RESEARCH ARTICLE

Profitability Analysis of Backyard Poultry Farming in Kheda District of Middle Gujarat, India: Triple Cross Vs Indigenous Chicken

Ashish B. Mahera[1]*, Snehal Mishra[2], Nikesh J. Bhagora[3], Yogesh A. Lad[4], M. Sathish Kumar [4]

Abstract

Backyard poultry is an age-old practice in India, particularly in rural areas, where households raise small groups of local chickens for family food. Though India's poultry industry has proliferated in the previous five decades, it has primarily been limited to the commercial poultry sector, which is concentrated in and around urban and semi-urban areas. This study aimed to determine the profitability of backyard poultry production of triple cross and indigenous chicken in the Middle Gujarat region. A well-structured questionnaire was used to collect data from 15 triple cross and 15 indigenous chicken farmers comprising 30 respondents in Kapadwanj Taluka of Kheda district in Middle Gujarat. The data were analyzed using profitability analysis and the Garret Ranking technique. Chicks up to the age of eight weeks killed by predators such as dogs and cats were the major constraint faced by the poultry farmers. The beneficiaries' second major constraint was a lack of knowledge about the scientific rearing of chickens. Labour cost was the highest of the total cost of production. Income from selling eggs followed by selling males for meat purposes were major contributors to income generation. Triple-cross chicken's net income per unit of 22 birds was Rs. 8617.12, while indigenous chicken's net income per unit was Rs. 6308.33. BC ratio of triple cross chicken (2.58) was higher than BC ratio of indigenous chicken (2.20).

Key words: Backyard poultry farming, Indigenous chicken, Profitability analysis, Triple-cross chicken.

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Introduction

Backyard poultry farming (BYPF) is a traditional activity followed by many rural households in India. In backyard poultry farming, desi or indigenous breeds of poultry are reared. Generally, backyard poultry farming is done with significantly less or no input. BYPF provides ready cash and food. Backyard poultry farming with improved chicken varieties is slowly gaining popularity as a potential tool to alleviate protein deficit and provide subsidiary income among the rural and tribal people across the country (Emokara *et al.,* 2016). Poultry farming is profitable due to the minimal space requirements, inexpensive capital investment, quick returns on investment, and evenly distributed turnover throughout the year. Backyard poultry increases income and provides nutritional security, improving the farmers' socio-economic situation (Rath *et al.,* 2015). In developing countries, including India, backyard poultry is essential to rural poultry production (Weyuma *et al.,* 2015). Backyard poultry farming has been identified as a possible instrument for eradicating malnutrition, lowering rural unemployment, establishing viable jobs, and alleviating rural poverty (Sharma and Chatterjee, 2009; Rajkumar *et al.,* 2010). It significantly impacts the socio-economic and nutritional status of low-income and malnourished people. Housing is required in backyard poultry farming, or free-range systems are simple, inexpensive, and manufactured from locally accessible materials (Sonaiya, 2004). Backyard poultry farming with low input and scientific management procedures provides year-round income, employment for youngsters, and a return to the farmer (Kumar *et al.,* 2014).

[1]Department of Marketing Management, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India

[2]Department of Agribusiness Economics and Policies, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India

[3]Poultry Research Station, Kamdhenu University, Anand, 388110, Gujarat, India

[4]Department of Human Resource Development & Personnel Management, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India

Corresponding Author: Ashish B. Mahera, Department of Marketing Management, International Agribusiness Management Institute, Anand Agricultural University, Anand, 388110, Gujarat, India. e-mail: drashish.mahera@gmail.com

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Though India has shown tremendous growth in poultry production over decades, backyard poultry farming is still lagging and has always been neglected. The indigenous breed of poultry is low-producing (Ali, 2015). Government agencies emphasize increasing egg production of indigenous poultry breeds by breed improvement. One of the mandates of Central Poultry Development Organizations (CPDOs) is to focus on an improved variety of chicken for backyard poultry that can survive at the farmer's doorstep. Several scientists world over (Maikasuwa and Jabo, 2011; Tufail *et al.,* 2012; Anang *et al.,* 2013; Islam *et al.,* 2015; Emokara *et al.,* 2016; Baruah and Raghav, 2017; Rawat and Kamal, 2019; Chakrabarti *et al.,* 2020) have studied the profitability of backyard poultry farming using indigenous and improved varieties of poultry and concluded that it's a good venture for nutritional and socio-economic security of small and marginal farmers and tribal people. The objectives of the present study were to assess the profitability of backyard poultry farming through the cost and return of poultry farming in Gujarat and to identify significant constraints in rural poultry farming.

Materials and Methods

Sampling Design

This study was conducted in consultation with Poultry Research Station, AAU, Anand (now Kamdhenu University, Anand) to investigate backyard poultry farmers in Kapadwanj Taluka of Kheda District in Middle Gujarat. A total of 30 beneficiaries with experience in Backyard poultry farming were selected. Fifteen beneficiaries who got triple-cross (n=22 birds per beneficiary) developed by Poultry Research Station, AAU, Anand were selected as respondents, and the other 15 selected respondents had desi (indigenous) chicken (average n=22 birds per beneficiary). The project duration was 48 weeks. Total cost and total return were calculated for 48 weeks of rearing by adopting the following technique.

Analytical tools

Analytical tools, Benefit-cost (BC) ratio, Garrett ranking, Tabular analysis, and descriptive statistical tools were used to achieve stipulated objectives (Baruah and Raghav, 2017).

Net Return Technique

Net return = GR – GC and **BC ratio** = GR / GC

Where, GR = Gross return, and GC = Gross cost.

GC = TFC + TVC

TFC= Total Fixed Cost, TVC= Total Variable Cost

Garrett Ranking Technique

Here ranks assigned by the individual respondents were converted into their % position value by using the formula

$$\% \text{ Position} = 100 (R_{ij} - 0.5)/N_j$$

where, R_{ij} stands for ranks given for the i^{th} factor by the j^{th} individual, and

N_j stands for number of items ranked by j^{th} individual

Results and Discussion

To meet the stipulated objective of profitability analysis, total cost and revenue were calculated for Local (desi) chickens and Triple-cross (TC) chickens. The cost and return were calculated for n=22 chickens each.

Table 1: Estimated cost of rearing of local and triple-cross chicken (for 48 weeks)

Particulars	**Triple cross chicken** (n=22)	**Local chicken** (n=22)
No. of respondents	15	15
A) Fixed Cost		
a) Land (available with farmer)	Yes	Yes
b) Cost of poultry shed or cage (Rs.)	2136.67	1830.00
c) Depreciation on poultry shed @ 33.33% per year (Rs.)	789.93 (14.47)	741.06 (14.11)
d) Cost of drinker and feeder (Rs.)	64.40 (1.18)	60.67 (1.15)
Total fixed cost (c+d) (Rs.)	854.33 (15.65)	801.72 (15.26)
B) Variable Cost		
1) Cost of chicks (Rs.)	308.00 (5.64)	440.00 (8.38)
2) Cost of feed (Rs.)	828.13 (15.17)	714.20 (13.60)
3) Cost of medicines (Rs.)	17.33 (0.32)	0.00 (0.00)
4) Transportation cost (Rs.)	178.67 (3.27)	46.33 (0.88)
5) Family labour charge (Rs.)	3093.75 (56.68)	3093.75 (58.89)
6) Miscellaneous cost (cost of gunny bags, electricity) (Rs.)	177.67 (3.26)	157.00 (2.99)
Total variable cost (1+2+3+4+5+6) (Rs.)	4603.55 (84.35)	4451.28 (84.74)
Total cost of production/Gross cost (TFC+TVC) (Rs.)	5457.88	5253.01
Cost of production per bird (Total cost of production / No. of chicken) (Rs.)	248.09	238.77

Figures in the parentheses indicate percentages.

As shown in Table 1, the total cost was calculated by adding the total variable costs and fixed costs. In total fixed cost, depreciation on poultry shed was 14.47 % of total cost for TC and 14.11 % for desi chicken which is nearly similar to the findings of Baruah and Raghav (2017) in which depreciation on poultry shed was 10.63% of the total cost. The cost of a feeder and drinker for TC birds was 1.18 % of the total cost, while for desi chickens, it was 1.15 %. In total variable cost, labor cost was highest, *i.e.,* 56.68 % for TC and 58.59 % for desi chicken. Nearby results were found by Islam *et al.* (2015), who found 58.48 % of labour cost for Vanaraja chicken. Baruah and Raghav (2017) found higher labour cost 71.73% of desi chicken as compared to Vanaraja chicken. Dhariya *et al.* (2013) also found labor cost 46.27% that was the highest in the total cost. Feed cost of BYPF ranked second in variable cost, i.e., 15.17 % for TC and 13.60 % for desi chicken. Dhariya *et al*. (2013) also found the second highest feed cost i.e. 18.86% of the total cost. Baruah and Raghav (2017) found feed cost as 16.72 % of the total cost. Similar results were found by Islam *et al*. (2015) who found 13.58 % feed cost. Present findings are contradictory to the finding of Nath *et al*. (2013), who reported the feed cost 90.95% which constituted the highest expenditure for both Vanaraja and local chicken under backyard rearing. Other significant costs include the cost of chicks which was 5.64 % for TC and 8.38 % for desi chicken. Baruah and Raghav (2017) found almost similar 5.31 % chick cost, whereas Islam *et al.* (2015) and Dhariya *et al*. (2013) found a higher 12.80 % and 15.05 % chick cost, respectively, as compared to the present study. Transportation costs accounted for 3.27 % for TC chicken and 0.88 % for desi chicken. Transportation costs for TC chickens were higher because they were brought from AAU, Anand, while desi chickens were purchased from nearby villages only. The miscellaneous cost, including gunny bags and electricity, was 3.26 % for TC chicken and 2.99 % for desi chicken. Similar type of miscellaneous cost was found by Dhariya *et al*. (2013). Total cost of production of TC was higher (Rs. 5457.88) than Desi chick (Rs. 5251.01). Baruah and Raghav (2017) also found a higher cost of production of Vanaraja chicken as compared to Desi chicken.

Total revenue was calculated from total income by selling cocks for meat purposes and selling eggs and selling spent hens for meat purposes. Beneficiaries were selling male birds for the meat purpose. They were getting income from selling eggs laid by the hens to the local market. Beneficiaries were selling female birds mainly spent hens for meat purposes. Female birds were getting less price as compared to the male birds. As per the information furnished in Table 2, selling eggs contributes the highest share, 65.26 % in total for TC chicken and 48.21 % for desi chicken in gross income generation. Similar results were found by Baruah and Raghav (2017), who also found the highest income share 48.53 % from selling of eggs and Islam *et al.* (2015) who got 57.26 % income from selling eggs for Vanaraja and 40% for Local chickens. As egg production in TC chicken (95 eggs) was higher than desi chicken (52 eggs) for 48 weeks, income from selling eggs in TC was more than desi chicken. Income from the selling of cock for meat purposes contributed second for income generation. For TC, income from selling cocks was 25.24 % compared to 39.78 % for desi chicken. Islam *et al.* (2015) also found similar 34.36 % of income from sell of male cock for Local chicken and 30.81 % for Vanaraja chicken. There is a high demand for Desi chickens as compared to improved varieties (TC) and they fetch higher prices also. Income from the selling of hen comprised of 9.50 % for TC chicken and 12.01 % for desi chicken. Net income for TC chicken unit of 22 birds was Rs. 8617.12, and for desi chicken it was Rs. 6308.33. Similar results were found by Baruah and Raghav (2017), who also found higher income from selling Vanaraja chicken as compared to local chicken. The BC ratio for TC chicken was higher (2.58) compared to the BC ratio of desi chicken (2.20). Baruah and Raghav (2017) also found a higher BC ratio of Vanaraja chicken 2.84 as compared to local chicken 2.25. Respondents were selling eggs and chicken for meat purposes from their homes only.

Table 2: Estimated return from local chicken and triple cross reared up to 48 weeks of age

Particulars	Triple cross chicken	Local chicken
1. Income from the selling of male chicken (Rs.) (Average selling price per male bird for TC = Rs. 419.10, and Desi = Rs. 521.66)	3552.67 (25.24)	4599.33 (39.78)
2. Income from selling of eggs (Rs.) (Average selling price per egg for TC = Rs. 13.93, and for Desi = Rs. 14.46)	9185.33 (65.26)	5573.33 (48.21)
3. Income from selling of female chicken (Rs.) (Average selling price per female bird for TC = Rs. 334.33, and for Desi = Rs. 372.66)	1337.00 (9.50)	1388.67 (12.01)
4. Total Gross Income (Rs.) (1+2+3)	14075.00	11561.33
5. Net Income (Total Gross Income - Total cost of production) (Rs.)	8617.12	6308.33
6. Net income/bird (Net Income / No. of chicken) (Rs.)	391.69	286.74
7. Gross Margin (Net Income-Total Variable Cost) (Rs.)	4013.57	1857.04
8. Net Farm Income (GM- Total Fixed Cost) (Rs.)	3159.23	1055.32
9. Benefit-cost-ratio (BCR)	2.58	2.20

Figures in the parentheses indicate percentages. Productive birds survived out of 22 chicks unit each in the beginning were only considered for this economics.

Table 3: Comparison of economic traits between triple cross and local chicken (48 weeks)

Particulars	Birds	Average	Minimum	Maximum
Net income (Rs.)	TC	**8617.12**	3280.01	13113.25
	Local	6308.33	3983.01	8726.25
B:C ratio	TC	**2.58**	1.52	3.63
	Local	2.20	1.75	2.81
Age at first egg (days)	TC	**162**	150	175
	Local	186	160	210
Egg production (No.)	TC	**95**	80	112
	Local	52	50	55
Egg Price (Rs.)	TC	13.93	12	16
	Local	**14.46**	12	17
Male bird Price (Rs.)	TC	419.10	400	600
	Local	**521.66**	450	650
Female bird price (Rs.)	TC	334.33	300	350
	Local	**372.66**	350	400

A triple cross is an improved variety of chicken developed by Poultry Research Station, AAU, Anand. Improved varieties performed better as compared to local varieties. Such varieties can be reared at farmers' doorstep, and their production is also more than local varieties. It can be seen from Table 3 that net income from TC was more (Rs. 8617.12) than Local chicken (Rs. 6308.33). BC ratio of TC was 2.58, whereas for Local it was 2.20. Age at first egg (AFE) for TC was 162 days, while AFE for local chicken was 186 days. The results show similarities with the study of Baruah and Raghav (2017), where AFE was better in Vanaraja chicken as compared to local chicken. Total egg production for TC was 95 eggs for 48 weeks, which was higher than local chicken, *i.e.,* 52 eggs only. Nearby results were also found by Baruah and Raghav (2017), who also found better egg production in Vanaraja chicken as compared to local chicken. Thus, economically and production-wise, BYPF with improved varieties of chicken like triple cross chicken may give better results to the respondents, though the produce from desi or indigenous chicken fetch more prices as their demand is huge amongst consumers, but has low production.

Table 4: Constraints faced by respondents

Rank	Constraints	Garrett score
1	Chicken killed by predators	80
2	Lack of awareness of scientific poultry farming practices	68
3	Low space for chickens due to small size cage for night shelter	60
4	High cost of compound poultry feed	53
5	Unavailability of compound poultry feed in nearby areas	47
6	Unavailability of poultry medicines in nearby area	40
7	Chicken death by diseases	32
8	Chicken death due to weather conditions	20

In backyard poultry farming, there were some constraints faced by beneficiaries which are mentioned in Table 4. Chicken killed by predators was a significant constraint found in the study area. Dhariya *et al.* (2013) recorded mortality due to natural enemies or predators that was ranked second by 60 % of respondents. In backyard poultry farming, chickens scavenged most of the day. At night they were given shelter in poultry cage or shed. During scavenging, chickens, mainly tiny chicks up to 8 weeks, were killed by predators like dogs and cats. Lack of awareness regarding the scientific rearing of chicken was the second constraint faced by beneficiaries. Dhariya *et al.* (2013) found 59 % of constraints faced by the poultry farmers. Backyard poultry farmers were rearing chickens using old-age techniques; they were not using scientific techniques. Scientific techniques include chicken vaccination, space requirements for chickens, knowledge of some common diseases and their medication, knowledge regarding feed additives, and knowledge of feeding chickens. Poultry farmers were keeping chickens in a small cage. They were not given sufficient space in the cage/ shed. There were some cases of death reported in chickens, especially in chickens more than 20 weeks of age, due to lack of space.

The following suggestions may be adopted to resolve some problems based on field experience and review literature: (1) minimize mortality due to predators by adopting varieties with good running speed and perching ability, (2) take special care of chicks up to 8 weeks of age, (3) impart training programs regarding scientific rearing of rural poultry chicken to increase awareness, (4) minimize feed cost by using locally available feed like maize, rice, wheat, bajra, pulses, vegetables, and kitchen waste appropriately to maintain a balanced feed, and (5) minimize mortality by providing proper space for chickens in cages for night shelters. The space requirement for Backyard poultry farming is 1.5-2.0 square feet per bird.

Conclusions

The present study on profitability analysis of BYPF in Middle Gujarat reveals that the net income per unit of 22 birds for triple-cross chicken is higher than the desi chicken (Rs. 8617.12 vs. 6308.33). The benefit-cost ratio is higher in the triple cross chicken than desi chicken (2.58 vs. 2.20) under backyard poultry farming. Thus, rearing improved varieties like triple cross in backyard poultry farming is a profitable venture that will help increase the income of beneficiaries in rural areas, and may result in poverty reduction in the long run through income generation and overall improvement in livelihood. Backyard poultry farming will flourish if the beneficiaries are given training regarding the scientific rearing of chickens and chickens' protection from predators, especially at the chick stage.

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