



# Financial Viability and Production Efficiency of Piggery Enterprises in Bengaluru, Karnataka, India: A Comprehensive Study

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The present study conducted in Bengaluru, covering Bengaluru urban and rural districts, examined the structure of piggery farms, costs and returns and production efficiency of piggery enterprises. The primary data were collected from 35 piggery farmers, 30 retailers, 10 traders, 5 processors, and 120 consumers. Financial analysis of pig farming in Bengaluru, focusing on a pig fattening and piggery breeding farms. The pig fattening farm, with a 40 average herd size, incurred a total cost of Rs. 5,93,096 /- over 8 months, yielding gross returns of Rs. 7,27,052 /- and net returns of

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Rs.1,33,955 /-. The financial assessment indicates positive outcomes with a NPW of Rs. 54,981 /- at 12 per cent discount rate, a BCR of 1.23, and an IRR of 14.60 per cent. Similarly, the piggery breeder's farm, with a herd size of 10 sows and 1 boar, annually demonstrates favourable financial feasibility, generating a net profit of Rs. 2,36,790 /-, NPW of Rs. 1,10,007 /- at 12 per cent discount rate, BCR of 1.31 and an IRR of 17.43 per cent. The production efficiency analyses for both piggery fattening and piggery breeding farms demonstrate positive impacts on efficiency, with significant coefficients for feed, labour, and veterinary care.

*Keywords: Financial viability; production efficiency; piggery enterprises; livestock.*

## 1. INTRODUCTION

Livestock serves as an indispensable component of the agricultural landscape in India, contributing significantly to the growth and development of the agricultural sector. Its multifaceted impact encompasses several vital aspects. Livestock plays a pivotal role in enhancing food and nutritional security by providing nutrient-rich food products. Simultaneously, it acts as a critical source of employment and income, offering a buffer against the adverse effects of crop failures. Furthermore, livestock supplies essential draft power and valuable manure for crop production activities, making it an integral part of the agricultural value chain.

Pork is the most consumed meat globally. However, in India, the consumption of pork is limited to few regions of the country. In India, as per 20<sup>th</sup> Livestock Census, the total Pig population is 9.06 million. Pigs stand out in terms of their potential to provide rapid economic returns to farmers due to inherent traits such as high fecundity, efficient feed conversion, early maturity, and a short generation interval (Thomas et al. 2021). Notably, pig farming demands relatively modest investments in infrastructure and equipment. This sector holds immense promise for ensuring both nutritional and economic security for vulnerable sections of society (Akriti et al. 2023).

As per the 20<sup>th</sup> Livestock Census, the distribution of the pig population across districts in Karnataka highlights Kalaburagi district with the highest percentage share at 13.66 per cent, followed by Bengaluru Urban (8.66%), Belagavi (6.73%), Bidar (6.43%), Yadgir (6.33%), Bagalkot (6.32%), Vijayapura (6.01%), and Raichur (5.06%). The remaining districts collectively contribute less than 5 per cent each to the state's total pig population. Notably, Uttara Kannada district holds the lowest position with only 0.37 per cent of the state's pig population. This distribution pattern underscores varying concentrations of

pig farming activities across Karnataka's districts, with certain regions holding considerably larger shares compared to others.

Pig farming in India has undergone a significant transformation in recent years. In the past, it was associated with a lower social status and was primarily undertaken by socially disadvantaged communities. However, perceptions have evolved, and commercial pig farming (Majunder et al. 2020) is no longer limited to lower-income groups. People now recognize the economic value of pig farming, making it a viable enterprise. The present study undertaken to assess financial feasibility and production of piggery enterprise.

## 2. METHODOLOGY

The study was carried out using multi-stage random sampling technique, to draw the samples from the study area. The first stage, constituted with selection of villages from Bangalore Rural district and Bengaluru Urban district. Further, in the second stage, list of piggery farms in the selected region were prepared with the help of local farmers and veterinarians of the district. Total sample size of 35 pig farmers i.e., 5 pig breeders and 30 pig fattening farmers were selected randomly for the study. Different marketing channels for the disposal of piglets, live animals and pork were examined by selecting a sample of size of 10 traders, 5 processors, 30 retailers and 120 consumers from the study area. The collected data pertained to the 2022-23.

### 2.1 Analytical Tools and Techniques

#### 2.1.1 Discounted cash flow analysis

An appraisal of investments was made by using discounted cash flow techniques. This technique is based on the time value of money principle, which states that a rupee today is worth more than the same rupee in the future due to its

earning potential. It is a process of finding the present worth of an amount received or paid in the future.

Discounted cash flow is a valuation method used to estimate the attractiveness of an investment opportunity. It discounts future cash flows using a required annual rate, to arrive at present value estimates.

### 2.1.2 Net Present Worth (NPW)

The discounted value of net cash flows to the project represents the net present worth. A discount rate of 12 per cent was used in the present study to discount the net cash flows representing the opportunity cost of capital. It may be represented by

$$NPW = \sum_{t=0}^n \frac{B_t - C_t}{(1+i)^t}$$

where,

- B<sub>t</sub>= Gross returns in year 't'
- C<sub>t</sub>= Cost in year 't'
- n= Economic life of the investment
- i= Discount rate

### 2.1.3 Benefit-Cost Ratio (BCR)

By discounting the net returns, the benefit-cost ratio was worked out with the help of the expected life of investment at a discount rate of

12 per cent. If a project has a BCR greater than one, it indicates that the NPW of the benefits exceeds the NPW of the costs. Therefore, the project can be considered viable if the value is significantly greater than one.

$$BCR = \frac{\sum_{t=0}^n B_t}{\sum_{t=0}^n C_t}$$

where,

- B<sub>t</sub>= Gross returns in year 't'
- C<sub>t</sub>= Cost in year 't'
- n= Economic life of the investment
- i= Discount rate

### 2.1.4 Internal Rate of Return (IRR)

IRR represents the discount rate at which the NPW of cash flows is equal to zero. It represents the average earning power of money used in the project over its economic life. This an alternative way of using discounted cash flow for measuring the worth of a project. It is a trial and error method that involves calculating one discount rate with positive net worth through another discount rate with negative net worth by interpolation method. Interpolation is a simple method of determining the intermediate value between two discount rates and the method of interpolation followed is as follows.

$$IRR = \text{Lower discount rate} + \frac{\text{Difference between the two discount rates}}{\left( \frac{\text{Present worth of cash flows at lower discount rate}}{\text{Absolute difference between present worth of cash flows at two discount rates}} \right)}$$

### 2.1.5 Cobb-Douglas production function

The Cobb-Douglas type of production function was used to study the effect of various inputs on major output. The production function analysis aimed to identify the factors contributing to efficiency in pig rearing. The estimated regression coefficients represented the production elasticities.

The form of Cobb-Douglas production function used in the present study is as follows.

$$Y = a X_1^{\beta_1} X_2^{\beta_2} X_3^{\beta_3} e^u$$

where,

- Y = Returns (Rs. per pig farm)
- a = Intercept
- X<sub>1</sub>= Feed cost (Rs. per pig farm)
- X<sub>2</sub> = Labour cost (Rs. per pig farm)

$X_3$  = Veterinary expenses (Rs. per pig farm)  
 $e^u$  = Random error term  
 $\beta$ 's = Output elasticities of respective factor inputs;  $i=1-3$ .

In terms of labor management, the sample pig farmers predominantly relied on family labor, supplemented by hired labor at a rate of 20.58 per cent. To assess the cost of labor, family labor contributions were imputed based on prevailing wage rates, providing a comprehensive understanding of the labor-related expenses incurred during pig rearing.

### 3. RESULTS AND DISCUSSION

#### 3.1 Financial Viability of Piggery Enterprise

##### 3.1.1 Cost and returns of pig rearing

The cost and returns structure associated with pig rearing for an eight-month batch period presented in Table 1. In line with our earlier discussion, the calculations are based on an average herd size of 40 pigs among the sampled farmers.

The annual total cost for maintaining a herd of 40 pigs was estimated at Rs. 5,93,096.53/-. Variable costs constituted the majority, making up 98.81 per cent, while fixed costs accounted for the remaining 1.19 per cent. Within the category of variable costs, the cost of piglets emerges as the primary expenditure, accounting for 37.98 per cent of the total variable cost. This is followed by feed costs at 33.44 per cent (Nagaraj et al. 2011), labor at 20.85 per cent, and interest on working capital at 6.55 per cent.

The other variable costs of pig rearing included expenses incurred towards veterinary care, water charges, and electricity charges. The main source of water for the sample pig farmers was their own farm (borewell) as well as open access resources (ponds and small temporary waterholes), and common property resources (water troughs constructed by gram panchayath). The water charges were imputed based on the prevailing market prices and accordingly, the cost was determined.

Fixed costs, constituting 1.19 per cent of the total, include depreciation on the shed (71.53%), depreciation on equipment (17.76%), and interest on fixed capital (10.71%). The distribution of fixed costs highlights the need for ongoing investment in infrastructure and equipment, which contribute to the overall stability and efficiency of pig rearing operations.

**Table 1. Cost and returns of pig fattening farm (n=30)**

Sl. No.	Particulars	Amount (Rs.) per 8 months	Percentage
1.	<b>Variable costs</b>		
	a. Feed	1,95,960.00	33.44
	b. Labour	122048.00	20.85
	c. Electricity charges	238.35	0.04
	d. Veterinary care	2,398.60	0.04
	e. Cost of piglet	2,22,400.00	37.98
	f. Water charges	4,676.20	0.80
	h. Interest on working capital @ 7%	38,340.48	6.55
	<b>Sub-total</b>	<b>5,86,061.63</b>	<b>100.00</b>
2.	<b>Fixed costs</b>		
	a. Depreciation on shed	5,023.68	71.53
	b. Depreciation on equipment	1,248.56	17.76
	c. Interest on fixed capital @ 12%	752.66	10.71
	<b>Sub-total</b>	<b>7,024.90</b>	<b>100.00</b>
	<b>Total cost</b>	<b>5,93,096.53</b>	
3.	<b>Returns</b>		
	a. Sale of pigs	609806.25	83.072
	b. Sale of dressed pig	105000	14.45
	c. Sale of manure	12,246.00	1.68
	<b>Gross returns</b>	<b>7,27,052.25</b>	<b>100</b>
	<b>Net returns</b>	<b>1,33,955.72</b>	

Note: Average herd size of 40

### 3.1.2 Returns from pig rearing

The returns from pig rearing are presented as gross and net returns. The gross returns amount to Rs. 7,27,052.25, encompassing revenue from the sale of pigs, dressed pigs, and manure. After deducting the total cost, the net returns are calculated to be Rs. 1,33,955.72. This figure represents the profit generated from the pig rearing enterprise.

The high proportion of variable costs, particularly the cost of piglets and feed, underscores the importance of efficient management and cost-effective sourcing of inputs. The reliance on family labor, supplemented by hired labor, reflects the prevalent labor structure in the sample pig rearing operations.

The net returns of Rs. 1,33,955.72 indicate the potential profitability of pig farming. Farmers should be encouraged to explore strategies for optimizing variable costs while maintaining the quality of care provided to the pigs.

## 3.2 Financial Viability of Piggery Enterprise

The financial viability of piggery fattening farm is presented in Table 2. To arrive this, various discounted cash flow metrics such as Net Present Worth, Benefit-Cost Ratio, and Internal Rate of Return were computed. The net cash flows underwent a discounting process at a rate of 12 per cent, aligning with the prevailing bank interest rate in the study area, which signifies the opportunity cost of capital. These discounted values reflect the present worth of income, providing a more realistic perspective compared to nominal values. The financial feasibility of investing in pig rearing was appraised by considering a six-year economic lifespan for the pig rearing unit. Table 2 presents an overview of the financial viability of pig rearing based on these evaluations.

### 3.2.1 Net Present Worth (NPW)

The positive Net Present Worth (NPW) of Rs. 54,981.48 at a 12 per cent discount rate suggests that the present value of net cash flows from rearing a herd size of 40 pigs is favorable. This positive NPW indicates that the investment in goat rearing is financially viable.

### 3.2.2 Benefit-Cost Ratio (BCR)

The BCR of 1.23 indicates the financial viability of investing in pig rearing. Each rupee invested in

pig rearing resulted in benefits amounting to Rs. 1.23. Adentunji and Adeyemo (2012) in their study revealed a noteworthy benefit-cost ratio of 2.82. Anamayi et al. (2009) conducted a comprehensive analysis of returns on investment, employing measures such as Benefit-Cost Ratio (BCR) and Internal Rate of Return (IRR).

### 3.2.3 Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) serves as the rate at which discounted benefits match discounted costs, essentially making the Net Present Value (NPV) zero. With a determined IRR of 14.60 percent, surpassing the opportunity cost of capital set at 12 percent, it signifies the financial viability of the pig-rearing enterprise in the study area. Consequently, the acceptance of the null hypothesis confirms that "pig rearing is a profitable enterprise".

Similar findings were recorded in the study conducted by Raja et al. (2022) in the North-eastern zone of Tamil Nadu aimed to assess the cost and returns of pig farming based on a sample of 45 swine farms. Findings revealed that larger farms exhibited lower production costs and higher net returns, indicating profitability in pig rearing. The benefit-cost ratio of 1.46 affirmed the economic viability of swine farms in the region.

## 3.3 Financial Viability of Piggery Breeding Farm

The financial viability of a piggery breeders farm is crucial for assessing the profitability and sustainability of the enterprise (Prasad et al. 2011). The Table 3 outlines the annual costs and returns associated with maintaining a piggery, allowing for a comprehensive analysis of the financial landscape.

### 3.3.1 Variable costs

The variable costs dominate the expenditure landscape, constituting 98.81 per cent of the total cost. Among these, the cost of feed for adults emerges as the primary expense, representing 49.27 per cent of the variable costs (Ogunniyi et al. 2011). This is followed by significant contributions from labor charges (40.48%) and interest on working capital (6.55%). The inclusion of veterinary care, water charges, and electricity charges completes the breakdown, highlighting the diverse elements contributing to variable costs.

**Table 2. Financial viability of piggery fattening farm (n=30)**

Sl. No.	Particulars	Figures
1.	Net Present Worth @ 12% (Rs.)	54,981.48
2.	Benefit-Cost Ratio	1.23
3.	Internal Rate of Return (%)	14.60

Note: Average herd size of 40

**Table 3. Cost and returns of piggery breeding farm (n=5)**

Sl. No.	Particulars	Amount (Rs.) per annum	Percentage
1.	Variable costs		
	a. Cost of feed for adults (96 quintal)	3,07,200.00	49.27
	b. Electricity charges	356.56	0.06
	c. Labour charges	2,52,000.00	40.48
	d. Veterinary care	17,860.00	2.87
	e. Water charges	5,280.00	0.85
	f. Interest on working capital @ 7%	40,788.47	6.55
	<b>Sub-total</b>	<b>6,23,481.03</b>	<b>100.00</b>
2.	Fixed costs		
	Interest on investment @ 12% per annum	1,17,840.00	79.57
	Depreciation on buildings @ 5% per annum	29,100.50	19.61
	Depreciation on equipments @ 10% per annum	1,248.50	0.84
	<b>Sub-total</b>	<b>1,48,189.00</b>	<b>100.00</b>
	<b>Total cost</b>	<b>7,71,670.03</b>	
3.	Returns		
	a. Sale of piglets	9,90,000.00	98.21
	c. Sale of manure	18,460.26	1.83
	<b>Gross returns</b>	<b>10,08,460.26</b>	<b>100.00</b>
	<b>Net returns</b>	<b>2,36,790.23</b>	

Note: Average herd size of 10 sow and 1 boar

The dominance of variable costs in the overall expenditure emphasizes the need for efficient management practices and cost-effective sourcing of inputs. The high percentage attributed to the cost of feed for adults underscores the importance of optimizing feeding strategies to enhance cost-effectiveness (Payeng et al. 2013).

The reliance on family labor, supplemented by hired labor, reflects the prevailing labor structure in piggery operations. The inclusion of interest on working capital underscores the financial dynamics associated with maintaining the necessary funds for day-to-day operations.

### 3.3.2 Fixed cost

Interest on investment at 12 per cent constitutes the majority at 79.57 per cent, emphasizing the long-term financial commitment. Depreciation on buildings and equipment is also factored in, underlining the ongoing investment required for infrastructure maintenance. The total fixed cost for the piggery breeders farm, encompassing

covered and open areas, as well as expenses for animals and equipment, amounts to Rs. 1,48,189.00. These costs are essential investments required for establishing and maintaining a successful piggery breeding operation. The allocation of resources for covered spaces, open areas, and necessary equipment is crucial for providing a suitable environment for breeding and ensuring the well-being of the animals. Additionally, the expenses associated with acquiring adult animals contribute to the overall fixed cost, emphasizing the comprehensive nature of the financial commitment involved in initiating and sustaining a piggery breeding venture.

### 3.4 Financial Viability Analysis of Piggery Breeding Farm

The financial viability of the piggery breeders farm presented in Table 4, is further assessed through discounted cash flow metrics such as Net Present Worth, Benefit-Cost Ratio, and Internal Rate of Return. With a six-year economic lifespan considered for the piggery unit, these

evaluations aim to provide a more realistic perspective on the long-term profitability and sustainability of the investment.

### 3.4.1 Net Present Worth (NPW)

The positive Net Present Worth of Rs. 1,10,007.84 at a 12 per cent discount rate indicates that the present value of net cash flows from operating a piggery breeders farm with a herd size of 10 sow and 1 boar is highly favorable. This suggests that the investment in piggery breeding is financially viable.

### 3.4.2 Benefit-Cost Ratio (BCR)

The Benefit-Cost Ratio of 1.31 implies that for every rupee invested in the piggery breeders farm, the returns amount to Rs. 1.31. This indicates a positive financial outcome, further supporting the viability of the investment. Akriti et al. (2023), in their study, focused on pig entrepreneurs from the Pashu-Vigyan Incubator who underwent the Piggery Entrepreneurship Development Program at Agri-Business Incubator IVRI, highlights the significant potential of non-ruminant livestock farming, particularly piggery, in addressing youth unemployment and fostering self-reliance. The average profit from piggery enterprises recorded was Rs. 5,24,382, demonstrating a Benefit-Cost Ratio of 1.33. These findings underscore the positive impact of piggery farming on income generation and self-reliance among entrepreneurs. Ezeibe (2010) demonstrated through his results that within a single production year of swine farming, the estimated Benefit-Cost Ratio (BCR) stood at 1.30.

### 3.4.3 Internal Rate of Return (IRR)

The Internal Rate of Return is a crucial metric for evaluating the profitability of an investment. With an IRR of 17.43 per cent, surpassing the opportunity cost of capital set at 12 per cent, it signifies a strong financial viability for the piggery breeders farm. The IRR indicates that the discounted benefits from the operation of the farm match the discounted costs, making the Net Present Value zero. The acceptance of the null hypothesis confirms that "piggery breeding with a herd size of 10 sow and 1 boar is a profitable enterprise."

The positive Net Present Worth, favorable Benefit-Cost Ratio, and a strong Internal Rate of Return collectively suggest that the financial feasibility of investing in a piggery breeders farm with the specified herd size is promising. The results of these financial metrics indicate that the investment is likely to generate positive returns, supporting the notion that piggery breeding with this herd size is a profitable and financially sound enterprise in the study area.

## 3.5 Production Efficiency of Piggery Fattening

The production efficiency of piggery fattening is presented in Table 5, where the coefficients of various resources used in the fattening process are presented. The coefficients of feed (0.76) (Devi et al. 2007) and labour (0.46) were found to be significant at five per cent and ten per cent significance levels, respectively. However, the coefficients of veterinary care were non-significant.

**Table 4. Financial feasibility of piggery breeders farm (n=5)**

Sl. No.	Particulars	Figures
1.	Net Present Worth @ 12% (Rs.)	1,10,007.84
2.	Benefit-Cost Ratio	1.31
3.	Internal Rate of Return (%)	17.43

*Note: Average herd size of 10 sow and 1 boar*

**Table 5. Production efficiency of piggery fattening farm (n=30)**

Sl. No.	Particulars	Parameters	Coefficients
1.	Intercept	A	0.84
2.	Feed	b <sub>1</sub> **	0.76
3.	Labour	b <sub>2</sub> *	0.46
4.	Veterinary care	b <sub>3</sub>	0.18
	R <sup>2</sup>		0.74
	Returns to scale		1.78

*Note: \* Significant at 10 per cent; \*\* Significant at 5 per cent*

The R<sup>2</sup> value for the piggery fattening model is 0.74, suggesting that the independent variables explain 74 per cent of the variation in the dependent variable. This indicates a relatively strong explanatory power of the model. The returns to scale for piggery fattening were found to be 1.78, implying increasing returns to scale. The non-significant coefficient for veterinary care in piggery fattening suggests that, in this specific context, it may not be a significant determinant of production efficiency.

The production efficiency of piggery fattening is influenced significantly by feed and labour, and the model has a strong explanatory power, as indicated by the relatively high R<sup>2</sup> value. The returns to scale value of 1.78 suggests that the piggery fattening process exhibits increasing returns to scale, indicating the potential for expanding production for higher overall efficiency. Raja et al. (2022) reported in the study conducted in the North-eastern zone of Tamil Nadu aimed to assess the production efficiency of pig farming based on a sample of 45 swine farms. Cobb-Douglas production function identified feed and veterinary care as significant factors positively influencing pork production.

#### 4. STUDY IMPLICATIONS

The study on the financial viability of piggery enterprises in Bengaluru reveals promising implications for agricultural diversification and economic development. It demonstrates that both pig fattening and breeding farms can yield positive financial returns, making pig farming an attractive investment opportunity. This finding is significant for policymakers, investors, and farmers alike, suggesting the potential for job creation, income generation, and nutritional enhancement through increased pork production. Moreover, the study highlights the need for sustainable practices and supportive policies to optimize productivity and ensure long-term profitability in pig farming ventures. By leveraging these insights, stakeholders can foster a more resilient agricultural sector in Bengaluru, enhancing food security and economic growth while promoting sustainable development.

#### 5. CONCLUSION

The study concludes that both pig fattening and piggery breeding farms in Bengaluru demonstrate favorable financial viability and production efficiency. The analysis of financial metrics such as NPW, BCR, and IRR indicates

that investing in these enterprises can yield positive returns, with IRRs surpassing the opportunity cost of capital. Moreover, the production efficiency analyses underscore the importance of feed management and labor utilization. These findings support the potential for pig farming to contribute positively to income generation and agricultural sustainability in the region.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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