

Economic Analysis of Broiler Farming: Feed Utilization, Profitability, and Production Constraints in Kanpur Dehat District

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Abstract:

Commercial broiler farming in Kanpur Dehat district was assessed to know the feed utilization efficiency, profit evaluation, resource use efficiency and major constraints in broiler production system under various farm size. Thirty farms were sampled and classified as small, medium and large farms and data were collected and analyzed by descriptive statistics, cost – return measures, correlation, regression, marginal value product – marginal factor cost ratio and constraint ranking. Results indicated that feed consumption was directly related to farm size, and feed conversion ratio was better on small farms at 1.65 compared to 1.60 on large farms. The best feed conversion ratio was achieved in the winter, while the summer showed a comparatively poor feed conversion ratio. Among the total production cost, feed was the major component, and the most significant factor on broiler output. Positive net returns were achieved on all farm categories with benefit–cost ratios increasing from 1.03 on small farms to 1.06 on large farms. The results of the regressions accounted for 91% of the variation in output and the estimates of the resources used showed potential for greater investment in feed, chicks, labour, and health care. Feed cost, chick cost, outbreaks of disease, fluctuations in market prices and medicine cost were the major limiting factors. Better feeding, disease control, technical assistance, low-cost inputs, and better market linkage are therefore crucial for improving profitability and the continued production of broilers in the district in the future.

Keywords: Broiler farming; Feed conversion ratio; Profitability; Resource-use efficiency; Production constraints

1. INTRODUCTION

Broiler production is one of the fastest expanding sectors of livestock because of its short production cycle, faster turnaround of capital and its growing significance in food security and rural livelihood. The growing demand of consumers for cheap animal protein has led to the development of commercial broiler farming, especially in developing countries where the production of broiler meat offers an income and employment generation for smallholders as well as commercial farmers. The poultry industry in India has seen tremendous development with the advancement of technology, genetic improvement, scientific feeding and organized production system making broiler farming a more profitable agricultural business. However, for the sustainability of economic viability, the production resources must be managed efficiently and productivity in the farm must be improved continuously (Gulati & Juneja, 2023; Yuvaraj et al., 2023).

Feed is the major production cost of all production factors and is a key determinant in the profitability of broiler production. Efficient feed utilization and balanced nutrition are necessary to ensure rapid growth, optimum body weight, reduced mortality and better feed conversion ratio (FCR), all of which have a direct impact on production efficiency. The use of commercial feeding standards and scientifically formulated rations has greatly improved broiler performance, optimizing nutrient utilization and reducing unnecessary feed costs (Leeson & Summers, 2009; Shakouri & Malekzadeh, 2016). Previous nutritional recommendations have also been based on the need for continual improvement of nutrient requirements to keep up with the genetic improvement in modern broiler stocks, and to support efficient feed conversion in commercial production (North & Bell, 1990; Applegate & Angel, 2014).

In broiler production, profitability is not only linked to biological performance but also to the efficient use of production factors and adequate financial management. Production cost, gross return, net return and benefit-cost ratio are the common economic indicators used to evaluate the economic sustainability of broiler enterprises. Research studies have

been carried out under various production systems, and it has been shown that good production practices such as improved feed efficiency, good farm management and optimum utilization of inputs are good for farm profitability (Balogun et al., 2023; Mukaila et al., 2023). Likewise, comparative studies among commercial broiler farms revealed that their profitability depends on management and production systems as well as scale of production, and economic evaluation is important to identify efficient production systems (Chahal et al., 2024; Khan et al., 2023).

The poultry industry has experienced significant expansion, but broiler farmers still face many production and economic constraints that affect enterprise performance. The rising costs of feed, the higher costs of chicks, disease outbreaks, fluctuations in market prices, an increase in the costs of veterinary care and a lack of technical knowledge are all factors that negatively affect production risk and profit margins. Small-scale producers are especially susceptible as they may have more limitations in implementing better management practices and dealing with fluctuating markets for inputs and outputs (Das et al., 2024). Hence, to ensure the sustainability of commercial broiler production, the enhancement of feed utilization efficiency along with overcoming the production constraints has become indispensable.

Though various research studies have been conducted on profitability and production performance in various regions, little empirical work has been done at the district level in Uttar Pradesh with respect to feed utilization, economic returns and production constraints, especially in Kanpur Dehat. These interrelated aspects need to be comprehensively evaluated to provide evidence at the local level to guide farmers, extension services and policy makers towards strategies to improve production efficiency and farm income.

The objectives of the present study were:

- To assess the efficiency of feed utilization and profitability of broiler farms in different types of farms in Kanpur Dehat district
- To know the important production constraints in broiler farming and their significance in improving the economic performance in broiler farming

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Kanpur Dehat district of Uttar Pradesh, which is one of the important agricultural districts, and commercial broiler farming has gained significant importance in the district due to growing demand for poultry meat and provision of marketing facilities. The district has a network of input suppliers, hatcheries, veterinary services and transportation which facilitate the production of poultry in the district. The district is an area where broiler farming is done at various production levels, and can be used to assess the feed utilization efficiency, profitability and constraints to production in farm categories. Geographical and production diversity of the district allowed a thorough evaluation of resource use and economic performance under the existing commercial farming practices.

2.2 Research Design

The study used an ex-post facto research design as the production and management practices of the broiler farmers had already taken place and were beyond the control of the investigator. The study aimed to analyze the current production system, feed management, cost structure and profitability in the natural farming system. Primary data were obtained through an interview schedule that was pre-tested and structured and was directly taken from broiler farmers during the production process. The study highlighted the economic aspects of broiler production, combining biological performance measures with financial results.

2.3 Sampling Procedure and Farm Categorization

The sampling was done by adopting a multistage sampling procedure. Kanpur Dehat district was purposively selected because of having the increasing commercial poultry sector. Broiler farms were identified with the help of local veterinary officials and poultry extension personnel. The commercial broiler farms were purposively sampled and categorized based on the number of broilers raised as small farms (n=10), medium (n=10) and large farms (n=10). This classification allowed the comparison of the production efficiency, feed utilization and profitability of the different

scales of operations and ensured good representation of commercial broiler enterprises. The number of sampled farms by production categories is shown in Table 1.

Table 1. Distribution of Sampled Broiler Farms

Farm category	Number of farms	Percentage (%)
Small	10	33.33
Medium	10	33.33
Large	10	33.33
Total	30	100.00

Equal representation of the various categories of farms allowed for fair comparisons of production performance and economic indicators among different levels of farm operation and reduced sampling bias.

2.4 Data Collection and Variables Considered

Primary information was gathered concerning feed utilization, flock performance, mortality, body weight, production costs, input utilization, output prices, and production constraints. Feed intake, feed conversion ratio (FCR), live weight gain, mortality rate, fixed cost, variable cost, gross return, net return and benefit-cost ratio were variables to be used in economic evaluation. Production constraints information was gathered using the farmers' perception of the severity of the various problems faced by broiler production by asking the farmers to rank the problems by order of most to least significant.

2.5 Economic Indicators and Feed Utilization Measures

Standard production parameters commonly used in commercial poultry operations were used for assessing the feed utilization efficiency. Feed intake was calculated as the amount of feed used by the flock in the production cycle. The main criterion for feed efficiency was Feed Conversion Ratio (FCR) and was calculated as:

$$FCR = \frac{\text{Total Feed Consumed (kg)}}{\text{Total Live Weight Produced (kg)}}$$

Lower FCR values indicate superior feed utilization efficiency.

The mortality rate was calculated as:

$$\text{Mortality Rate (\%)} = \frac{\text{Number of Birds Died}}{\text{Total Birds Placed}} \times 100$$

The average live weight gain per bird was estimated as:

$$\text{Average Live Weight Gain} = \frac{\text{Total Live Weight}}{\text{Number of Birds Sold}}$$

2.6 Cost and Profitability Analysis

Fixed cost, variable cost, gross return, net return and benefit-cost ratio were estimated to evaluate economic performance. Variable costs were the cost of chicks, feed, medicines, vaccines, labour, electricity, litter material and other operating expenses, while fixed costs included depreciation and other fixed investments. Gross return was calculated as the total revenue from broiler sales, and net return was net of the total production cost. The following equations were used for calculating the economic indicators:

$$\begin{aligned}\text{Gross Return} &= \text{Quantity Sold} \times \text{Selling Price} \\ \text{Net Return} &= \text{Gross Return} - \text{Total Cost} \\ \text{Benefit-Cost Ratio} &= \frac{\text{Gross Return}}{\text{Total Cost}}\end{aligned}$$

2.7 Statistical Analysis

Production and economic variables were summarized by descriptive statistical measures such as means, percentages, frequency, and standard deviation. Association between production inputs and broiler output was studied using Pearson's correlation analysis. Multiple regression analysis was used to identify the contribution of each of the production factors to profitability. The efficiency of resource use was measured by comparing the Marginal Value Product (MVP) and Marginal Factor Cost (MFC) and:

$$\text{Resource Use Efficiency} = \frac{\text{MVP}}{\text{MFC}}$$

3. RESULTS

3.1 Farm Characteristics and Broiler Production Performance

The study comprised 30 commercial broiler farms distributed equally across small, medium and large farm categories. The average flock size of small farms was 900 birds, medium farms 1,750 birds and large farms 3,533 birds. The total broiler population of the sampled farms was 61,830, with 57.14% of the broilers being raised on large farms. The average live weight at marketing was found to be increasing continuously in accordance with the size of the farm: 2.01 kg per bird in small farms, 2.14 kg in medium farms, and 2.27 kg in large farms. The average market weight of the overall population was 2.14 kg/bird. The mortality rate on small, medium and large farms was 4.10%, 4.40% and 4.90%, respectively, giving an overall mortality rate of 4.47%.

3.2 Feed Utilization Efficiency among Farm Categories

The feed consumption was 3.30 kg/bird on small farms, 3.45 kg/bird on medium farms and 3.60 kg/bird on large farms. But the larger the farm, the better the feed conversion. The average FCRs of large, medium and small farms were 1.60, 1.63 and 1.65, respectively. There was also a seasonal variation. The overall FCR was highest in summer (1.66), decreased to 1.63 in the rainy season and was most efficient in winter (1.60).

The major production and economic indicators for the three farm categories are given in Table 2. The findings indicate that large farms had higher market weights and better feed conversion ratios and relatively good financial performance.

Table 2. Production and Economic Performance of Broiler Farms by Farm Category

Indicator	Small farms	Medium farms	Large farms	Overall
Number of farms	10	10	10	30
Average flock size (birds)	900	1,750	3,533	2,061
Feed consumption (kg/bird)	3.30	3.45	3.60	3.45
Average FCR	1.65	1.63	1.60	1.63
Market weight (kg/bird)	2.01	2.14	2.27	2.14
Mortality rate (%)	4.10	4.40	4.90	4.47

Total cost per farm (₹)	189,000	371,875	769,239	443,371
Gross return per farm (₹)	193,950	387,672	803,757	461,793
Net return per bird (₹)	15.00	20.00	25.00	20.00
Benefit–cost ratio	1.03	1.05	1.06	1.05

3.3 Cost Structure of Broiler Farming

Fixed costs were about 6.97% while variable costs accounted for over 90% of the total production expenditure. In the total production cost, the highest cost was due to feed with an average of ₹138 per bird, which represents approximately 65.09% of the total production cost. The share of this increased from 62.86% on small farms to 67.29% on large farms. The average fixed cost was found to be ₹14,280 on small farms, ₹25,375 on medium sized farm and ₹52,040 on large farms.

3.4 Profitability Analysis

Net returns were positive for all farm types. The gross return per farm was found to be higher in medium (₹387,672) and large (₹803,757) farms as compared to small farms (₹193,950). Net return per bird was raised by ₹5 for all three types of farms. The benefit–cost ratios of 1.03, 1.05 and 1.06 were an indication of the economic viability of broiler farming and showed a progressive increase in profitability as the size of the farms increased.

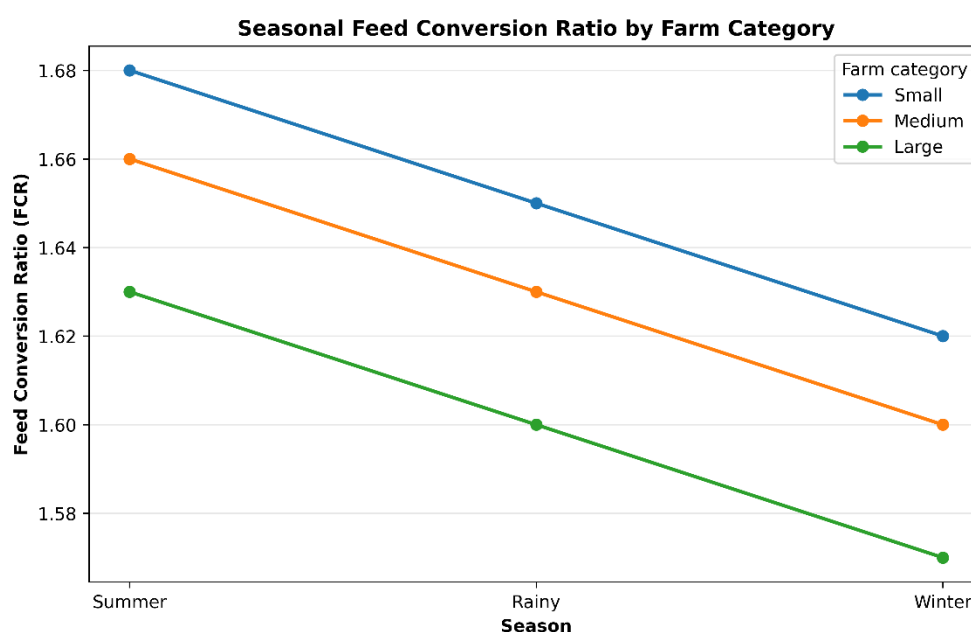


Figure 1. Seasonal variation in feed conversion ratio across small, medium, and large broiler farms.

Feed efficiency is seen to improve from summer to winter for all farm categories, as seen in Figure 1. The lowest FCR was observed on the large farms, and the best FCR in all seasons was observed during the winter season.

3.5 Relationship between Production Inputs and Broiler Output

The broiler output had the highest positive correlation with feed cost. $r_{0.916}$, while chick cost was the next highest $r_{0.842}$. An estimated production function was:

$$Y = 2.315 + 0.284X_1 + 0.512X_2 + 0.086X_3 + 0.041X_4 + 0.022X_5$$

This model accounted for 91% of the output variability. $R^2=0.91$. The largest regression coefficient was that for feed expenditure. The ratios of the MVPs to the MFCs were 1.58 for feed, 1.42 for chicks, 1.18 for labour, 1.09 for medical expenditure and 0.94 for miscellaneous expenses. The ratios > 1 suggested opportunities to invest more in feed, chicks, labour, and health management, while miscellaneous expenditure was near its economic optimum.

3.6 Major Production Constraints Faced by Broiler Farmers

The production constraint most commonly cited by farmers was high feed cost (92.59%). It was followed by high cost of the chick (88.89%), outbreaks of diseases (81.48%), fluctuation in market price (77.78%), high cost of medicine (70.37%), lack of technical knowledge (55.56%) and shortage of skilled labour (48.15%).

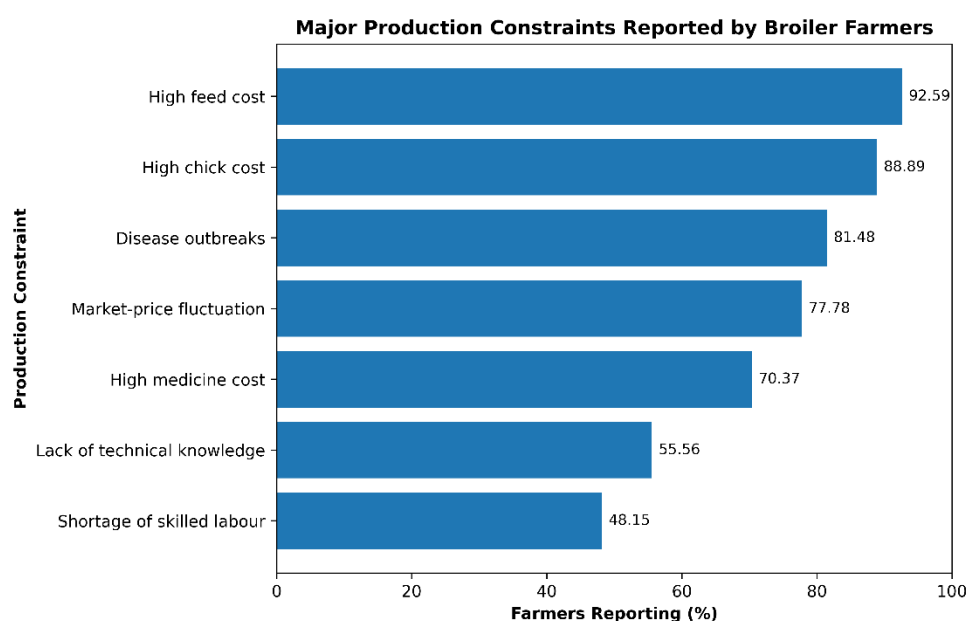


Figure 2. Major production constraints reported by broiler farmers in Kanpur Dehat district.

As shown in Figure 2, the pressures of input costs were greater than the constraints of technical and labour. Feed and chick prices were the dominant two factors, and disease incidence and volatile market prices impacted production stability and profitability.

4. DISCUSSION

The present study reveals that in commercial broiler production, feed utilization efficiency continues to be one of the most critical factors affecting productive and economic results. Farms with lower F.C.R. consistently had superior market weights and financial returns with a higher consumption of feed. This discovery suggests that the right use of nutrients is key, not just lower feed intake, in maximizing production efficiency. In commercial broiler production, a better feed conversion rate (FCR) has been linked to improved biological performance and economic viability (Khan et al., 2023; Zampiga et al., 2021). Moreover, recent developments in poultry nutrition indicate that precision feeding techniques, the use of enzymes in feeds, and the precise formulation of nutrients can significantly enhance feed efficiency by optimizing nutrient digestibility and minimizing feed waste in commercial production settings (El-Wahab et al., 2024; Abd El-Hack et al., 2025).

The comparison of the farm categories showed that the large-scale broiler farms had better economic performance than the small and medium-scale farms. Production costs were higher on large farms due to the increased input usage and flock size, but large farms also had higher gross returns, higher net returns per bird, and higher benefit-cost ratios. Much of these improvements have been due to economies of scale, effective management of resources and better production practices, which reduced the amount of feed needed to produce a unit of live weight gain. Similar results have been observed in other studies performed in Punjab, North Eastern India and Nigeria, where higher profitability was

consistently achieved in larger commercial broiler farms due to better production management and utilization of available resources (Mouzam & Chahal, 2025; Yuvaraj et al., 2023).

Feed cost was the biggest single component of total production cost and had the greatest impact on farm profitability. Correlation and regression analysis showed that feed cost was the most positively associated factor with broiler output, thus proving that investment in quality feed is the key to productive performance. However, variations in feed prices had a significant impact on net income and benefit-cost ratio since feed cost comprised about 2/3 of the total production cost. This is also corroborated by empirical studies which revealed that profitability is heavily reliant on the balance between feed quality and feed cost while maintaining efficient growth performance (Balogun et al., 2023; Mukaila et al., 2023). Therefore, better feed management is one of the best practices to be adopted to enhance the economic efficiency of commercial broiler farms.

The resource-use efficiency analysis also showed that the value products of feed, chicks, labour and health care expenses are higher than the marginal factor costs, suggesting that the resources are not at their economically optimum level. The level of productive inputs could thus be increased to improve the overall farm profitability if efficient management practices are exercised. In the field of poultry nutrition, mathematical techniques have also highlighted the importance of optimizing resources through predictive production models to enhance decision-making and boost production efficiency in commercial poultry farming contexts (Oviedo-Rondón, 2025; Jha & Mishra, 2021).

The constraint analysis indicated that the most critical constraint for broiler farmers was feed cost, followed by the price of the chicks, disease outbreaks, fluctuating prices in the market and the rising cost of medicine. These results show that input uncertainties and market uncertainties remain a challenge to the profitability and sustainability of the broiler business. Another financial risk is the occurrence of diseases that lead to increased mortality, impaired growth performance and higher veterinary expenses, especially in intensive production systems and warm climates (Das et al., 2024; Daghir, 2008). Thus, good disease management, secure supply of inputs and better market linkage are still needed to enhance the resilience of broiler production systems.

The results are relevant to applied developments in the poultry industry. Feed efficiency and economic returns can be significantly improved by optimising feed formulation, the use of precision nutrition technologies, improving flock health management and encouraging scientific production practices. Extension should focus on training farmers in feed management, biosecurity, financial planning and making quality feed and healthy chicks available to them at an affordable price. Besides, policies on input price stabilization, veterinary infrastructure and technical advisory services would enhance production efficiency and economic vulnerability and help ensure long-term sustainability and competitiveness of broiler farming systems.

5. CONCLUSION

This study shows that commercial broiler farming in Kanpur Dehat district is an economically viable enterprise and profitability increases gradually with the increase in the size of the farm. Feed conversion ratio proved to be the key factor affecting production performance, with those farms with lower feed conversion ratios having higher liveweight, net returns and benefit-cost ratios. The most important factor influencing the overall profit was the feed expenditure, which was the highest production cost. It was also found that allocation of productive inputs like feed, quality chicks, labour and health care are important and can make a difference in improving production efficiency and profitability. Rising feed prices, rising prices of broiler chicks, veterinary expenses, disease outbreaks and fluctuating market prices, however, are still threatening the sustainability of broiler farming, which are decreasing profit margins and increasing production risks. Proper feed management with appropriate nutrition, efficient feeding and timely disease prevention, and proper scientific flock management can significantly boost production efficiency and reduce avoidable expenses. Enabling increased access to quality inputs, veterinary services, farmer training programmes and institutional credit will further enhance the economic resilience of broiler enterprises. Improving market connections and encouraging stable pricing systems would also help to decrease financial risks and increase sustainability in farmers' profits. With the growing demand for poultry meat and the growing commercial poultry industry, Broiler farming has huge potential in the future in Kanpur Dehat district. The adoption of these modern production technologies, precision feeding, better biosecurity and evidence-based farm management will not only boost farm profitability, but will also facilitate sustainable poultry production, rural job creation and regional economic growth.

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