and interest on fixed capital, show a higher and more significant average value for the crossbred cows than the local cows, as revealed by t-test and subsequent p-value.

The total costs of milk production are worked out as ₹181.83 and ₹143.64 per day per cow for crossbred cows and local cows respectively. The p-value is less than 0.05, indicating significant differences in the total costs of milk production calculated based on ₹ per day per cow. These differences cannot attribute to the fluctuations in the data. The analysis reveals that the dairy farmers have to incur higher expenses for rearing crossbred cows than the local cows. The results of the study are in line with the findings of Islam et al. (2008), Ghosh et al. (2015), Mondal et al. (2010) and Meena et al. (2019) who have shown higher total costs of milk production for crossbred cows than the local cows. The major reason for the cost differences in the breed types can be attributed to the high feed cost, veterinary cost and maintenance expenses.

#### Returns from Milk Production (₹ per day per milch animal)

Table 3 depicts the data on the returns from the milk production calculated based on ₹ per day per cow. The gross returns included the sale of milk, sale of dung and sale of young stock. The gross returns are worked out as ₹253.02 per day per cow for crossbred cows and ₹144.18 per day per cow for local cows. The t-value (13.65) and p-value (0.000) indicated the significant differences in the gross returns per day per cow between the breed types. Similar findings have been reported by Meena et al. (2019) and Islam et al. (2018). The difference in the gross returns from the milk production between the breed types arises primarily due to the differences in earnings from the sale of milk. The sale of milk is found at ₹247.64 and ₹138.62 per day per cow for crossbred cows and local cows respectively. The earnings from the sale of milk are higher for crossbred cows than the local cows due to the higher milk yield of crossbred cows (8.61 litres per day per cow) than the yield of local cows (4.78 litres per day per cow). Crossbreeding is generally the combination of desirable qualities of two different breeds. The genetic improvement leads to a higher milk yield. The difference in other components of gross returns, such as the sale of dung and the sale of young stock, are found to be insignificant as the earnings from these components constitute a very small proportion of the gross returns from the milk production.

#### Total cost of milk production (₹ per day per milch animal)

The total cost of local cow milk production is decomposed into two parts: fixed cost and variable cost. Table 2 provides a handful of information about the total costs of milk production of crossbred cows as well as local cows. The variable costs of milk production include feed and fodder cost, labour cost, veterinary cost and miscellaneous expenses (such as expenses on electricity, fuel, etc.). The variable costs of crossbred cow milk production are worked out as ₹154.02 per day per cow which is ₹127.44 per day per cow for local cow milk production. The variable costs of milk production differ significantly between the breeds of the cow as indicated by  $p < 0.05$ . For the components of variable cost, it is found that feed cost and veterinary costs have a higher average value for crossbred cows than local cows. This is due to the reason that feed and fodder requirement of the crossbred cows is higher than the local cows. With less availability of good quality feed and fodder, the crossbred cows are more vulnerable to the diseases than local cows and hence, increasing the veterinary expenses on crossbred cows. The results are in line with the study of Jadav et al. 2016, in which they have shown that feed and fodder costs constitutes more than four-fifth of the total variable costs in rural areas. Labour cost constitutes the second major component of total variable costs in both breeds of cows. However, it does not show any significant difference.

**Table 3:** Returns from Milk Production (₹ per day per milch animal)

Description	Cow Breed Type	Average	t-value	p-value
Milk Yield	Crossbred	8.61	18.56	0.000*
	Local	4.78		
Sale of Milk	Crossbred	247.64	13.69	0.000*
	Local	138.62		
Sale of dung	Crossbred	3.71	0.029	0.97
	Local	3.7		
Sale of young stock	Crossbred	1.67	0.42	0.67
	Local	1.84		
Gross Returns	Crossbred	253.02	13.65	0.000*
	Local	144.18		
Net Returns (per day per cow)	Crossbred	72.08	7.35	0.000*
	Local	0.54		
Net Returns (₹ per litre)	Crossbred	7.77	5.63	0.001*
	Local	-1.04		

Source: Field Survey, 2019, \*Significant at  $p \leq 0.05$

between the breed types. Moreover, Patel et al. 2016 have raised the issue of costly hired labour as a major constraint faced by dairy farmers in rural areas.

The net returns from milk production calculated based on ₹ per day per cow are worked out as ₹72.08 for crossbred cows and ₹0.54 for local cows. There have been found significant differences in the net returns from the milk production between the crossbred cows and the local cows. These findings confirm the results of Lal and Chandel (2016) and Singh and Alli (2017) who have shown higher net returns from milk production calculated based on per day per cow for crossbred cows than the local cows. The higher gross returns lead to higher net returns from crossbred cow milk production. On contrary, the total cost of local cow milk production overweighs the gross returns, resulting in negative net returns from local cow milk production. The net returns from milk production calculated based on ₹ per litre for crossbred cows are found to be ₹7.77. One study by Kaur et al. (2011) shows that net returns per litre from crossbred cow milk production varies from ₹ 4.42 to ₹ 6.25 in Punjab. The net returns per litre from the milk production of local cows are worked out as negative, i.e. ₹ -1.04. The studies of Sunil et al. (2016) and Kumari et al. (2020) also show the negative net returns per litre from local cow milk production. The negative net returns per litre arise due to a higher per litre cost of milk production than the price per litre. The poor management practices adopted by the dairy farmers are also responsible for negative net returns from local cow milk production. The negative net returns from the local cow milk production indicate a loss in local cow milk production. This is due to the higher expenses in the rearing of local cows than the income earned from the sale of fluid milk. The p-value reveals the significant differences in the net returns per litre of milk production between the crossbred cows and the local cows. The average value of net returns per litre of milk production is significantly higher for crossbred cows than the local cows.

## Conclusion

Aiming to make a comparative economic analysis of crossbred cows and local cows in rural Punjab, the study reveals that the average milch herd size is 2.26 for crossbred cows and 1.48 for local cows. The crossbred cows are preferred over the local cows due to their higher milk productivity and better reproductive efficiency. The total fixed costs of milk production are found to be ₹27.82 and ₹16.2 per day per cow for crossbred cows and local cows respectively. Significant differences have been found in the total fixed cost between the breed types as the p-value is worked out at less than 0.05. The major reason for the cost differences in the breed types can be attributed to the high feed cost, veterinary cost and maintenance expenses. The net returns from milk production calculated based on ₹ per day per cow are worked out as ₹72.08 for crossbred cows and ₹0.54 for local cows. The net returns from milk production calculated based on ₹ per litre for crossbred cows are found to be ₹7.77. The net returns per litre from the milk production of local cows are worked out as negative. The negative net returns per litre arise due to a higher per litre cost of milk production than the price per litre. The p-value indicates the significant differences in the net returns per litre of milk production between the crossbred cows and the local cows. The earnings from the sale of milk are higher for crossbred cows than the local cows due to the higher milk yield of crossbred cows than the yield of local cows. It is clear from the analysis that the crossbred cows are more profitable than the local cows. The veterinary infrastructure should be strengthened more to provide Artificial Insemination (A.I.) and quality breed injections to promote the inclusion of crossbred cows in the herd size of the dairy farmers in rural areas of Punjab. The scientific knowledge about dairying can be provided by organizing the training courses for the different target groups to enhance milk productivity.

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