

Effect on Small-Scale Broiler Farming At Rural Households With or Without Management Intervention During Summer

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Abstract: The study was conducted to determine the productive performance and profitability of small scale broiler farming at rural households carried out with or without management intervention during summer. Twelve thousand six hundred day old chicks were procured from a commercial hatchery and distributed into 36 farms of which 18 farmers in six treatment groups (100, 200, 300, 400, 500 and 600 birds) were allowed to manage their farms in their own way while the other 18 were in six treatment groups (100, 200, 300, 400, 500 and 600 birds) trained on the basic principles of broiler farm operation, management and procedure of record keeping. Six groups, each of the three farmers (18 farmers) were provided training whereas another six groups, each of three treatment groups (18 farmers) were considered from non-trained section for comparison. Each and every trained farm owners took care of chicks providing improved management including feeds and feeding procedures, housing, disease prevention, medication, vaccination etc. as per instructions. Data were collected for productive performance, cost of farming and returns were used to determine the benefit cost ratio (BCR). Data were statistically analysed and comparisons of results were made between farms with intervention those were no intervention. Management intervention and flock size had some effects on broiler growth performance like FCR and survivability. Higher survivability and lowest FCR values found in improved management than the birds reared on traditional management. Feed efficiency improved as the flock size increased. BCR value increased with the increasing in flock size that is larger flock earns more profit than smaller counterpart. The farmers who followed improved management in summer also earned more profit than who had not practiced improved management. It was concluded, therefore, the satisfactory productive performance is achievable and profitability be improved from scale broiler farming at rural households of the farmers if management intervention is made.

Keywords: cost and return; flock size; management intervention; small-scale;

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I. Introduction

Identified of factors affecting the profitability of small-scale broiler farming at rural households under traditional system of rearing, it was decided to conduct a field trial to investigate whether improved management like feed management, water management, backed by extension support could accelerate productivity and profitability. Therefore, the experiment was conducted to i) assess the productive performance, costs and returns of small-scale broiler farming under field conditions with or without management intervention in summer and ii) to identify the constraints of small-scale broiler farming.

II. Materials And Methods

Thirty six small-scale broiler farmers who had some facilities at their home in terms of farm inputs were selected from Bhabkhali and Baera union under sadar Upazila of Mymensingh district. Among them, 18 farmers were allowed to manage their farms in their own way while the other 18 were trained on the basic principles of broiler farm operation, management and procedure of record keeping. Management intervention was made for this later group during the course of farm operation. This group of farmers also received a short training before they started farming. Most (97%) of the broiler houses of farmers were made of tin-roof with bamboo-mat ceiling and 1-1.5 feet wooden or brick wall with wire net boundary. Floor type was *kutch*a (clay made) with cemented coating. Farmers repaired their broiler houses, cleaned, washed and dried, fumigated before the commencement of trial. A floor space of 900 cm² was provided for each bird in each flock. Clean

new papers were spread over the litter, and the house was warmed up for at least 2 hours before the arrival of day old chicks (DOCs). Farms with small flocks in operation were conducted from 28 May to 30th June 2011. During this period, the maximum temperature was 32.2°C and minimum temperature was 26.97°C; maximum humidity was 94.30% and minimum humidity was 72.50%. Twelve thousand six hundred DOC were procured from a commercial hatchery and distributed into six treatment groups (100, 200, 300, 400, 500 and 600 birds). Six groups, each of the three farmers (18 farmers) were provided training whereas another six groups, each of three treatment groups (18 farmers) were considered from non-trained section for comparison. Each and every trained farm owners took care of chicks providing improved management including feeds and feeding procedures, housing, disease prevention, medication, vaccination etc. as per instructions.

Strict hygienic measures and appropriate sanitation programmes were carried out by the small-scale broiler farmers of different flock sizes during the whole trial period. Frequent visits were made to farmers' households and management intervention in terms of practical training and technical advice were provided to selected farmers on all sorts of rearing and management of the broiler flocks. Efforts were made to correct faults when found on the spot during visit. Activities in relation to management practices of flocks in improved and without improved management groups are shown in Table 1

Records were kept of initial body weight at one day old, weekly body weight, feed intake and mortality for each small flock. Economic performances of small flocks were estimated on both variable and total cost basis that is called tabular technique, which is easy to understand and simple in calculation. The total cost of these broiler enterprises were categorized into variable and fixed costs. Variable costs were those costs that varied with the size of the flock. Fixed costs are those costs that remain fixed whether production is zero or positive. This included interest on housing and equipment cost, depreciation of housing, depreciation of tools and equipment, land use cost and opportunity cost of family labour. Housing cost was estimated by unit cost basis (per piece of 1 sq.ft area) which is dependent on quality of housing materials. Costs of tools and equipment were determined multiplying the total number of equipment by the market price of equipment. Interest rate was calculated at the rate of 12% per annum because housing and few types of equipment are long term investment and it was charged after discussion with the Bangladesh Krishi Bank (BKB) officials. Depreciation cost of both house and equipment were assumed as 5% per year. Land use cost was estimated using 8% interest on value of land for 5 years lease. Opportunity cost of family labour accounted on the basis of labour use as part time job in another broiler farm. Gross return was estimated as the value of live weight, used litter and excreta and sale of gunny bags on the basis of market price. Gross margin and net return were estimated deducting from the gross return to variable cost and total cost, respectively. Finally, profitability as well as BCR was estimated from total gross return divided by total cost.

Table 1 Differences between with or without improved management of broiler farms in summer

Activity	Without improved management	With improved management
Use of antibiotic	Indiscriminate use in drinking water	No application of antibiotics.
Use of electrolyte	Seldom practiced electrolyte and vitamin supplementation.	Everybody practiced electrolyte and vitamin supplementation during hot weather.
Feed management	No consideration to environmental temperature.	Considered environmental temperature and increased frequency of feeding in coolest part of the day as the birds became older.
Drinking water	Supplied water regularly but water temperature was not considered.	Farmers supplied cold, clean and fresh water considering the environmental temperature.
Litter management	Somebody reused litters and seldom practiced racking and stirring litters.	Everybody used fresh litters and 2-3 times racking and stirring were done in a day during cool hours.
Foggers	Did not maintain foggers inside and outside of the house.	Maintained foggers inside and outside the house.

All recorded and calculated parameters of biological trials were for a 2 rearing systems × 6 flock sizes were analyzed following factorial experiment in a Completely Randomized Design (CRD) for general analyses of variance (ANOVA) using SAS 9.1.3 (2007) package program. When parameter showed significant difference, least significant difference (LSD) was calculated to make comparison among treatment groups.

III. Results And Discussion

3.1 Growth performance and flock size

The performance of small-scale broiler units of 100, 200, 300, 400, 500 and 600 birds that were achieved under rural condition with or without improved management is presented in Tables 2 and 3. Birds reared by different small-scale farmers exhibited no marked differences ($P > 0.05$) in body weight and survivability. However, feed consumption of broilers differed significantly ($P < 0.05$) among various farm categories. It was observed that the most important broiler growth performance factor FCR was significantly ($P < 0.001$) correlated with the flock size. It was seen that feed consumption and FCR had decreasing trends with increasing size of the flock. Poor live weight achieved in smallest flock size compared to other increasing flock

sizes was probably due to inadequate technical knowledge on broiler management that might have been arisen from their inherent educational background resulting from poor technology receiving ability. Chowdhury *et al.* (2010) stated that most of the small-scale broiler farmers had only primary level of education, which explained their difficulty in understanding the science and technology related to poultry production and their inability to apply scientific knowledge in practice during their farm operation which resulted low growth performance in terms of FCR. Present findings partially similar with the result of Fouzder (2006) and Farming System and Environment Study (FSES) (2002a) where no marked differences among farm categories in feed consumption, FCR and survivability of broilers were found. Body weight and FCR of broilers increased with the farms categories that were linked with farmers’ knowledge. Previous study of Akteruzzaman *et al.* (2009) also showed that farmers’ technical knowledge accelerated poultry production as well as increased their income with consequent expansion of their farm size. Therefore, the flock size had effects on feed consumption and FCR of broilers in small-scale broiler farming at rural households.

Table 2 Effect of flock size on growth performances of small-scale broiler farming

Parameter	Flock size						SED	Level of significance
	100	200	300	400	500	600		
Body weight (kg/bird)	1.442	1.452	1.438	1.460	1.468	1.473	0.027	NS
Feed consumption (kg/bird)	2.950 ^a	2.832 ^{ab}	2.718 ^b	2.697 ^b	2.643 ^b	2.630 ^b	0.074	*
FCR	2.05 ^d	1.95 ^b	1.89 ^{bc}	1.85 ^{cd}	1.81 ^d	1.79 ^d	0.024	***
Survivability (%)	94.71	95.58	94.17	94.73	95.10	94.73	0.847	NS

Means bearing superscripts not in common in each row differ significantly; NS, Non-significant; *, P<0.05; ***, P<0.001.

3.3 Growth performance and flock management

Results indicate that difference in management did not exert any marked influence on feed consumption and body weights of broilers (Table 3). However, it has been found that broilers converted feed more efficiently (P<0.001) when improved management was practiced. Survivability was also significantly (P<0.001) higher in birds that received improved management. It might have been resulted from comparatively better brooding, better feed management, addition of extra vitamins and electrolytes to cool drinking water in high temperature, standard biosecurity etc. practiced in improved management by trained farmers, in contrast to those followed traditional management. FCR values of scientifically managed farm at field level in the present study were 1.84, whereas it was 1.93 when improved management was absent. Lack of facilities to train poultry farmers on various aspects of broiler farming was a major deficiency in feeding regime and management that greatly affected production efficiency. The results clearly indicated that farms supervised by technical person were better than those managed by rural farmers without technical help from any corner. This result was in agreement with Jabber *et al.* (2007) who reported that contract farmer was more performer than private farmer. Under contract farming system, farmers got technical support in some areas during rearing of broilers. Jaim and Islam (2008) concluded that feed consumption was lower and efficiency was higher in technically supported farms than that of non-supported farmers. In this study, the FCR values in both managements were higher than that of standard value of the Cobb Breeding Company Limited, which was may be due to the high temperature (27°C to 33°C) that caused less feed utilization by the broiler and ultimately survivability decreased where improved management and technical support were not provided. Okelo *et al.* (1998) reported that high ambient temperature greatly affected the production performance and mortality of broilers. They also observed that cool drinking water effectively relief heat stress, enhanced greater intake of drinking water, cool roost and carbonated drinking caused highest survivability and FCR.

Table 3 Effect of flock management on growth performances of small-scale broiler farming

Parameter	Flock management		SED
	Without improved management	With improved management	
Body weight (kg/bird)	1.436	1.476	0.016
Feed consumption (kg/bird)	2.778	2.712	0.043
Feed conversion ratio***	1.93	1.84	0.014
Survivability (%) ***	93.35	96.32	0.489

***, P<0.001.

Interaction of flock size and flock management did not have any significant influence on the productive performance of body weight, feed consumption, FCR and survivability of broilers in different flock sizes.

3.4 Cost of broiler production

The total costs of the enterprise were categorized into fixed and variable costs. Findings indicate that the estimated fixed costs were statistically significant ($P < 0.05$) among various flock sizes (Table 4). The highest fixed cost was found in the smallest size of the flock (100) and the lowest fixed cost was seen in comparatively higher flock size (600), whereas remaining flocks were differed each other but the difference was not significant. It may be due to the quality difference in equipment as the buying capacity of the different category of the farmers and labour costing. The labour cost covered ranging from 1.57 to 2.79% per bird of the total cost that shared the major portion of the fixed cost. Fixed cost incurred only 2.05 per cent to 3.73% among different flock sizes which accounted for 3.27 to Tk. 6.69 per bird of total cost that is nearly similar to that of Begum (2004) and Fouzder (2006). They showed that fixed cost ranged from 1.53 to 2.02% and 1.91 to 1.94% of the total cost of different farm categories, respectively. Fixed cost did not significantly differ ($P > 0.05$) with flock management and interaction between flock size and flock management (Table 4). Variable cost included feed cost, chick cost, vaccination cost, medication electricity cost etc.

Table 4 Effect of flock size on profitability of broiler farming

Parameter	Flock size						SED	Level of significance
	100	200	300	400	500	600		
Fixed cost	3.733 ^a	2.985 ^b	2.49 ^{bc}	2.667 ^{bc}	2.728 ^{bc}	2.052 ^c	0.222	**
Variable cost	96.27 ^c	97.02 ^b	97.51 ^{ab}	97.33 ^{ab}	97.27 ^{ab}	97.96 ^a	0.222	***
Total cost (Tk./Br)	179.62 ^a	168.13 ^b	164.26 ^{bc}	163.90 ^{bc}	160.64 ^{bc}	159.45 ^c	2.459	***
Return (Tk./Br)	199.72	201.42	199.30	203.23	203.85	204.44	3.722	NS
Sac return (Tk./Br)	0.675	0.760	0.650	0.370	0.565	0.613	0.031	NS
Droppings return (Tk./Br)	1.72	1.71	1.74	1.72	1.74	1.75	0.035	NS
Gross return (Tk./Br)	202.12	203.88	201.69	205.31	206.15	206.80	3.728	NS
Net return (Tk./Br)	22.50 ^c	35.75 ^b	37.43 ^b	41.41 ^{ab}	45.51 ^a	47.35 ^a	2.456	***
Net return (Tk./kg)	15.39 ^c	24.71 ^b	25.88 ^b	28.20 ^{ab}	30.80 ^a	32.04 ^a	1.428	***
Benefit cost ratio	1.13 ^c	1.22 ^b	1.23 ^b	1.26 ^{ab}	1.29 ^a	1.30 ^a	0.015	***

Means bearing superscripts not in common in each row differ significantly; ***, $P < 0.001$; NS, Non-significant; Br, Broiler; SED, Standard error of difference.

3.5 Return from broiler farming

Gross return is mainly affected by the market price of live broiler that is dependent on market demand and availability of other substitute foods like meat, fish, vegetables etc. During summer (March to June), due to scarcity of vegetables, fish and other foods, live broiler had to occupy higher market price that resulted handsome gross return to the broiler farmers. Gross return from the marketing of live broilers, sac and droppings indicated that it was increased with the flock size but the difference was not significant whereas management intervention had a significant ($P < 0.02$) effect on gross return from broiler farming (Tables 4 and 5). This was due to significantly higher live weight gain (Table 3) where intensive care was taken than practiced in conventional management by the individual farmers. Receiving higher market price in improved management group were also aggregated gross return than in without improved management. Poor marketing knowledge and less awareness of market conditions also deprived farmers who did not follow improved management and training. Similarly Mohsin *et al.* (2008) observed that small farmers had losses due to poor marketing knowledge and less awareness of market condition than trained farmers (Akteruzaman *et al.*, 2009). Interaction effects of flock size and flock management had no significant effect with respect to gross returns.

Table 5 Effect of flock management on profitability of broiler farming

Parameter	Flock management		SED	Level of significance
	Without improved management	With improved management		
Fixed cost	2.567	2.985	0.128	
Variable cost	97.44	97.02	0.128	**
Total cost (Tk./Br)	171.74	160.26	1.419	***
Return (Tk./Br)	198.27	205.71	2.149	NS
Sac return (Tk./Br)	0.562	0.649	0.018	NS
Droppings return (Tk./Br)	1.73	1.73	0.020	NS
Gross return (Tk./Br)	200.56	208.09	2.153	*
Net return (Tk./Br)	28.82 b	47.83 a	1.418	***
Net return (Tk./kg)	20.03b	32.31a	0.806	***
Benefit cost ratio	1.17 b	1.30 a	0.009	***

*, $P < 0.05$; ***, $P < 0.001$; NS, Non-significant; Br, Broiler; SED, Standard error of difference.

Net profit per broiler or per kg was highly affected by the flock size and the flock management (Tables 4 and 5). Table 4 showed the net income on overall farms amounted to Tk. 15.39, 24.71, 25.88, 28.20, 30.80 and 32.02/kg in F₁, F₂, F₃, F₄, F₅ and F₆ flock size, respectively. Thus, large flock (F₆) was most profit efficient than that of their other comparative five smaller size counterparts. Higher net profit, Tk. 32.04/kg was found in large flock size (F₆) and lowest profit, Tk. 15.39/kg had in small flock size. It indicated that as the flock size increased the net income also increased. Such a relation of flock size with net return may have been arisen for the increased ability of the larger flock size to decrease per unit variable cost. The result also showed that there was scale effect on economic efficiency of the broiler farms as economic efficiency was found to increase with the increase of scale farming (number of birds in the flock). These results were also in agreement with the result of Islam *et al.* (2010). Table 9 indicated that significantly higher ($P<0.001$) net profit was found where improved management was practiced by the broiler farmers resulting from training and regular monitoring. Like net profit, BCR values positively ($P<0.001$) increased with an increase in flock size (Table 8). Increasing total number of broilers reared in a flock reduced variable cost and total cost (Table 3.10), side by side increased the rate of return with a consequent marked improvement in BCR. Maximum cost (96%-97%) was incurred in variable cost of which major (48%-50%) cost involved in feed item for broiler production (Table 6). Thus, the profitability of individual farms depends on feed utilization as well as FCR by the broiler. Reduction of FCR might improve the profitability which was reflected in flock size as shown in Table 3.6. Chand *et al.* (2009) also suggested that profitability is enhanced if farmers are properly trained to improve FCR value, thereby reducing production cost and if biosecurity is strengthened to reduce mortality under field condition. Management intervention had a significant ($P<0.001$) effect on BCR (Table 9). Higher BCR (1.30) was found in improved management than that found in without improved management group. This might have resulted from skill and technical knowledge of the farmers which was more for achieving better performance in FCR as indicated in Table 3. These results coincided with the earlier findings of Islam *et al.* (2010), who concluded that comparatively larger farms achieved higher economic efficiency due to better cost economy and better technical performance of the flocks.

During summer, a significant difference was found on feed consumption and FCR among the flock sizes. FCR decreased with increasing flock sizes. Survivability rate increased and FCR decreased in summer when management intervention was made by technical personnel. Improved management groups showed a FCR (1.84) that was lower than in without improved management (1.93). Results indicated that flock management and flock size had clear impact on broiler productivity. Total cost of production decreased with increasing flock size whereas BCR increased. Highest BCR was found in 500 flock sizes (1.29) and 600 flock sizes (1.30) than the remaining four flocks. Lowest cost of broiler production was found when improved management was practiced. Therefore, significantly higher BCR values was found in improved management (1.30) than in without improved management (1.17). High temperature, excessive load shedding in rural areas during summer, lack of technical knowledge of farmer and high chick cost were the major challenges for the farmers to explore higher productivity and profitability.

IV. Conclusion

Management intervention and flock size had some effects on broiler growth performance like FCR and survivability. Higher survivability and lowest FCR values found in improved management than the birds reared on traditional management. Feed efficiency improved as the flock size increased. Cost and return affected both input and output cost of the broiler farming. BCR value increased with the increasing in flock size that is larger flock earns more profit than smaller counterpart. The farmers who followed improved management in summer also earned more profit than who had not practiced improved management. It is therefore concluded that training to the small-scale broiler farmers, introduction of improved management practices, regular monitoring with adequate poultry extension services are the key elements to get satisfactory result from broiler farming. These might enhance better productive performance as well as maximize profitability. High temperature, frequent power break in rural areas, insufficient technical and poor marketing knowledge, poor technology, improper marketing facilities and lack of biosecurity of the flock were the major constraints of broiler farming.

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