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An analysis of farm profitability of poultry production in eastern Uttar Pradesh

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Abstract

This study examines the economic dynamics of the poultry industry in Eastern Uttar Pradesh, India, focusing on costs, returns, and profitability across small, medium, and large farms during the 2020-21 agricultural year. Using a multi-stage random sampling technique, data were collected from 100 poultry farms (50 layers and 50 broilers) in Deoria and Kushinagar districts through personal interviews and secondary sources. Results reveal that large farms, despite higher costs (₹2,82,639 for broilers and ₹17,76,058 for layers), achieve greater profitability due to economies of scale, with net returns of ₹4,21,509 (broilers) and ₹99,93,787 (layers). The benefit-cost (B:C) ratio highlights this trend, peaking at 1:2.49 for broiler farms and 1:5.63 for layer farms on large scales, compared to 1:1.45 and 1:2.99 for small farms. The findings underscore the economic viability of poultry farming, particularly for larger operations, and emphasize the need for policy support to enhance disease surveillance, quality control, and global competitiveness.

Keywords: Poultry industry, costs and returns, economies of scale, benefit-cost ratio, broiler farms, layer farms

1. Introduction

The poultry industry in India has transformed from a modest backyard activity into a robust, commercialized sector, significantly contributing to the nation's economy and food security. With a current market value of approximately USD 28.18 billion, the industry is projected to grow at a compound annual growth rate (CAGR) of 8.1% from 2024 to 2032, reaching an estimated USD 44.97 billion by 2032 (Expert Market Research, 2024). This growth is fueled by rising disposable incomes, shifting dietary preferences toward protein-rich foods, and increasing urbanization, which have made poultry products like eggs and meat daily staples for many Indian households.

India ranks as the third-largest egg producer globally, with egg production rising from 138.38 billion in 2022-23 to 142.77 billion in 2023-24, a 3.17% increase (BAHS, 2023). The per capita egg availability has also improved, from 101 eggs in 2022-23 to 103 in 2023-24. Poultry meat production, contributing 51.14% of the country's total meat output, reached approximately 5 million tonnes annually, with broiler meat dominating the segment (BAHS, 2023). The industry's growth is particularly strong in states like Tamil Nadu, Andhra Pradesh, Maharashtra, Uttar Pradesh, and Telangana, which host large-scale commercial farms.

The shift in consumer habits, driven by greater awareness of health and wellness, has increased demand for poultry products as affordable sources of protein. Unlike fish or mutton, poultry is widely available, cost-effective, and considered hygienic, making it a preferred choice across communities. The rise of large, vertically integrated poultry enterprises has further propelled this growth. These companies manage the entire supply chain—from hatcheries and feed mills to processing—and support smaller contract farmers with resources like financial aid, veterinary services, and technical guidance. Over 80% of poultry production now comes from organized commercial farms, with live market sales constituting 90-95% of broiler meat sales, while processed chicken meat accounts for only 5% (BAHS, 2023).

India's poultry exports have also expanded, generating USD 134 million in revenue in 2022-23 by exporting to 64 countries (BAHS, 2023). However, domestic demand far exceeds supply, limiting large-scale exports. The industry operates in three segments: layers (egg production), broilers (meat production), and backyard poultry. Layer birds, concentrated in southern states like Andhra Pradesh and Tamil Nadu, produce 80.49% of the country's eggs, while backyard poultry contributes 19.50%. Broiler production, reliant on feed (65%) and chicks (25%), is increasingly consolidated, with smaller producers engaging in contract farming.

To sustain this growth, the industry requires comprehensive policy support, including robust disease surveillance, stringent quality control for feed and vaccines, and

adherence to global food safety standards like HACCP and GMP. Implementing these measures will enhance product quality, ensure compliance with international trade regulations, and boost India's competitiveness in global markets. Additionally, investments in product grading, value addition, and brand promotion are essential to meet rising consumer expectations for safe, nutritious food.

2. Materials and Methods

This study was fell within the jurisdiction of the region of Uttar Pradesh. A four-stage multi-stage random sampling technique was employed for constructing sampling plan of the study. The sampling plan was started from the selection of district (first stage) of the study from the north eastern plain zone followed by selection of blocks (second stage) from the district, selection of villages (third stage) from the selected blocks and the selection of farms (fourth stage) from the selected villages. Deoria and Kushinagar district was selected randomly. Deoria (Rampur karkhana, Deoria Sadar and Rudrapur) and Kushinagar (Fazilnagar, Kasia and Hata) was selected randomly.From the selected blocks four villages were selected blocks randomly. A list of all farm household of the selected four villages along with their operational holding was prepared and sixty farm household from all the four villages were selected in probability proportional to their numbers. A complete procedure for selecting sample household is given bellow.

Selection of poultry farm respondent

three size groups on the basis of their number of raising poultry birds *viz*.

a) Small size group - Less than 1000 birds
b) Medium size group -1000 - 2000 birds
c) Large size group - above 2000 birds

A list of 100 poultry owners' farms (50 layer and 50 broiler farms) were selected randomly following the proportionate random sampling technique.

Data and its sources: Both primary and secondary data were collected to attain the objectives of the research under investigation

Primary data: The primary data required for the study were collect from the sampled farmers by the personal interview method, using a pre-tested structured schedule pertaining to the agricultural year 2020-21.

Secondary data: Secondary data collection was done through extensive literature review on the concerned subject matter. The principal sources of secondary information were journal articles, books, research reports, periodicals, theses and various government publications.

Statistical tools: Suitable statistical tools were used to analyze the data and present of results. Period of Inquiry: The data will pertain to the agricultural year 2020-21.

Cost and Benefit analysis

Total cost of production (TCP) = amount spent for rent of the land/houses, purchase of day-old chicks, feed, medicine and wages, electricity and water bills, caring and depreciation;
Total revenue (TR) = amount received from sales of chicken, eggs and poultry waste products;
Net profit (NP) = TR-TCP;
Cost-benefit ratio (CBR) = TR÷TCP;
Rate of return on investment (RRI)% = NP÷TCP×100;
Gross ratio (GR) = TCP÷TR; and Profitability index (PI) = NP÷TR.

In addition, the production costs and profits/losses per chick, along with the whole-sale and retail-sale prices for each breed were also calculated.

Farm income measures

a. Gross return

The gross returns were calculated by using total production and price per kg:
Gross returns = Total production (in kg.) × Price per kg (in Rs.)

b. Net return

The net returns (profit) were also worked out by deducting the total cost from the gross returns:
Net returns (Rs.) = Gross returns - Total cost
The gross returns and net returns were also calculated per acre.

c. Benefit-cost ratio

The Benefit-Cost Ratio (BCR) is a financial metric used to evaluate the economic feasibility of an investment. It is calculated by dividing the total benefits by the total costs. In short, the BCR helps determine whether the benefits outweigh the costs or if an investment is financially viable. Here's the formula:

B-C Ratio = Total Benefits / Total Costs

3. Results and Discussion

3.1 Measure of per farms costs and returns from broiler farms

The table 1 revealed that the cost and return in poultry farming across small, medium, and large farms, alongside an average for broader comparison. The total cost, encompassing both variable and fixed components, varies significantly with farm size. Small farms incur a total cost of approximately ₹1,00,625, medium farms spend ₹2,00,172, and large farms face the highest expenses at ₹2,82,639, with an average of ₹2,03,353 per farm. Variable costs, primarily driven by expenses such as feed and labor, dominate the cost structure, with large farms spending ₹1,75,101 compared to ₹66,498 for small farms. Fixed costs, including infrastructure investments, also increase with farm size, ranging from ₹34,126 for small farms to ₹1,07,537 for large farms.
In terms of returns, small farms generate ₹1,39,061 from broiler sales, while medium and large farms earn ₹3,15,944 and ₹6,93,948, respectively. Additional revenue from poultry manure and gunny bags, ranging from ₹6,600 to ₹10,200 depending on farm size, contributes to gross returns, which average ₹3,94,641 across all farms. Net returns, after accounting for total costs, amount to ₹45,036 for small farms, ₹1,23,572 for medium farms, and a

substantial ₹4,21,509 for large farms, with an average of ₹1,91,287. Income over variable costs highlights the efficiency of larger operations, with large farms achieving ₹5,29,046.

The benefit-cost (B:C) ratio further underscores profitability trends. Large farms exhibit the highest ratio at 1:2.49, followed by small farms at 1:1.45, medium farms at 1:1.62, and an average of 1:1.83. These findings indicate that large farms benefit from economies of scale, making them the most profitable, while small and medium farms remain viable but yield lower returns. Overall, poultry farming demonstrates economic feasibility across all scales, though profitability is notably influenced by farm size.

Table 1: Measure of per farms costs and returns from broiler farms

S. No.	Items	Per farm Costs and returns (Rs.)			
		Small farm	Medium farm	Large farm	Average
1	Total variable cost	66498.59	110527.56	175101.66	119802.51
2	Total fixed cost	34126.49	89644.46	107537.36	83550.88
3	Total cost (CostC_3)	100625.08	200172.02	282639.02	203353.39
4	Average weight per farm(kg)	1540.85	3500.77	7689.18	4281.54
5	Average weight per farm poultry manure and Gunny bags	550.00	650.00	850.00	686.00
6	Return from broiler	139061.71	315944.49	693948.50	386409.06
7	Return from poultry manure and gunny bags	6600.00	7800.00	10200.00	8232.00
8	Gross returns	145661.71	323744.49	704148.50	394641.06
9	Net returns	45036.63	123572.48	421509.48	191287.67
10	Income over variable cost	79163.12	213216.93	529046.84	274838.54
11	Income over fixed cost	111535.22	234100.04	596611.14	311090.18
12.	B:C ratio	1:1.45	1:1.62	1:2.49	1:1.83

3.2 Measure of per bird costs and returns from broiler farms

The table 2 revealed that the comparative analysis of per-farm costs and returns across small, medium, and large poultry farms. It is evident that economies of scale significantly influence profitability. Total variable and fixed costs increase with farm size, with large farms incurring the highest costs (₹4072.13 variable and ₹2500.87 fixed), while small farms incur the least (₹1709.48 variable and ₹877.29 fixed). However, the total gross returns also rise sharply with scale, with large farms earning ₹16375.55 compared to ₹3744.52 for small farms.

The average weight of poultry produced per farm increases significantly from 39.61 kg in small farms to 178.82 kg in large farms. A similar trend is seen in the return from poultry manure and gunny bags, contributing to additional income, especially for medium and large farms.

Net returns show a dramatic increase with scale ₹1157.75 for small farms versus ₹9802.55 for large farms highlighting the greater profitability of larger operations. The income over variable and fixed costs is also highest for large farms, at ₹12303.41 and ₹13874.68 respectively, indicating better cost-efficiency and resource utilization.

The Benefit-Cost (B:C) ratio reflects the economic viability of the operations, with values of 1:1.45, 1:1.62, and 1:2.49 for small, medium, and large farms respectively. The average B:C ratio stands at 1:1.83, indicating profitability across all scales, but especially favorable for large-scale producers.

Table 2: Measure of per bird costs and returns from broiler farms

S. No.	Items	Per farm Costs and returns (Rs.)			
		Small farm	Medium farm	Large farm	Average
1	Total variable cost	1709.48	3694.10	4072.13	3386.16
2	Total fixed cost	877.29	2996.14	2500.87	2361.53
3	Total cost (CostC_3)	2586.76	6690.24	6573.00	5747.69
4	Average weight per farm(kg)	39.61	117.00	178.82	121.02
5	Average weight per farm poultry manure and Gunny bags	14.14	21.72	19.77	19.39
6	Return from broiler	3574.85	10559.64	16138.34	10921.68
7	Return from poultry manure and gunny bags	169.67	260.70	237.21	232.67
8	Gross returns	3744.52	10820.34	16375.55	11154.35
9	Net returns	1157.75	4130.10	9802.55	5406.66
10	Income over variable cost	2035.04	7126.23	12303.41	7768.19
11	Income over fixed cost	2867.23	7824.20	13874.68	8792.83
12.	B:C ratio	1:1.45	1:1.62	1:2.49	1:1.83

3.3 Measures of per farm costs and returns from layer farms

The table 3 revealed that the detailed comparison of costs and returns per poultry farm across different scales - small, medium, and large. A clear trend emerges: larger farms incur higher costs but generate significantly greater returns, leading to enhanced profitability. For instance, the total cost for small farms is ₹3.04 lakhs, compared to ₹17.76 lakhs for large farms. Despite this steep cost rise, the gross returns for large farms (₹47.26 lakhs) are over twelve times those of small farms (₹3.81 lakhs), showcasing strong economies of scale.

The average weight of poultry per farm also scales proportionally with farm size from approximately 2.14 lakh

kg on small farms to 23.37 lakh kg on large farms. Similarly, returns from layers and by-products (manure and gunny bags) increase substantially, with large farms earning over ₹93.5 lakhs from layers alone.

Net returns sharply differentiate the profitability of different farm sizes. Small farms report ₹9.09 lakhs, while large farms realize an impressive ₹99.94 lakhs. This is further reinforced by income over variable and fixed costs, both of which are exponentially higher for large farms.

The Benefit-Cost (B:C) ratio, a key indicator of economic efficiency, reflects this advantage. Small farms yield a B:C ratio of 1:2.99, while large farms reach as high as 1:5.63. On average, farms maintain a B:C ratio of 1:3.95.

Table 3: Measures of per farm costs and returns from layer farm

S. No.	Items	Per farm Costs and returns (Rs.)			
		Small farm	Medium farm	Large farm	Average
1.	Total variable cost	235946.38	414673.82	1048553.93	534299.31
2.	Total fixed cost	68201.40	299485.06	727504.30	361785.27
3.	Total cost ($CostC_3$)	304147.78	714158.88	1776058.23	896084.58
4.	Average weight per farm(kg)	214488.21	617876.64	2337577.45	975741.64
5.	Average weight per farm poultry manure and Gunny bags	152.36	550.05	1890.58	812.96
6.	Return from broiler	857952.84	2471506.56	9350309.80	3902966.54
7.	Return from poultry manure and gunny bags	13767.25	49702.52	170832.81	73458.65
8.	Gross returns	38090.00	137512.50	472645.00	203238.85
9.	Net returns	909810.09	2658721.58	9993787.61	4179664.04
10.	Income over variable cost	605662.31	1944562.70	8217729.38	3283579.46
11.	Income over fixed cost	673863.71	2244047.76	8945233.68	3645364.74
12.	B:C ratio	1:2.99	1:3.72	1:5.63	1:3.95

3.4 Measures per farm costs and returns from layer farms on the basis of per bird

The data presented in the table 4 highlights the per bird costs and returns of layer poultry farming across three farm sizes - small, medium, and large. A consistent trend emerges indicating that economies of scale significantly enhance the profitability and efficiency of larger farms compared to smaller ones.

In terms of cost structure, the total variable cost per bird increases with farm size, from ₹9,681.84 on small farms to ₹45,293.91 on large farms. Similarly, fixed costs range from ₹2,798.58 to ₹31,425.67, resulting in total costs per bird of ₹12,480.42 for small farms and ₹76,719.58 for large farms. While this indicates a higher absolute investment on larger farms, the return metrics suggest that this investment is well justified.

Production efficiency, as measured by average weight per bird, also improves with scale. Large farms yield an average of 100,975.27 kg per farm compared to only 8,801.32 kg on small farms. Likewise, by-products like poultry manure and gunny bags, although modest in volume, show a proportional increase with farm size, enhancing overall farm income.

Returns from broiler sales are notably higher on large farms (₹403,901.07) compared to small farms (₹35,205.29). Additional income from manure and gunny bags further boosts total gross returns, reaching ₹20,416.63 on large farms versus ₹1,562.99 on small farms. As a result, net returns rise sharply from ₹37,333.20 on small farms to an impressive ₹431,697.09 on large farms.

Profitability metrics strongly favor larger operations. Income over variable and fixed costs increases drastically with scale, peaking at ₹354,977.51 and ₹386,403.18, respectively, for large farms. Most notably, the Benefit-Cost (B:C) ratio - a key indicator of economic efficiency - stands at 1:2.99 for small farms and escalates to 1:5.63 for large farms, with an average of 1:3.95 across all farms.

Table 4: Measures per farm costs and returns from layer farms on the basis of per bird

S. No.	Items	Per farm Costs and returns (Rs.)			
		Small farm	Medium farm	Large farm	Average
1.	Total variable cost	9681.84	28796.79	45293.91	50028.02
2.	Total fixed cost	2798.58	20797.57	31425.67	33875.03
3.	Total cost ($CostC_3$)	12480.42	49594.37	76719.58	83903.05
4.	Average weight per farm(kg)	8801.32	42908.10	100975.27	91361.58
5.	Average weight per farm poultry manure and Gunny bags	6.25	38.20	81.67	76.12
6.	Return from broiler	35205.29	171632.40	403901.07	365446.31
7.	Return from poultry manure and gunny bags	564.93	3451.56	7379.39	6878.15
8.	Gross returns	1562.99	9549.48	20416.63	19029.85
9.	Net returns	37333.20	184633.44	431697.09	391354.31
10.	Income over variable cost	24852.78	135039.08	354977.51	307451.26
11.	Income over fixed cost	27651.36	155836.65	386403.18	341326.29
12.	B:C ratio	1:2.99	1:3.72	1:5.63	1:3.95

4. Conclusion

This study on poultry farming in Uttar Pradesh sheds light on how small, medium, and large farms fare economically, based on data from the 2020-21 agricultural year. It's clear that poultry farming can be a rewarding venture, but the size of the farm makes a big difference. Large broiler farms

brought in net returns of ₹4,21,509 with a benefit-cost ratio of 1:2.49, while large layer farms earned an impressive ₹99,93,787 with a ratio of 1:5.63. Small farms, though still profitable, earned much less—₹45,036 for broilers and ₹9,09,810 for layers—with ratios of 1:1.45 and 1:2.99, showing how tougher it is for them to keep costs down while scaling up.

Medium farms landed somewhere in the middle, balancing costs and returns. While all farm sizes showed profitability, smaller farms need a helping hand to thrive. Policies that focus on better disease monitoring, quality feed and vaccines, and financial or technical support could level the playing field. Plus, investing in value addition and meeting global standards like HACCP and GMP will help the industry grow sustainably, meeting both local demand and global opportunities head-on.

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