



Study on the Evaluation of the Profitability, Efficiency and Investment Trends of Different Poultry Farming Systems

Venketesa Palanichamy N^{a++}, Sagar Surendra Deshmukh^{b#}
and Kalpana M^{a†*}

^a Agricultural College and Research Institute, TNAU, Coimbatore, India.

^b Indian Institute of Technology, Guwahati, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Over the past 20 years, the Indian poultry sector has transformed into a dynamic entity with more structured operations. Following all these practices almost at every level, poultry industry is now achieving new heights day by day. The entire livestock sector's contribution to India's GDP is greatly aided by the poultry industry in the country. India's poultry sector ranks second and third in the world in terms of meat and egg output, respectively, with 3.4 million tonnes of meat and 65 million tons of eggs produced (FAO). Significant advancements in the industry have resulted from management initiatives. Most of India's organized structure

⁺⁺ Dean (Agriculture);

[#] Assistant Professor;

[†] Professor;

*Corresponding author: E-mail: kalpusiva@gmail.com;

has contributed to the effective use of resources and the right implementation of policies, which have improved firm financial positions and produced the intended results. The data was collected from stakeholders with the help of pretested interview schedule. Separate interview schedule was prepared for broiler farmers (100 samples), breeder farmers (10 samples) and processing cum distribution centers (20 samples).

A combination of tools viz. average, percentage, cost and return analysis. To get better understanding of the study, the sample farmers were classified into different supply chains based on their mode of working and business stages performed. Feeding management practices were followed aptly by most of the farmers. Almost all farmers were following suitable health management practice by vaccinating their birds. Based on number of birds reared poultry farms were classified as small, medium and large poultry farms. Small farms were in only in Supply Chain II and III. Fixed investment they did was `583010 and `46733 out of which nearly 85 per cent building charge. In medium sized poultry farms category, poultry farms from Supply Chain II, III and IV were present. Fixed investment they made was `12,22,096, `15,94,147 and `13,27,778 respectively of which more than 90 per cent was spent on farm buildings construction purpose. In large poultry farms, Supply Chain IV farmers had made quite huge fixed investment. For all the farms, of the total investment, 90 per cent was in buildings and 10 per cent was in equipments.

Keywords: Profitability; efficiency; investment trends; poultry farming systems.

1. INTRODUCTION

In past two decades, poultry is one of the fastest growing segments of the agricultural sector in India. It is growing at a much faster rate than any other constituent of the crop and livestock sector. While the production of agricultural crops has been increasing at a rate of 1.5 to 2 per cent per annum, the production of eggs and broilers has been increasing at a rate of 8 to 10 per cent per annum. The share of poultry in the total value of output of livestock sector has been increasing significantly. Within the poultry sector, broiler production is growing faster than eggs production. Around 66.7 per cent of the total output (in value form) is realized from the poultry meat sector and only 33 per cent from egg production.

The poultry sector in India has undergone a paradigm shift in structure and operation, Poultry, which was considered as a backyard venture in the early 1960's now it has been transformed into a strong agri-based farming activity. It has come a long way, from a backyard activity to an organized, scientific and vibrant industry. Compared with the other livestock sectors (dairy, goat, sheep and fisheries), the poultry industry in India is well organized, modernized with hi-technology and almost 75 per cent of the activities are automated. The growth of the poultry sector in India has also been inked by an increase in the economic scale and size of the poultry farm. For example, in earlier years, broiler farms used to produce a few hundred birds (200-500 chicks) per cycle on average; whereas now

poultry units with less than 5,000 birds are becoming rare, and units with 5,000 to 50,000 birds per week cycle are very common.

Over the last three decades, there have been significant developments in the poultry industry with each decade focusing on different sectors. The seventies saw a spurt in egg production; the eighties an acceleration in broiler production; the nineties advances in poultry integration, automation and feed production. The present decade promises to exploit value-added products and participate in export trade. There is significant growth in egg and broiler production along with per capita availability. The development of poultry industry in India within a span of just two decades is remarkable. From the rural backyard poultry production catering to the domestic market prior to the 1980s, the sector has transformed itself into advanced industrial production in many states.

Aganga et al., [1] in his research on 'Traditional poultry production and commercial broiler alternatives for small-holder farmers in Botswana' used extensive free range management system (85 samples) and commercial small scale broiler farms (25 samples).

Goodger et al., [2] included only family poultry farming system for comparative analysis of poultry farming in 12 african countries. The purpose of their research was conduct a survey on family poultry to obtain information on disease prevalence, feeding practices, and the management of poultry housing.

Kondombo et al. [3] classified poultry farming systems as the mixed crop/livestock farming system (CLFS) and Livestock farming system. His study was conducted in Burkina Faso, West Africa.

Chang, [4] mentioned backyard and commercial poultry farming systems, as well as he classified it into 3 subtypes viz. native, broiler and layer chickens. His objective of the research was to identify the issues and opportunities facing the Philippine poultry industry and to suggest policy responses.

Ramaswami et al., [5] took contract producer and non-contract producers (poultry farmers) for determining the efficiency and distribution under Indian context. Number of samples was 25 for each of the group. It was collected randomly from villages in Andhra Pradesh during 2002-03.

Castellini et al., [6] proposed two different types of poultry farming systems as conventional and organic poultry production/rearing system. The main differences in the two systems were the energy cost for poultry feed and for cleaning/sanitization of the buildings between successive productive cycles. Comparison of the organic poultry system with a conventional one from the viewpoint of sustainability showed that all the energy-based indicators are in favour of the organic farming system with a higher efficiency in transforming the available inputs in the final product, a higher level of renewable inputs, a higher level of local inputs and a lower density of energy and matter flows.

Kumaresan et al., [7] studied only backyard poultry farming system in Mizoram, India. He suggested that village chickens are an important income source for household expenses, and that traditional free-range poultry production in the smallholder sector of developing countries can possibly be improved through the use of improved dual-purpose birds.

Niranjan et al. [8] suggested free range and semi intensive system is the viable alternative poultry farming system for improving the livelihood of rural people and provides additional income and protein supplement. For the study, four improved breeds were selected (Cross 1, Cross 2, Vanraj and Grampriya). Comparative evaluation of production performance revealed that the Cross 1 breed is better over others for dual purpose backyard farming.

Rangnekar and Rangnekar, [9] has compared traditional backyard poultry farming system with commercial poultry farming system. He pointed concern towards risk of abuse of resources and marginalization of small farmers by commercial poultry production system. Commercial poultry is a good example of mass production and rapid growth, but should be differentiated from development and production by the masses.

Begum et al., [10] studied two types of poultry farming systems, contract farming and independent farming systems. She took 25 independent farms and 50 contract farms for study of Technical Efficiency (TE), Allocative Efficiency (AE) and Economic Efficiency (EE) at poultry farms.

Kalamkar, [11] divided poultry farming systems into two, as contract farming and non-contract (Independent management) farming. The study was conducted during June 2009-May 2010 in Maharashtra, India. The profitability, efficiency, and investment trends of different poultry farming is studied in details in this paper.

2. MATERIALS AND METHODS

The study was conducted in Maharashtra state, India. Maharashtra is one among the few states performing well in poultry Sector. Maharashtra state is purposively selected, as it comprised of both, traditional (backyard) as well as integrated, system of poultry management. Maharashtra is divided into four sub-regions namely Vidarbha, West Maharashtra, Marathwada and Kokan of which Vidarbha and West Maharashtra were selected for study.

West Maharashtra is well developed in poultry farming as compared with other regions. The districts such as Mumbai, Thane, Pune, Nashik and Kolhapur are having well developed distribution network through integrated companies. Almost all the poultry farms in these (above) districts are with integrated companies and all farms are larger in size. Whereas, in Vidarbha region, districts such as Akola, Amravati, Buldana, Yeotmal and Washim are having poultry farms of independent farmers' own poultry farms. To get samples of traditional and integrated farms, these regions were purposively selected. Thus, there were two regions selected for study.

Region A (IPFS) – Pune, Nashik, Nagpur, Bhandara, Gondia

Region B (TPFS) – Akola, Amravati, Buldana, Yeotmal, Wardha

From each region, 50 farms were randomly selected and contacted for data and other required information collection. The study sample farms were post-stratified, as such, there is no official information and data about total number of poultry farms in the state. The farms are divided into small, medium and large farms based on the number of poultry birds reared by the farmer. Thus, totally 100 poultry farm owners were contacted for survey. 10 breeder farm owners (parents' poultry farm) and 20 processing cum distribution centers were contacted and information gathered. Integrated company and government officials were also contacted to get better understanding of poultry sector of the study area.

Costs and returns approach was used for accessing vertically integrated contact poultry farming system. Various costs incurred and returns obtained during farm operations will be calculated. Fixed Cost is the expenditure, which is incurred whether or not the production is carried out. It includes poultry house, permanent labour, etc. Variable costs are those costs, which are incurred on variable factors of production and can be altered in the short run. It includes chick cost, feed cost, labour cost, veterinary cost, and miscellaneous costs. The sum of fixed cost (FC) plus variable costs (VC) is total cost (TC)

$$TC = FC + VC$$

On the revenue side gross returns, net returns, rate of return was determined and analysed for study. Net return is defined as difference between total revenue (TR) and total cost (TC) i.e. TR - TC. Net returns were determined by subtracting total cost of production from total income per flock realized by the poultry farmer.

$$\text{Net Return} = TR - TC$$

Ratios of the value of output to input are calculated by dividing as values of output by total costs.

$$\text{Input - output ratio} = \frac{\text{Value of Output}}{\text{Total Cost}}$$

Percentage mortality (MR) is calculated according to the model of Faye and Perechon as cited by, Kondombo, (2003), where

$$MR = ND/AF \times 100$$

ND = the total number of dead or missing chickens during the observation period, being the sum of deaths due to disease and losses due to predators, bad weather or unknown causes;

AF = average flock size = $1 / 2 \times (\text{flock size on day 1} + \text{flock size on day 60})$.

2.1 Tools of Analysis

The collected data was analysed with reference to the objectives set for the study. The analytical techniques used in the study are presented as follows.

2.2 Descriptive Analysis

Averages and percentages were estimated to understand the characteristics of sample respondents such as age, educational status, size of farm operations, number of poultry birds, production and marketing costs and return in poultry farming.

3. RESULTS AND DISCUSSION

The investments required for establishment of a poultry farm is consists of the fixed capital investment on building and equipments (broiler birds rearing shade, feed store, feeders, water drinker, light fittings, miscellaneous items such as office and labour room) and variable capital investment on working capital (cost of chick, feed, medicines, labours, electricity charges, water, transportation, etc.)

3.1 Investment Pattern and Returns of Small Poultry Farms across Different Supply Chains

In Supply Chain I and Supply Chain IV there were no small poultry farmers (rearing 1000 to 4999 birds). The details on investment pattern, various costs and returns of Supply Chain II and III are presented in Table 1.

The total fixed capital investment in Supply Chain II farms was ` 5,83,010 while in Supply Chain III it was ` 4,67,333 of which investment in buildings (broiler shade, office, labor room and feed store)

was 90 per cent and 83 per cent in Supply Chain II farms and Supply Chain III farms respectively. The Supply Chain II and III farms were being in market integration, had lesser variable cost of 40 per cent and 25 per cent than fixed cost 61 per cent and 75 per cent respectively. The gross and net returns were significantly higher (approximately double) in small poultry farms of Supply Chain II than small poultry farms of Supply Chain III. It could be inferred that the small poultry farms of Supply Chain II were more efficient and they were implementing better management practices.

3.2 Investment Pattern and Return Per Bird of Small Poultry Farms under Market Integration

Per bird investment, costs incurred and returns gained among the small poultry farms of Supply Chain II and III are given in the following Table 2.

Per bird enumeration of investment pattern, costs and returns would give better insights for better understanding of the poultry farming.

The fixed capital investment per bird made by the farms of Supply Chain III was higher than that of farms of Supply Chain II. The total cost incurred per bird was nearly same (₹ 9.18 and ₹ 9.31) for both the supply chains 2 and 3 farms. Variable cost incurred was lesser for Supply Chain III farms, since they did not pay any amount for medicines administered to birds. The net return was higher (₹ 2.57 per bird) in Supply Chain II farms than Supply Chain III farms (₹ 1.87 per bird). This might be due to lesser fixed capital investment and total fixed cost in Supply Chain II farms than the Supply Chain III farms moreover, the numbers of birds reared by Supply Chain II farms were also significantly higher.

Table 1 Investment pattern and returns of small poultry farms across different supply chains (₹ per farm)

S. No.	Particulars	Supply Chain II	Supply Chain III
A	Fixed Investment		
i)	Buildings	523836(89.85)	388151(83.06)
ii)	Equipments	59174(10.15)	79183(16.94)
	Total Fixed Investment	583010	467333
B	Fixed Cost		
i)	Depreciation on buildings & equipments	43726(38.46)	35050(38.46)
ii)	Interest on fixed capital	69961(61.54)	56080(61.54)
	Total Fixed Cost	113687	91130
C	Variable Cost		
i)	Feed	0(0.00)	0(0.00)
ii)	Day old chicks	0(0.00)	0(0.00)
iii)	Labour charges	34774(47.46)	20830(69.59)
iv)	Litter	13951(19.04)	4983(16.65)
v)	Medicines/Vaccines	18629(25.42)	0(0.00)
vi)	Electricity/Water, etc.	4968(6.78)	3522(11.76)
vii)	Other Costs	952(1.30)	599(2.00)
	Total Variable Costs	73273	29933
D	Total Cost		
	B Total Fixed Cost	113687(60.81)	91130(75.27)
	C Total Variable Costs	73273(39.19)	29933(24.73)
	Total Cost (B+C)	186960	121063
E	Gross Return		
i)	Broilers	237697(99.34)	145352(100)
ii)	Manure	0(0.00)	0(0.00)
iii)	Gunny Bags	1585(0.66)	0(0.00)
	Total Return	239282	145352
F	Net Return	52322	24288

Figures in parentheses indicate per cent to total

Table 2. Investment pattern and return per bird for small poultry farms in different supply chains (₹ per Bird)

S. No.	Particulars	Supply Chain II	Supply Chain III
1	Average number of birds per year (Number)	20370	13000
2	Total Fixed Capital Invested	28.62	35.95
3	Depreciation on buildings & equipments	2.15	2.70
4	Interest on fixed capital	3.43	4.31
5	Total fixed cost	5.58	7.01
6	Total Variable Cost	3.60	2.30
7	Total cost	9.18	9.31
8	Gross Return	11.75	11.18
9	Net return Per Bird	2.57	1.87

Table 3. Investment pattern and returns for medium poultry farms in different supply chains (₹ per farm)

S. No.	Particular	Supply Chain II	Supply Chain III	Supply Chain IV
A	Fixed Investment			
i).	Buildings	1116579(91.37)	1477721(92.70)	1193264(89.87)
ii).	Equipments	105467(8.63)	116373(7.3)	134513(10.13)
	Total Fixed Investment	1222096	1594147	1327778
B	Fixed Cost			
i).	Depreciation on buildings & equipments	91657(38.46)	119561(38.46)	99583(38.46)
ii).	Interest on fixed capital	146652(61.54)	191298(61.54)	159333(61.54)
	Total Fixed Cost	238309	310859	258917
C	Variable Cost			
i).	Feed	0(0.00)	0(0.00)	3516498(75.99)
ii).	Day old chicks	0(0.00)	0(0.00)	892550(19.29)
iii).	Labour charges	82783(51.56)	48795(72.21)	62090(1.34)
iv).	Litter	14416(8.98)	10183(15.07)	25871(0.56)
v).	Medicines/Vaccines	47814(29.78)	0(0.00)	46568(1.01)
vi).	Electricity/Water, etc.	11989(7.47)	6990(10.34)	19403(0.42)
vii).	Other Costs	3568(2.22)	1602(2.37)	64678(1.40)
	Total Variable Costs	160571	67574	4627658
D	Total Cost			
B	Total Fixed Cost	238309(59.74)	310859(82.14)	258917(5.30)
C	Total Variable Costs	160571(40.26)	67574(17.86)	4627658(94.70)
	Total Cost (B+C)	398880	378432	4886575
E	Gross Return			
i).	Broilers	524870(98.74)	499579(99.62)	5324377(99.59)
ii).	Manure	2877(0.54)	0(0.00)	0(0.00)
iii).	Gunny Bags	3837(0.72)	1905(0.38)	22009(0.41)
	Total Return	531584	501485	5346386
F	Net Return	132705	123052	459811

Figures in parentheses indicate per cent to total

3.3 Investment Pattern and Returns for Medium Poultry Farms

The investment pattern, cost and returns for medium sized poultry farmers of Supply Chains II, III and IV are given in Table 3. There was no

medium sized poultry farm in Supply Chain I thus; it was excluded from the Table.

The total fixed capital invested by farmers of Supply Chain III for their poultry farm was higher than that of farmers of Supply Chain II and

Supply Chain IV, among the medium sized poultry farms. However, the total cost incurred by Supply Chain III farmers was significantly lower than other farms, which was a result of lowest variable cost incurred by Supply Chain III farmers. Variable cost incurred by the Supply Chain IV farms was significantly high (₹46,27,658) since they bear the cost of all poultry inputs like cost of day old chicks, feed cost, medicine cost and veterinary aid required.

On the other hand, returns were higher among farmers in Supply Chain IV (₹4,59,811) and returns were lower among farmers in Supply Chain II (₹1,32,704) and Supply Chain III (₹1,23,052) since farmers in Supply Chain IV bear more risk and do the marketing function by themselves. Thus, major chunk of profit was remained with them but in case of Supply Chain II and Supply Chain III farmers, profit gained by farmers was less, since major share of profit gone to the integrator companies.

3.4 Investment Pattern and Return per Bird for Medium Poultry Farmers

To get better insights of investment pattern, details on costs and returns of medium sized farms and per bird investment are given in Table 4.

The fixed capital investment per bird made by farmers in Supply Chain III was higher (₹40.76) than farmers in Supply Chain II (₹32.76) and Supply Chain IV (₹35.41) by nearly ₹8 and ₹5 respectively. The significant difference in variable costs was clearly observed. The cost incurred on poultry medicines was higher and it could be

interpreted based on the difference between the variable costs of Supply Chain II and Supply Chain III farms. Net return per bird was higher for farmers in Supply Chain IV (₹12.26) while it was lower for farmers in Supply Chain II (₹3.56) and Supply Chain III farms (₹3.15). This indicated that the Supply Chain IV farms were more profitable and it was a result of efficient and better management.

3.5 Investment Pattern and Returns among Large Poultry Farms

The details of investment pattern, costs and returns among large poultry farms are given in Table 5.

Fixed capital investment was highest in large poultry farms of Supply Chain IV. The variable cost incurred by them was also highest. Total cost of poultry farms in Supply Chain IV was highest (₹1,86,69,800) followed by Supply Chain I farms (₹1,12,43,239), Supply Chain II farms (₹7,96,131) and Supply Chain III farms (₹5,85,097).

Net return was more for Supply Chain IV farms (₹21,37,000) followed by Supply Chain I farms (₹8,83,467), Supply Chain II farms (₹5,66,344) and it was least for Supply Chain III farms (₹4,47,092).

3.6 Investment Pattern and Return Per Bird among Large Poultry Farmers

Details on investment per bird and costs and returns among large poultry farmers are given in Table 6.

Table 4. Per Bird Investment pattern and return for medium poultry farmers in different supply chains (₹ per Bird)

S. No.	Particulars	Supply Chain II	Supply Chain III	Supply Chain IV
1	Average number of birds per year (Number)	37308	39113	37500
2	Total Fixed Capital Invested	32.76	40.76	35.41
3	Depreciation on buildings & equipments	2.46	3.06	2.66
4	Interest on fixed capital	3.93	4.89	4.25
5	Total fixed cost	6.39	7.95	6.90
6	Total Variable Cost	4.30	1.73	123.40
7	Total cost	10.69	9.68	130.31
8	Gross Return	14.25	12.82	142.57
9	Net return per bird	3.56	3.15	12.26

Table 5. Investment pattern and returns among large poultry farms in different supply chains (₹ per Farm)

S. No.	Particulars	Supply Chain I	Supply Chain II	Supply Chain III	Supply Chain IV
A	Fixed Investment				
i).	Buildings	2858004 (88.21)	2544294(88.69)	2179214(90.12)	5163740(89.03)
ii).	Equipments	381996(11.79)	324456(11.31)	238911(9.88)	636260(10.97)
	Total Fixed Investment	3240000	2868750	2418125	5800000
B	Fixed Cost				
i).	Depreciation on buildings & equipments	243000(38.46)	215156(38.46)	181359(38.46)	435000(38.46)
ii).	Interest on fixed capital	388800(61.54)	344250(61.54)	290175(61.54)	696000(61.54)
	Total Fixed Cost	631800	559406	471534	1131000
C	Variable Cost				
i).	Feed	7871836(74.18)	0(0.00)	0(0.00)	13388572(76.34)
ii).	Day old chicks	2284191(21.53)	0(0.00)	0(0.00)	3467786(19.77)
iii).	Labour charges	132977(1.25)	117062(49.45)	77625(68.35)	213402(1.22)
iv).	Litter	41555(0.39)	13007(5.49)	14375(12.66)	66688(0.38)
v).	Medicines/Vaccines	105424(0.99)	90398(38.19)	0(0.00)	160052(0.91)
vi).	Electricity/Water, etc.	36938(0.35)	13007(5.49)	19406(17.09)	53351(0.30)
vii).	Other Costs	138518(1.31)	3252(1.37)	2156(1.90)	188950(1.08)
	Total Variable Costs	10611439	236725	113563	17538800
D	Total Cost				
	B Total Fixed Cost	631800 (5.62)	559406 (70.27)	471534 (80.59)	1131000(6.06)
	C Total Variable Costs	10611439(94.38)	236725(29.73)	113563(19.41)	17538800(93.94)
	Total Cost (B+C)	11243239	796131	585097	18669800
E	Gross Return				
i).	Broilers	12002153(98.97)	1345423(98.75)	1020629(98.88)	20444762(98.26)
ii).	Manure	0(0.00)	0(0.00)	0(0.00)	0(0.00)
iii).	Gunny Bags	124554(1.03)	17052(1.25)	11561(1.12)	362038(1.74)
	Total Return	12126707	1362476	1032190	20806800
F	Net Return	883468	566344	447093	2137000

Figures in parentheses indicate per cent to total

Table 6. Investment pattern and return per bird among large poultry farmers in different supply chains (per Bird)

S. N o.	Particulars	Supply Chain I	Supply Chain II	Supply Chain III	Supply Chain IV
1	Average number of birds per year (Number)	82627	85500	79205	144000
2	Total Fixed Capital Invested	39.21	33.55	30.53	40.28
3	Depreciation on buildings & equipments	2.94	2.52	2.29	3.02
4	Interest on fixed capital	4.71	4.03	3.66	4.83
5	Total fixed cost	7.65	6.54	5.95	7.85
6	Total Variable Cost	128.43	2.77	1.43	121.80
7	Total cost	136.07	9.31	7.39	129.65
8	Gross Return	146.76	15.94	13.03	144.49
9	Net return per bird	10.69	6.62	5.64	14.84

The fixed capital investment was highest in Supply Chain IV farms (₹40.28) followed by Supply Chain I (₹39.21), Supply Chain II (₹33.55) and Supply Chain III (₹30.53) respectively. Total cost incurred was higher for Supply Chain I farms (₹136.07) followed by Supply Chain IV (₹129.65), Supply Chain II (₹9.31) and Supply Chain III farms (₹7.39) respectively.

However, the net return over total cost was highest for Supply Chain IV farms (₹14.84) and it was lowest for Supply Chain III farms (₹5.64) among large poultry farms category. The average number of birds reared by the Supply Chain IV farmers per year was higher than other supply chain farmers. Since they were not in integration, they could rear more batches per year as compared with contract farmers (integrated farmers), where they had to depend on only one chick provider and these chick providers (integrators) were generally providing 5 batches per year with longer inter-batch gap (in days).

3.7 Investment Pattern and Returns among Overall Poultry Farms in Different Supply Chains

The Investment pattern and returns for poultry farms in Supply Chains I, II, III and IV are given in Table 7.

The total fixed capital invested by farmers of Supply Chain I was highest (₹32,40,000) since they had used and maintained most improvised building material and equipments. The total fixed capital invested by farmers of Supply Chain II was lowest (₹12,17,594) as most of the farmers used average quality and locally available material and

equipments. Total variable cost incurred by farmers of Supply Chain I was highest (₹1,06,11,439) followed by farmers of Supply Chain IV (₹59,18,772), farmers of Supply Chain II (₹1,38,316) and farmers of Supply Chain III (₹76,073) respectively.

The variable cost in case of Supply Chain II and III was significantly low as compared to Supply Chain I and IV because of the cost incurred in purchasing birds, feed and medicine (only in Supply Chain III) was not borne by the farmer, it was provided by integrator companies to them. The total cost was also high (₹1,12,43,238.92) in farms of Supply Chain I followed by farms of Supply Chain IV (₹62,64,897.36), Supply Chain III (₹4,07,806) and Supply Chain II (₹3,75,746.85) respectively.

Net return was highest for farms in Supply Chain I (₹8,83,467.87), followed by Supply Chain IV (₹5,97,530.34), Supply Chain II (₹1,74,433.30) and Supply Chain III (₹1,43,276.75) respectively.

3.8 Investment Pattern and Return Per Bird among Poultry Farmers

To get clear and better thought on investment per bird and returns are worked out and the results are presented below in Table 8.

The total fixed capital invested per bird by the farmers in Supply Chain I, II, III, and IV was ₹39.21, ₹32.17, ₹36.05 and ₹36.86 respectively. The variable cost in Supply Chain I (₹128.43) and IV (₹122.92) was higher than in Supply Chain II (₹3.65) and Supply Chain III (₹1.61).

Table 7. Investment pattern and returns among poultry farms in different supply chain (₹ per Farm)

S. No.	Particular	Supply Chain I	Supply Chain II	Supply Chain III	Supply Chain IV
A	Fixed Investment				
i).	Buildings	2858004(88.21)	1095454(89.97)	1507768(88.63)	1587731(89.45)
ii).	Equipments	381996(11.79)	122124(10.03)	193502(11.37)	187269(10.55)
	Total Fixed Investment	3240000	1217595	1701193	1775000
B	Fixed Cost				
i).	Depreciation on buildings & equipments	243000(38.46)	91320(38.46)	127590(38.46)	133125(38.46)
ii).	Interest on fixed capital	388800(61.54)	146111(61.54)	204143(61.54)	213000(61.54)
	Total Fixed Cost	631800	237431	331733	346125
C	Variable Cost				
i).	Feed	7871836(74.18)	0(0.00)	0 (0.00)	4507903(76.16)
ii).	Day old chicks	2284191(21.53)	0(0.00)	0(0.00)	1155918(19.53)
iii).	Labour charges	132977(1.25)	68450(49.49)	53290(70.05)	75715(1.28)
iv).	Litter	41555(0.39)	15451(11.17)	11253(14.79)	27797(0.47)
v).	Medicines/Vaccines	105424(0.99)	43057(31.13)	0(0.00)	56786(0.96)
vi).	Electricity/Water, etc.	36938(0.35)	9102(6.58)	9940(13.07)	21410(0.36)
vii).	Other Costs	138518(1.31)	2257(1.63)	1590(2.09)	73243(1.24)
	Total Variable Costs	10611439	138316	76073	5918772
D	Total Cost				
	B Total Fixed Cost	631800(5.62)	237431(63.19)	331733(81.35)	346125(5.52)
	C Total Variable Costs	10611439(94.38)	138316(36.81)	76073(18.65)	5918772(94.48)
	Total Cost (B+C)	11243239	375747	407806	6264897
E	Gross Return				
i).	Broilers	12002153(98.97)	544354(98.94)	548327(99.50)	6788599(98.92)
ii).	Manure	0(0.00)	992.75(0.18)	0(0.00)	0(0.00)
iii).	Gunny Bags	124554(1.03)	4833(0.88)	2755(0.50)	73828(1.08)
	Total Return	12126707	550180	551083	6862428
F	Net Return	883468	174433	143277	597530

Figures in parentheses indicate per cent to total

Table 8 Investment pattern and return per bird among poultry farmers in different supply chains (₹ per Bird)

S. No.	Particulars	Supply Chain I	Supply Chain II	Supply Chain III	Supply Chain IV
1	Average number of birds per year (Number)	82627	37850	47193	48150
2	Total Fixed Capital Invested	39.21	32.17	36.05	36.86
3	Depreciation on buildings & equipments	2.94	2.41	2.70	2.76
4	Interest on fixed capital	4.71	3.86	4.33	4.42
5	Total fixed cost	7.65	6.27	7.03	7.19
6	Total Variable Cost	128.43	3.65	1.61	122.92
7	Total cost	136.07	9.93	8.64	130.11
8	Gross Return	146.76	14.54	11.68	142.52
9	Net return per bird	10.69	4.61	3.04	12.41

In Supply Chain II, farmers were getting day old chicks and feed without any charge. Farmer had to bear charges of medicine. In Supply Chain III, farmers were getting day old chick, feed and medicine too without any charge. Thus, variable cost per bird for farmers in Supply Chain III was lowest (₹1.61). Total cost per bird incurred in Supply Chain I, II, III, and IV were ₹136.07, ₹9.93, ₹8.64 and ₹130.11 respectively.

The gross return for farmers in Supply Chain I and IV was higher (₹146.76 and ₹143.14) as these farmers were bearing the total market risk and farmers were able to sell their produce directly to the market. The gross return for farmers of Supply Chain II and III was ₹14.54 and ₹11.68 respectively. In which, farmers were selling their produce (grown poultry birds were picked up) at farm gate either by company or by traders, resulting in lesser returns. From the Table 8 it could be concluded that the farmers of Supply Chain IV were getting more (₹12.41 per bird) net return from poultry farming business which was followed by farmers of Supply Chain I (₹10.69), Supply Chain II (₹4.61) and Supply Chain III (₹3.04). Highest net returns by the farmers in Supply Chain IV indicated that they implemented more efficient management practices as compared to farmers in other supply chain. Based on the result, null hypothesis H1 is rejected since there is significant difference in profitability of integrated (Supply Chain II and III) and traditional (Supply Chain I and IV) poultry farming systems.

4. CONCLUSION

The poultry industry in India is experiencing consistent growth, providing a source of income

for many people seeking alternative livelihoods beyond traditional agriculture. While some regions like Telangana, Andhra Pradesh, Tamil Nadu, and Maharashtra contribute significantly to the industry, not all areas are developing equally. The study aimed to investigate why certain regions remain untapped, identifying challenges faced by farmers and system deficiencies.

Poultry farms were classified as small, medium, and large, with varying levels of investment and cost structures across different supply chains. Small farms operated within Supply Chains II and III, where fixed costs were high due to infrastructure investments, while net returns varied between the two chains. Medium-sized farms spanned Supply Chains II, III, and IV, each facing different costs and returns. Farms in Supply Chain IV experienced higher net returns due to independent management and higher investments in infrastructure. Large farms, particularly in Supply Chain IV, had substantial investments, primarily in buildings, leading to higher net returns per bird. However, the distribution of variable and fixed costs differed across supply chains, affecting profitability.

In conclusion, the Indian poultry industry demonstrates promising growth with considerable untapped potential in certain areas. Further exploration and targeted support could enhance development and profitability across the industry.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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