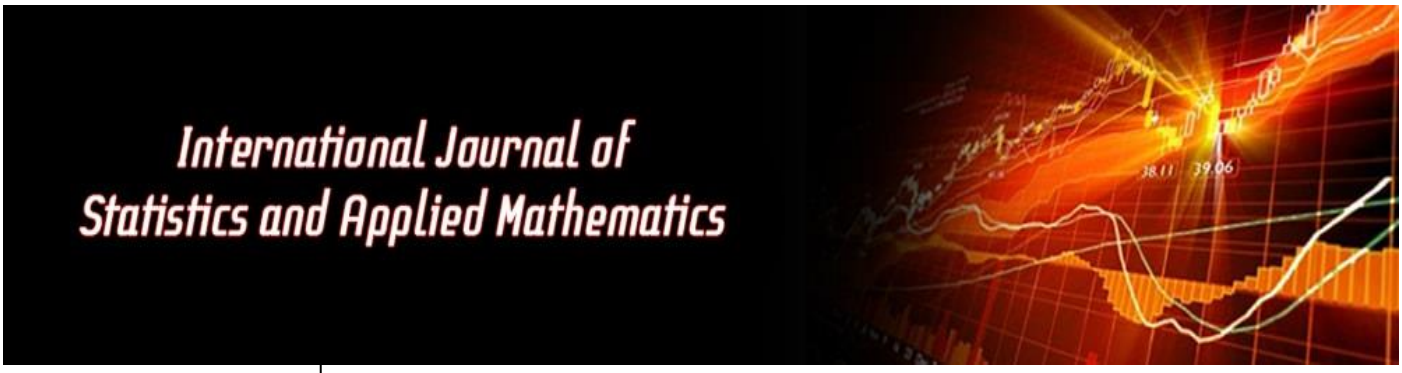
International Journal of Statistics and Applied Mathematics 2024; SP-9(1): 105-108



ISSN: 2456-1452
Maths 2024; SP-9(1): 105-108

https://www.mathsjournal.com
Received: 18-11-2023
Accepted: 21-12-2023

Bendre Omkar
Agricultural Economics Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

MS Jadhav
Agricultural Economics Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

HR Shinde
Agricultural Economics Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

BJ Deshmukh
Agricultural Economics Department, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

KJ Patil
Agricultural Economics Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Corresponding Author:
Bendre Omkar
Agricultural Economics Section, RCSM College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India

Economics of goat faming in Western Maharashtra

Bendre Omkar, MS Jadhav, HR Shinde, BJ Deshmukh and KJ Patil

Abstract
The cost of goat farming is a crucial economic metric for evaluating the productivity of farm households in goat production and serves as the foundation for setting prices. The aim of the research was to investigate the costs and benefits related to goat farming in Satara district of Maharashtra. Based on the number of goats, the study gathered 90 goat farmers who were divided into three groups: small (up to 10 goats), medium (11-20 goats), and large (more than 20 goats). According to the study, the profits made by large goat farmers were more than those made by medium and small goat farmers and in the cost's aspects, where large goat farmers high cost of farming than the medium and small. Labour cost have highest contribution in production cost (49.76 per cent at overall) followed by concentrate cost (14.86 per cent). The sale of goats per flock was found to be higher in the large size flock (41.06) than in the medium and small size flock (23.78 and 11.7).

Keywords: Cost and returns, goat farming, Satara, break even analysis

Introduction
Accurate statistical values are required to determine the future outlook of the goat population and their productivity. They are also required before any improvement policies which can be planned on a realistic basis and implemented with confidence. The world total number of goats was 1 Billion. (FAO STAT, 2019). There are immense variations among the different part of the country.

China has the largest production of goats. The goat population in India is 148.88 million. Farmers keep goat as a supplementary activity to increase their income among the many agricultural enterprises. The goat farming is very significant to India's rural economy. It benefits the nation's farming community as well as the working class by providing income and jobs. Goat farming typically plays an important part in generating employment and a reliable source of income for rural residents who want to complement their main source of income.

The typical milk production per lactation ranges from 20 to 40 liters for domestic goats and 60 liters for crossbred goats. India produced 221.06 million tons of milk overall in 2021-22, of which 5.4 million tones came from goats. About 7 per cent (0.94 million MT) of the nation's current meat production comes from goats. The crucial items are goat meat, skin and milk.

Products can be exported to generate significant foreign exchange for the nation. Goats are referred to as the "poor man's cow" (or "mini-cow") because they make a significant economic contribution to the underprivileged. They give their kids milk that is nourishing and simple to digest, and they give labourers, the underprivileged, and/or small farmers a reliable, consistent source of supplemental cash. Given their small stature, goats are simple for women and kids to handle. Goat feeding, milking, and care don't call for a lot of tools or laborious work. Investment expenditures, food expenses, and upkeep expenses are all rather modest. One native cow can be raised for the same price as four goats. Goats can be raised very well in places with little fodder and resources. Goat farming provides employment and income in rural areas mostly.

Methodology
Satara district ranks tenth in goat population in Maharashtra state. It is one of the largest goat farming districts in Maharashtra. Two tehsils *viz*. Man (29,180), Phaltan (28,477) and were selected on the basis of highest population of goats.

45 respondents (15 small, 15 medium and 15 large) were selected from each tehsil, comprising of total 90 respondents (30 small, 30 medium and 30 large). Three categories were determined for the herd size: small (up to 10 goats), medium (11-20 goats), and large (> 20 goats). Topics related to thegoat farming; data was collected from different size groups by using the well-structured questionnaire.

Total costs and fixed costs were the two categories into which the cost elements were divided. The current value of goat, interest on working capital, and depreciation on shed and accessories were examples of fixed costs. The variable costs that were taken into consideration included the cost of feed, labour, and veterinary expenses. The entire cost was calculated by adding the fixed and variable cost together. To calculate the gross returns, factors such as the number of goats sold, quantity of milk and manure, were considered. The net returns were obtained by deducting the cost from the gross profits. The bank rate was used to compute the interest on working capital. Estimating depreciation was done using the straight-line method.

$$\text{Annual Depreciation} = \frac{\text{Purchased price- Junk value}}{\text{Expected remaining life}}$$

The shed annual depreciation was estimated at 10%, and the productive life of the different kinds of equipment-such as the sickle, Ghamela, milking cans, and broom-were also taken into account. The expenditure on different types of fodder was calculated by using simple averages and percentage. Both hired and family labour used in goat farming was included in the labor expenditures. The wages were computed based on the data collected from the group size. Veterinary expenses included vaccination and treatment of goats. It also included miscellaneous cost like rope, tagging, repairing of cattle shed etc. Using the following technique, break-even analysis was performed to determine the percentage margin of safety for goat farming of various categories.

$$\text{BEP} = \frac{F}{p - v}$$

Where, F is fixed costs, p selling price, v is variable cost per unit

Results and Discussion

In addition to breed and management techniques, goat farming is also influenced by the animal's availability to feed and fodder.

Table 1 shows the quantity of fodder fed and cost incurred on each animal per annum. In large size flock green fodder of Rs. 275.31 were given, Rs. 282.52 in case of medium flock size and Rs. 254.76 in case of small flock size. Dry fodder of Rs. 244.92 were given in case of large group size, Rs. 225.80 in case of medium group size and Rs. 180.71 in case of small group size. Concentrates were given; in case of large flock size, it is Rs. 955.64, followed by medium g size Rs. 899.95 and small flock size Rs. 678.57. Among the all-herd size groups, maximum expenses on green fodder, dry fodder and concentrates were done by large flock size. Among the costs, the highest cost was incurred for the labour (52%), followed concentrates (15%), green fodder (4%) at overall. Variable cost account for about 83% and fixed cost accounts for about 17%. The highest cost per goat was recorded in case of large group size (₹ 6046.33) followed by medium (₹ 5599.78) and small group size (₹ 4944.57). The cost is higher for large herd sizes, maybe because they produce more number of kids that needs to be disposed of, which raises income. The animals can be fed since they have greater financial resources.

Table 2 depicts average annual income per goat to gain a more comprehensive view, let's delve into the average annual income per goat across various flock sizes. The per-goat gross returns, when considering all sources, at overall level Rs.9638.12. However, when breaking this down by flock size, per-goat gross returns were lowest in small-sized flocks, amounting to Rs.6616.71, followed by medium-sized flocks at Rs.7099.20 and large-sized flocks at Rs.8635.74. This indicates that large-sized flocks yielded the highest per-goat gross returns. It is worth highlighting that the sale of goats remained the principal income source in goat farming. Notably, receipts from goat sales were most substantial in small-sized flocks. These findings align with prior research conducted by Garje 2013, specifically regarding net income

Table 3 depicts the gross returns obtained per goat in goat farming The data also provides insights into net returns per goat over total costs, which paints a similar picture. The small-size goat class shows net returns of Rs.3928.59 per goat, whereas the medium-size class returns Rs.5522.09 per goat, and the large-size class delivers Rs.7845.47 per goat. On average, the net returns per goat over total costs is Rs.9304.69. Notably, the small size goat class appears to have the lowest net profit over total cost among the three categories, primarily due to relatively higher maintenance expenses, including increased labor, concentrate, and fodder charges. In contrast, the large-size goat class exhibits the highest net profit, possibly driven by factors like economies of scale or specific management practices.

Table 4 depicts Break-even analysis is a technique used in cost-volume-profit (CVP) analysis to determine the point at which total revenue equals total cost, resulting in zero net income. In the context of goat farming, the minimum cost required to cover maintenance costs varies based on farm size, with small, medium, and large farms needing Rs.13954.07, Rs.23190.15 and, Rs.37366.83 respectively. To achieve a profit, farmers must maintain a cost higher than these break-even point cost. This approach provides valuable insights into when profitability begins for goat farming operations of different sizes

Table 5 depicts at an overall level, the coefficient of multiple determination, or R-square, was calculated to be 0.85. This indicates that, when considered collectively, the five resources explained 85% of the variation in annual gross returns from goat farming. Regarding flock size (X_1), the results showed its significance at a 1 per cent level in the overall analysis. An increase in flock size corresponded to an annual gross income rise, suggesting the potential to enhance income by expanding the flock size. Gazing and fodder charges (X_2), the results showed its significance at a 5 per cent level in the overall analysis. An increase in grazing and feeding corresponded to an annual gross income rise, suggesting the potential to enhance income by increasing investment on the grazing and feeding. Regarding human labour (X_3), the results showed it is non significant at a 1 per cent level in the overall analysis. An increase on labour not corresponded to an annual gross income rise, it's not suggesting the potential to enhance income by expanding human labour. In the case of concentrate charges (X_4), it was found to be significant at a 10 per cent level in the overall analysis. An increment in concentrate charges led to a corresponding increase in annual gross income. Similarly, the veterinary charge (X_5) exhibited significance at a 10 per cent level overall. An augmentation of veterinary charges resulted in an annual gross income increase.

Table 1: Cost of maintenance per goat (Rs/goat)

		Flock size		
Particulars	**Small**	**Medium**	**Large**	**Overall**
Depreciation on goat	716.14	747.91	785.82	776.65
	(14.48)	(13.35)	(12.99)	(13.33)
Depreciation on shed	65.88	65.40	70.11	69.24
	(1.33)	(1.16)	(1.15)	(1.18)
Depreciation on equipment	26.11	37.89	39.88	37.51
	(0.52)	(0.67)	(0.65)	(0.64)
Interest on fixed capital	96.97	102.14	107.49	106.20
	(1.96)	(1.82)	(1.77)	(1.82)
Fixed cost (1 to 4)	897.04	944.84	994.36	980.59
	(18.14)	(16.87)	(16.44)	(16.83)
Dry fodder	180.71	225.80	244.92	231.97
	(3.65)	(4.03)	(4.05)	(3.98)
Green fodder	254.76	282.92	275.31	279.33
	(5.15)	(5.05)	(4.55)	(4.79)
Concentrate	678.57	899.95	955.64	906.11
	(13.72)	(16.07)	(15.80)	(15.56)
Human labour	2594.44	2862.08	3175.45	3033.28
	(52.47)	(51.11)	(52.51)	(52.08)
Veterinary expenses	56.15	59.37	44.76	52.30
	(1.13)	(1.06)	(0.74)	(0.89)
Misc.	18.09	20.26	25.35	22.93
	(0.36)	(0.36)	(0.41)	(0.39)
Interest on working capital	264.79	304.52	330.50	316.81
	(5.35)	(5.43)	(5.46)	(5.44)
Variable cost (5 to 11)	4047.52	4654.9	5051.97	4842.76
	(81.85)	(83.12)	(83.55)	(83.16)
Total cost (A+ B)	4944.57	5599.78	6046.33	5823.36
	(100.00)	(100.00)	(100.00)	(100.00)

(Figures in parentheses indicate percentage to the total)

Table 2: Average annual income per goat (Rs)

Particulars	**Small**	**Medium**	**Large**	**Overall**
Per goat				
Sale of goats	5743.70	6025.44	7320.50	8453.72
	(86.81)	(84.87)	(84.77)	(87.71)
Manure	773.00	980.00	1243.84	1099.34
	(11.68)	(13.81)	(14.41)	(11.41)
Milk	100	93.75	71.39	85.04
	(1.51)	(1.32)	(0.82)	(0.88)
Gross return	6616.71	7099.20	8635.74	9638.12
	(100)	(100)	(100)	(100)

(Figures in parentheses indicate percentage to total)

Table 3: Gross returns per goat (Rs)

Sr.no	**Particulars**		**Flock size**		
		Small	**Medium**	**Large**	**Overall**
Per goat					
1	Gross return	8873.17	11121.88	13891.81	15128.05
2	Variable cost	4047.52	4654.93	5051.97	4842.76
3	Fixed cost	897.04	944.84	994.36	980.59
4	Total cost	4944.57	5599.78	6046.33	5823.36
5	Operating income	4825.64	6466.94	8839.84	10285.29
	Net profit	3928.59	5522.09	7845.475	9304.69

Table 4: Break-even point of goat farming in monetary term (Rs)

Sr. no	**Flock size**	**As per BEP**	**Total returns**	**Margin of safety**
1	Small	13954.07	74534.66	60580.59
2	Medium	23190.15	158597.99	135407.84
3	Large	37366.83	332014.32	294647.53
4	Overall	35000.45	230248.99	195248.56

Table 5: Estimated multiple regression production function of Goat farming

Sr.no	**Particulars**	**Regression coefficients**
1	Flock size	11625.19*** (2278.11)
2	Grazing and fodder charges	0.9856** (0.34)
3	Human labour	0.9514^{NS} (0.70)
4	Concentrate	0.8768*** (0.098)
5	Veterinary expenses	2.3534* (0.7864)
6	R^2	0.85

*, **, *** and NS denote significance at 10, 5, 1 and non-significant per cent level of significance.

Conclusions

Across all size groups, feed and labour accounted for more than 72% of the overall cost of goat farming. Perhaps as a result of their heavy input use, large farmers in the current study had higher goat farming cost. The studies conducted by Garje (2013) and Gund (2021) [2] also reported similar findings.

When comparing small flock size goat farmers to medium and large flock size goat farmers, that large flock size goat farmers receive is higher gross returns. It is because of more number goats and as a result returns obtained from them are also high. Large size groups had the highest gross returns, followed by medium and small groups. Similar results were Garje (2013) and Gund (2021) [2].

The break-even analysis showed that the all the size groups were running in the profit zone, which shows highest percentage margin of safety in case of large size group. The findings of the functional study suggested that the significance of flock size, concentrate charges, grazing and feeding charges and veterinary charges as critical factors impacting annual gross returns in goat farming.

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