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Business analysis of animal feed manufacturing units in Nagpur district

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Abstract

Animal feed manufacturing is a key component of the livestock and agribusiness sector, supporting the productivity and income of livestock farmers. This study, based on primary data from selected animal feed manufacturing units of different scales in Nagpur district, Maharashtra, examines the resources used, establishment and operating costs, returns, and overall economic performance of the enterprises. It also analyses the marketing channels through which feed reaches consumers, along with the role of wholesalers and retailers in transportation, storage and distribution. The findings indicate that animal feed manufacturing has good business potential, though its long-term performance depends on effective management of raw materials, production costs, storage, product quality, and marketing. The study offers useful insights for entrepreneurs, feed manufacturers, livestock farmers, policymakers and financial institutions seeking to improve the efficiency, profitability and sustainability of animal feed enterprises.

Keywords: Animal feed, business analysis, establishment cost, cost and returns, marketing channel, Nagpur district

Introduction

The livestock sector is a fast-growing segment of Indian agriculture, contributing significantly to nutritional security, rural employment and the national economy. Since animal feed forms the foundation of livestock production, the growing commercialization of dairy and poultry farming has increased demand for scientifically formulated, balanced feed. Animal feed manufacturing involves processing and blending agricultural by-products such as maize, soybean meal, de-oiled cakes, wheat bran, rice bran and molasses into nutritionally balanced feed, thereby adding value to agricultural produce and generating rural employment. Nagpur district of Maharashtra, located in the Vidarbha region, has emerged as an important centre for the animal feed industry due to its strategic location, transport connectivity, availability of raw materials and rising livestock population.

The profitability of animal feed manufacturing depends on the expenditure incurred on raw materials, labour, electricity, packaging, transportation and fixed investment, along with the returns obtained from the sale of cattle feed and concentrate feed. Hence, analysis of establishment cost, cost and returns, and marketing channels is essential for assessing the economic performance and business viability of feed manufacturing units. The present study was therefore undertaken to analyse the business performance of selected animal feed manufacturing units in Nagpur district of Maharashtra. The study covers selected units engaged in the production of cattle feed and concentrate feed and analyses their establishment cost, operational costs, returns, profitability and marketing channels. It also evaluates the utilization of machinery, labour, raw materials and production capacity to assess the operational efficiency and overall business viability of the selected animal feed manufacturing units.

Methodology

Area of Study

The study was conducted in Nagpur district of Maharashtra. Nagpur district was purposively selected because of the presence of several organized animal feed manufacturing units catering to livestock farmers in the Vidarbha region. Animal feed is manufactured in

Different categories. For the present study, the following concentrated feed products were selected:

1. Cattle Dry Feed
2. Cattle Mineral Mixture
3. Calf Feed

Analytical Tools

The data collected from the selected manufacturing units were analyzed using suitable descriptive statistical and financial analytical tools. The profitability of feed production was estimated using establishment cost, fixed cost, variable cost, total cost, gross returns, net returns, Benefit-Cost Ratio, Break-Even Point, Margin of Safety, marketing cost, marketing margin.

Establishment Cost: To achieve the first objective, information regarding the initial investment made by the owner of the selected animal feed manufacturing unit was collected. The establishment cost included the cost of land, factory building, plant and machinery, installation of machinery, electrical installation, furniture and office equipment, laboratory equipment, licensing and registration charges, preliminary expenses, and working capital.

Fixed cost: It includes data on the cost of machinery, building, furniture, wages of permanent employee, Labor license, insurance and taxes. The data was collected specially from each millon the above item.

Variable cost: Variable cost consists of expenditure on purchase of raw material waged of casual labour oil and lubricants energy charges repair maintenance of machine, packing cost and invest on working capital.

Total cost: Total cost of processing composed of the total fixed cost and total variable cost and was calculated by adding these costs together.

Total cost = Fixed cost + Variable cost

Gross Returns: The gross returns was defined as the total rate of returns on an investment before the deduction of any expenses.

Gross Return = Quantity of the product * price per unit

Net Returns: Net returns refers to returns after deducting all expenses from the gross returns generated by the investment.

Net return = Gross return -Total cost

Benefit-Cost Ratio: The benefit cost ratio compares the present value of all benefit with that of the cost and investment of the project.

B: C ratio = $\text{Gross return} / \text{Total cost}$

Break-Even Point: Break-Even Point shows the minimum size of volume to recover total cost required for processing in a year.

$$BEP = \frac{FC}{SP - VC}$$

Where, FC= Fixed cost, SP= Selling cost, VC= Variable cost. **Margin of safety:** Margin of safety indicates the extent to which output can decline before the enterprise reaches the

break-even point. A higher margin of safety indicates lower business risk.

MOS = Total Output - Output at BEP

MOS (%)= $MOS / \text{Total Output} \times 100$

Marketing channel of the product

Sr.No.	Channel Type	Marketing Channel Structure
1	Channel I	Producer → Wholesaler → Retailer → Dairy Farmer / Consumer
2	Channel II	Producer → Dairy Farmer

Marketing Cost

Marketing cost refers to the total expenditure incurred by the manufacturer and intermediaries in moving the feed products from the production unit to the final consumer.

Marketing Margin

Marketing margin refers to the difference between the selling price and the purchase price of intermediaries in the marketing channel.

Marketing Margin = Selling Price - (Purchase Price + Marketing Cost)

Results and Discussion

Establishment cost of selected units

The establishment cost represents the initial investment required for setting up an animal feed manufacturing unit, including expenditure on land, buildings, machinery, vehicles and other assets. The establishment cost of the selected units was analysed to understand their investment pattern and capital requirements, and the results are presented in Table 1.

Table 1: Establishment cost of selected animal feed units (₹ in lakh)

Particulars	Unit 1	Unit 2	Unit 3
Land & site development	30.00 (8.33)	50.00 (32.26)	40.00 (33.60)
Building & civil construction	130.00 (36.11)	18.00 (11.61)	60.00 (50.40)
Machinery	115.00 (31.94)	35.00 (22.58)	8.25 (6.93)
Vehicles & other assets	85.00 (23.61)	52.00 (33.55)	10.80 (9.07)
Total establishment cost	360.00 (100.00)	155.00 (100.00)	119.05 (100.00)

(Figures in parentheses indicate percentage share.)

The total establishment cost was highest for Unit 1 (₹360.00 lakh), followed by Unit 2 (₹155.00 lakh) and Unit 3 (₹119.05 lakh), reflecting wide variation in the scale of investment among the selected units. In Unit 1, building and civil construction (₹130.00 lakh) and machinery (₹115.00 lakh) together accounted for the major share of investment, indicating a larger, more capital-intensive setup. In Unit 2, land and site development (₹50.00 lakh) and vehicles (₹52.00 lakh) formed the largest components, while in Unit 3, building and civil construction (₹60.00 lakh) alone accounted for over half of the total establishment cost. The variation across units suggests that older and larger-scale units (Unit 1) invested more heavily in permanent

infrastructure and machinery, whereas newer and smaller units (Units 2 and 3) operated with comparatively leaner fixed-asset bases.

Fixed cost per annum of selected units

Table 2: Fixed cost per annum of selected animal feed units (₹ in lakh)

Particulars	Unit 1	Unit 2	Unit 3
Depreciation on Building @5%	6.50 (8.67)	0.90 (3.06)	3.00 (12.57)
Depreciation on Machinery @10%	9.50 (12.67)	4.55 (15.45)	1.45 (6.06)
Depreciation on Furniture @10%	0.50 (0.67)	0.15 (0.51)	0.10 (0.40)
Depreciation on Appliances & Fixtures @10%	1.50 (2.00)	0.28 (0.93)	0.20 (0.84)
Depreciation on Vehicles @10%	3.00 (4.00)	3.50 (11.88)	0.08 (0.31)
Interest on Fixed Capital @12%	39.60 (52.80)	12.33 (41.86)	14.29 (59.87)
Principal annual cost	14.40 (19.20)	7.75 (26.31)	4.76 (19.95)
Total annual fixed cost	75.00 (100)	29.46 (100)	23.86 (100)

(Figures in parentheses indicate percentage share.)

The total annual fixed cost was highest in Unit 1 (₹75.00 lakh), followed by Unit 2 (₹29.46 lakh) and Unit 3 (₹23.86 lakh), in line with their respective scales of establishment cost. Interest on fixed capital (12%) formed the single largest component of fixed cost across all units, accounting for 52.80 per cent in Unit 1, 41.86 per cent in Unit 2 and 59.87 per cent in Unit 3, reflecting the dominant influence of capital investment on annual fixed expenditure. Depreciation on machinery was the next major contributor in Unit 1 (12.67%) and Unit 2 (15.45%), while depreciation on building was relatively more significant in Unit 3 (12.57%) given its higher share of investment in civil construction. Overall, the fixed cost structure closely mirrors the composition of establishment cost, with capital-intensive components dominating annual fixed expenditure in all three units.

Variable cost per annum of selected units

Table 3: Variable cost per annum of selected animal feed units (₹ in lakh)

Particulars	Unit 1	Unit 2	Unit 3
Raw Material Cost	2091.00 (82.38)	1173.20 (86.13)	355.68 (83.82)
Labour Cost	48.48 (1.91)	14.50 (1.06)	11.70 (2.75)
Electricity Cost	34.80 (1.37)	25.50 (1.87)	5.40 (1.27)
Water Charges	0.96 (0.03)	3.20 (0.23)	0.60 (0.14)
Packaging Cost	33.96 (1.33)	10.25 (0.75)	5.62 (1.32)
Transportation Cost	88.08 (3.47)	9.50 (0.69)	6.00 (1.41)
Repair & Maintenance	10.00 (0.39)	1.80 (0.13)	0.74 (0.17)
Working Capital Interest @10%	230.72 (9.09)	124.03 (9.10)	38.57 (9.09)
Total annual variable cost	2538.00 (100)	1361.97 (100)	424.31 (100)

(Figures in parentheses indicate percentage share.)

The total annual variable cost was highest in Unit 1 (₹2,538.00 lakh), followed by Unit 2 (₹1,361.97 lakh) and Unit 3 (₹424.31 lakh), corresponding to the differences in production scale among the units. Raw material cost was overwhelmingly the largest component of variable cost in all three units, accounting for 82.38 per cent in Unit 1, 86.13 per cent in Unit 2 and 83.82 per cent in Unit 3, confirming that procurement of raw materials is the most critical recurring expenditure in animal feed manufacturing. Interest on working capital (10%) was the second major component, contributing a fairly uniform 9.09 to 9.10 per cent of variable cost across all units. This cost structure highlights that controlling raw material procurement costs is central to improving the profitability of feed manufacturing enterprises.

Total cost per annum of selected units

Table 4: Total cost per annum of selected animal feed units (₹ in lakh)

Particulars	Unit 1	Unit 2	Unit 3
Total annual fixed cost	75.00 (2.87)	29.46 (2.08)	23.86 (5.13)
Total annual variable cost	2538.00 (97.12)	1361.97 (97.84)	424.31 (94.71)
Total annual cost	2613.00 (100)	1391.43 (100)	448.17 (100)

(Figures in parentheses indicate percentage share.)

The total annual cost was highest in Unit 1 (₹2,613.00 lakh), followed by Unit 2 (₹1,391.43 lakh) and Unit 3 (₹448.17 lakh), reflecting differences in the scale of production and operational capacity among the units. Variable cost accounted for the overwhelming share of total cost in all three units 97.12 per cent in Unit 1, 97.84 per cent in Unit 2 and 94.71 per cent in Unit 3 while fixed cost contributed only a marginal share. This indicates that profitability of animal feed manufacturing units is influenced far more by recurring operational expenses, particularly raw material procurement, than by fixed investment-related costs.

Raw material used for production

Table 5: Raw material used for production by the selected units

Particulars	Unit 1	Unit 2	Unit 3
Raw materials	Maize, Groundnut (DOC), Rice bran (DOC), Molasses, Mixed Minerals, Sorghum, Pearl Millet, Wheat Bran, Salt	Cotton seed	Maize, Wheat bran

The raw materials used varied considerably across the selected units, reflecting differences in product range and scale of operation. Unit 1 used the widest range of ingredients, consistent with its larger, more diversified cattle feed production. Unit 2 relied mainly on cotton seed, in line with its dual output of cattle feed and oil, while Unit 3 used a comparatively simple raw material base of maize and wheat bran. This variation indicates that larger units formulate more nutritionally balanced, multi-ingredient feed, while smaller units operate with a narrower, more localized raw material base.

Gross returns of cattle feed

Table 6: Gross returns of cattle feed from selected animal feed units (₹ in lakh)

Particulars	Unit 1	Unit 2	Unit 3
Annual weight of cattle feed (MT)	8500	2849	1872
Gross return from main product	2890.00	1025.60	505.44
Gross return from by-product (oil)		485.75	
Total gross return	2890.00	1510.80	505.44

Unit 1 produced the highest quantity of cattle feed (8,500 MT) and earned the highest gross return of ₹2,890.00 lakh, entirely from the main product. Unit 2 produced a comparatively smaller quantity (2,849 MT) but its total gross return rose to ₹1,510.80 lakh the second highest overall due to an additional ₹485.75 lakh earned from 335 MT of oil as a by-product. Unit 3 recorded the lowest output (1,872 MT) and gross return (₹505.44 lakh). The results indicate that by-product utilization can be an important additional source of revenue in feed manufacturing.

Net returns and Benefit-Cost ratio

Table 7: Net returns per annum of selected units (₹ in lakh)

Particulars	Unit 1	Unit 2	Unit 3
Total annual gross return	2890.00	1510.75	505.24
Total annual cost	2613.10	1395.43	448.46
Net return	276.90	115.32	56.78
B:C Ratio	1.11	1.08	1.13

Unit 1 earned the highest annual gross return (₹2,890.00 lakh) and, after deducting its total annual cost, recorded the highest net return of ₹276.90 lakh. Unit 2 recorded a net return of ₹115.32 lakh, while Unit 3 recorded the lowest net return (₹56.78 lakh) but the highest B:C ratio (1.13), indicating that Unit 3, despite the lowest absolute profit, achieved better returns per rupee invested, whereas Unit 1's higher profit was primarily driven by its larger scale of production rather than superior efficiency.

Break-even point and margin of safety

Table 8: Break-even point and margin of safety of selected units

Particulars	Unit 1	Unit 2	Unit 3
Break-even point (₹ lakh/year)	615.77	299.10	148.96
Break-even point (MT/year)	1811.10	564.05	551.92
Margin of safety (₹ lakh/year)	2274.23	1211.65	356.98
Margin of safety (MT/year)	6688.90	2284.95	1320.86
Margin of safety (%)	78.69	80.20	70.56

The break-even point (BEP) was estimated at ₹615.77 lakh per year (1,811.10 MT) for Unit 1, ₹299.10 lakh per year (564.05 MT) for Unit 2 and ₹148.96 lakh per year (551.92 MT) for Unit 3. The margin of safety was ₹2,274.23 lakh (6,688.90 MT) for Unit 1, ₹1,211.65 lakh (2,284.95 MT) for Unit 2 and ₹356.98 lakh (1,320.86 MT) for Unit 3, with Unit 1 recording the highest absolute margin of safety due to

its larger scale of operation. In percentage terms, Unit 2 recorded the highest margin of safety (80.20%), followed by Unit 1 (78.69%) and Unit 3 (70.56%), indicating that Unit 2 had the highest relative safety cushion against a decline in sales.

Marketing channels of the product

Table 9: Marketing channels of the selected animal feed units

Channel Type	Marketing Channel Structure
Channel I	Producer → Wholesaler → Retailer → Dairy Farmer / Consumer
Channel II	Producer → Dairy Farmer

Two marketing channels were identified in the study area. Channel I was an indirect channel in which feed moved from the producer to the wholesaler, then to the retailer, and finally to the dairy farmer or consumer. Channel II was a direct channel in which the producer sold feed directly to the dairy farmer without any intermediary involvement, offering greater price realization for the producer.

Channel I marketing cost and margin

Table 10: Channel I marketing cost and margin (₹/quintal)

Particulars	Unit 1	Unit 2	Unit 3
Price received by producer	3600	3800	2800
Total marketing cost of Wholesaler	90	95	75
Net profit margin of Wholesaler	110	105	25
Total Marketing Cost of Retailer	100	50	45
Marketing Margin of Retailer	300	250	155
Selling price to consumer	4200	4300	3100

The price received by producers under Channel I was ₹3,600, ₹3,800 and ₹2,800 per quintal for Units 1, 2 and 3, respectively. Wholesalers incurred marketing costs of ₹90, ₹95 and ₹75 per quintal and earned net profit margins of ₹110, ₹105 and ₹25 per quintal. Retailers incurred further marketing costs of ₹100, ₹50 and ₹45 per quintal and earned margins of ₹300, ₹250 and ₹155 per quintal, consistently higher than wholesaler margins. The final price paid by the consumer was ₹4,200, ₹4,300 and ₹3,100 per quintal, with transportation, storage and handling forming the major components of marketing cost.

Price spread Channel I

Table 11: Price spread of Channel I (₹/quintal)

Particulars	Unit 1	Unit 2	Unit 3
Net price received by producer	3600	3800	2800
Total marketing cost	190	145	120
Total marketing margin	410	355	180
Purchase price paid by consumer	4200	4300	3100
Producer's share in consumer rupee (%)	85.71	88.37	90.32

The total price spread under Channel I was ₹600 per quintal in Unit 1, ₹500 in Unit 2 and ₹300 in Unit 3. The producer's share in the consumer's rupee was 85.71 per cent in Unit 1, 88.37 per cent in Unit 2 and 90.32 per cent in Unit 3, with Unit 1 experiencing the greatest erosion of producer returns due to intermediary costs and margins.

Channel II marketing cost and margin

Table 12: Channel II marketing cost and margin (₹/quintal)

Particulars	Unit 1	Unit 2	Unit 3
Price received by producer	4150	4100	3000
Total marketing cost	85	75	65
Net realization after marketing cost	4065	4025	2935

Under Channel II, the direct marketing route, the price received by the producer was ₹4,150, ₹4,100 and ₹3,000 per quintal for Units 1, 2 and 3 notably higher than the corresponding producer prices under Channel I. Producers incurred marketing costs of ₹85, ₹75 and ₹65 per quintal, mainly on transportation, loading and unloading. Since no wholesaler or retailer was involved, there were no intermediary margins, resulting in higher net realization for the producer.

Price spread Channel II

Table 13: Price Spread Of Channel Ii (₹/Quintal)

Particulars	Unit 1	Unit 2	Unit 3
Net price received by producer	4075	4025	2935
Total marketing cost	75	75	65
Purchase price paid by consumer	4150	4100	3000
Producer's share in consumer rupee (%)	98.17	98.17	97.83

The producer's share in the consumer's rupee under Channel II was substantially higher than under Channel I, at 98.17 per cent in both Unit 1 and Unit 2, and 97.83 per cent in Unit 3. This confirms that the direct marketing channel allows producers to retain a much larger proportion of the final price, as the absence of intermediaries eliminates additional marketing margins and reduces the overall price spread.

Conclusion

The study concludes that animal feed manufacturing is an economically viable business activity in Nagpur district, with all three selected units recording positive net returns and B:C ratios above one. Establishment cost and scale of investment varied substantially across units, with Unit 1 requiring the highest investment yet Unit 3 achieving the best cost efficiency (B:C ratio of 1.13). Raw material procurement emerged as the most critical cost factor, underscoring the need for efficient sourcing, timely purchase and proper storage to control production costs and improve profitability. The marketing system relies mainly on wholesalers and retailers, whose margins widen the price gap between producer and consumer, indicating scope for strengthening direct marketing channels to improve producer returns. Overall, the selected units show good business potential, but their long-term profitability and competitiveness will depend on better raw material management, cost control, and stronger marketing and distribution strategies.

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