

*Article*

## **Smallholder duck farming: a potential source of livelihood in haor women in Bangladesh**

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**Abstract:** An experiment was carried out to investigate the effects of feed supplementation on growth performance of Jinding duckling in Haor Household. Nine hundred unsexed day old ducklings were considered for the feeding trial. Duckling were divided into three dietary treatments having 3 replications (50 duckling per replication) and reared on littered floor in an open sided house by providing 0.14 m<sup>2</sup> floor space per bird. Dietary treatments Group 0 was considered as control or full scavenging group, fed mash feed to the other group 25 g and 50 g per duck per day. Body weight and body weight gain were improved significantly ( $p < 0.05$ ) with the increasing levels of feed supplementation compared to no feed supplementation group during the period of 4-12 weeks. The average net return of per duckling of 25 g dietary group was significantly ( $p < 0.05$ ) higher than that of no supplementation group and 50 g dietary group throughout the experimental period. Net return per batch were 1924 BDT in 25 g feed supplementation group at 12 weeks and yearly net profit was 6735 BDT by rearing of 50 ducklings. Benefit–cost ratio was 1:1.30. The result revealed that duck intervention increased duck production, reduce duckling mortality and improved haor women’s source of income and significantly contributes to rural livelihoods.

**Keywords:** duckling; feed supplementation; growth; profit; haor

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### **1. Introduction**

Duck rearing is an integral part of poultry production in Bangladesh. Duck population of Bangladesh is estimated to be 577.52 million (DLS, 2019). The climate and environment of Bangladesh are suitable for duck habitation and the innumerable water bodies are also favorable for duck production. According to a report of Food and Agricultural Organization, the position of Bangladesh with respect to duck meat and egg production is 11<sup>th</sup> and 4<sup>th</sup> respectively among the Asian countries (Pingle, 2011). Duck production plays an important role in the haor districts of Bangladesh, providing meat and egg and generates income. Bangladesh is a riverine country where 16488 Km<sup>2</sup> are haors, canals, pond and low-lying water reservoir and can be efficiently utilized for duck production. In Bangladesh most of the duck are indigenous (Ahmed, 1986; Arboleda, 1990) but other most important ducks available in the country are Khaki Campbell, Indian Runner, Jinding, Pekin and their crosses. Fluctuations in feed availability from natural sources often affect production costs and vary from 72% to 87% of the total production costs (Huque and Sultana, 2002). Reports are also available that scavenging feeds are deficient in nutrients to support optimum growth of ducks (Huque *et al.*, 1994; Biswas *et al.*, 2005). Huque *et al.* (2001) stated that average feed supplement (g/day/bird) is reduced from 105 g in the dry period (October to December) to 34 g in the scavenging period (January to September). However, the average egg production increased from 30% in the dry period to 62% in the scavenging period. Scavenging ducks are used to forage different types of faunas such as snails, fish, earthworms and flora such as duckweed and algae. All these feeds are rich sources of protein, minerals and vitamins that help meeting different types of nutrient requirements

needed by ducks and increasing their productivity. Nevertheless, the availability of natural feed resources is affected by their habitats, the waterlogged areas that vary according to seasons of the year and regions of the country. Huque and Sultana (2002) reported that natural water areas in different districts of Bangladesh vary from 151 to 12731 hectares. Total national supply of duck eggs is 73.03 million, 80 percent of which comes from the Haor districts. Hatcheries being the supplier of ducklings play major role in determining the trend of the sub-sector in the commercial market (Oxfam, 2013). It would be possible if they are supported with some feed supplements, vaccine, medicines as well as training. Nutrition has much more effect on production duck being the most important poultry species can contribute to change the economic status and also provide employment to the unemployed youth, rural widow and women of the farmers in these low land areas. The aim of this study was the effect of feed supplementation on growth performance and profitability of ducks in haor smallholders of Sylhet.

## 2. Materials and Methods

The trial was conducted in the farmer's house in haor area with day old ducklings. A survey was conducted in three villages of Haripur, Sylhet district to assess the existing village duck production system. A formal survey schedule was used to collect relevant data, using a multi-stage sampling technique. A total of 20 village households were considered for the study and training was arranged for them. Subsequently an experiment was carried out in order to evaluate effects of feed supplementation to ducklings on growth performance under the haor condition of Sylhet, Bangladesh. Nine hundred day old ducklings were distributed among 18 farmers. Each farmer received 50 birds. For take care of day old ducklings during their early stage of growth without the help of broody hens and there were problems of predators which might cause losses of ducklings, it was decided to rear ducklings for the first three weeks in the confinement in the farmer's house. Thus the distributed ducklings would be more able to adapt under village condition.

Dietary treatments were: Control,  $T_0$  = without supplemental feed except those farmers provided under traditional system,  $T_1$ =25 g feed supplementation under scavenging condition,  $T_2$ = 50 g feed supplementation under scavenging condition. Diets were formulated using locally available feedstuffs. Ducklings were initially fed with a standard mash diet containing 2850 kcal ME/kg diet (20% crude protein (CP), as fed) from hatch to 42 days of age. At day 42, these birds were fed diets that contained 17%CP (as fed) and energy density level (2950 kcal ME/kg diet) (Table 1). The diets were fed until the birds were 84 days of age. The chemical analyses of different feed ingredients were carried out by following standard methods (AOAC, 2004; Kent *et al.*, 1967; Hall and HacsKaylo, 1963). Proximate components, Calcium (Ca) and total Phosphorous (P) of those ingredients were determined in the Animal Nutrition Laboratory, Department of Livestock Services (DLS) and in the Department of Poultry Science, Sylhet Agricultural University. Calcium and total P were determined by atomic absorption and spectrophotometer (FAO, 1989). Amino acids were determined by amino acid analyzer in the Institute of Food Science and Technology of BCSIR Laboratory in Dhaka. The ducklings were immunized against duck plague and duck cholera as per recommendation of the manufacturers.

Records were kept of body weight, feed consumption, mortality, production costs and sale price of live bird. Feed conversion ratio (FCR), net return, cost benefit ratio (BCR) and survivability were calculated. Recorded and calculated data of the diets fed to birds were analyzed by General Linear Model's procedure of SAS (2008) program. Differences among means were determined by the least significant difference (LSD) procedure of SAS (2008).

## 3. Results and Discussion

### 3.1. Status of duck farmers

On the basis of age (years) of the farmers of the study areas were arranged into three main groups namely: young, middle-aged and old. Information exhibited in Table 2 show that most of the farmers (45%) in the study territory were middle-aged, young aged were (35%) and old aged were (20%). Educational qualification was measured by direct interview with the respondent farmers in the study area. Twenty (20%) percent farmers received primary education and only five (5%) percent had higher secondary or above level of education. The literacy rate was twenty five (25%) percent. The state of education is very disappointing in Haor areas. According to NIPOR, Sylhet district (which has the largest concentration of Haors) has the lower proportion of people attending the primary and secondary education in compare to other divisions. Thirty five percent of the respondent farmers had larger family size (more than 7 members) which was followed by medium size forty five percent and small size twenty percent of the farmers. The literacy rate of 57 per cent recorded seemed to be lower than that of national average of 64.67 per cent (BBS, 2007)

The occupation of the participant farmers are shown in Table 2. From the table it is evident that most of respondent farmers (45%) had agriculture as their main occupation followed by Duck farming (25%), business (20%) and service (10%). The participant duck farmers had some subsidiary occupation which helped them in earning some extra income.

According to the number of duck rearing farmer were classified into three categories (small, Medium and large) that shown in Table 2. Seventy (70%) percent farmer rear below 25 duck, about fifteen (15%) farmer rear 26-100 duck and also fifteen (15%) farmer rear above 100 duck in this study area. On the basis of land amount farmer also classified into three group 1. landless/small group whose have no land or less than 0.05 acre land 2. medium group whose have between 0.05-2.5 acre land and last one is large group whose have more than 2.5 acre land. From Table 3 about (15%) farmer were small group, (65%) farmer were medium group and (20%) farmer were large group, maximum farmer were medium group in this study area.

Feeding management is the most important factor in duck farming. Because, feed cost is the highest cost among all other production costs. Efficient management in feeding duck saves production cost that increases net return from duck farm. From Table 4 among farmers, 40 percent did not supply additional feed to their ducks. Ducks were reared under scavenging condition (with only natural feed resources) during rainy season, whereas, 60 percent farmers gave supplemental feeding to their ducks to maximize egg production. The main components of supplemental feeds were paddy, a mixture of rice and broken rice and a mixture of rice polish and wheat bran and mixed feed materials. About 55 percent farmers supplemented their ducks with mixed feed whereas 10%, 10% and 25% farmers supplemented their ducks with paddy, a mixture of rice and broken rice, a mixture of rice polish and wheat bran.

Table 4 show the average egg consumption per person per year in study area. On the basis of egg consumption farmer are classified into three categories, 1. Less consumption group who eat less than 50 egg per year about 10% farmer eat less than 50 egg per year, 2. Medium consumption group (50-100 egg/person/year) about 55% farmer eat 50-100 egg per year.

High consumption group (above 100 egg/person/year) about 35% farmer eat above 100 egg per year. Table 4 also show the average duck meat consumption per person per year in study area. On the basis of meat consumption farmer are classified into three categories, 1. low consumption group who eat less than 2 kg meat per year about 40% farmer eat less than 2 kg duck meat per year, 2. medium consumption group (2-5 kg meat/person/year) about 55% farmer eat 2-5 kg meat per year, 3. high consumption group (above 5 kg meat/person/year) about 5% farmer eat above 5 kg meat per year.

### 3.2. Growth performance

The effects of dietary supplementation on growth performance are shown in Table 5. Day old body weight of different group of duckling had no significant difference among the three dietary groups. Body weight of 4<sup>th</sup> week had no significant difference among the three dietary groups. Body weight of 12<sup>th</sup> week was 717, 1100 and 1256.66 in 0, 25 g and 50 g dietary group respectively. The weight was higher in 50 g feed supplementation group in every stage of weighing compare with other. The body weight of control group was lower among the treated group. There was a significant ( $p < 0.05$ ) difference between the treated group and control group. The present study was in agreement with the findings of earlier workers (Rahman *et al.*, 2007; Men *et al.*, 1995; Huque and Hossain, 1991; Kamal, 1993; Ketarun, 1998 and Ukil, 1992) who on the basis of their feeding trials reported that increased live weight gain was the result of supplementary feeding in addition to scavenging. But the present findings were contradict with the Chakravarti and Mohan (2014), they found 828 g body weight at 12 weeks of age in farmer field.

The results showed that differences in body weight gains were statistically significant ( $p < 0.05$ ) among the treatment at 12 weeks. The weekly average body weight gain of 50 g dietary group was found higher than that of 25 g dietary group and no supplementation group throughout the experimental period. Huque (1999) found significantly ( $P < 0.01$ ) higher live weight gain in ducks due to supplementary feeding compared to birds that were reared on scavenging. Normal growth in ducks was highly dependent on nutritional content, especially essential amino acids (Kamran *et al.*, 2008). Other researchers also stated that besides proper nutritional diet, genetics, and management had great influence on the performance and carcass quality of ducks (Adeola, 2006; Xie *et al.*, 2014). Normal growth in poultry is not enough only with limited availability of source materials or energy substrate as a result of the synthesis of proteins (amino acids), but also very influential in the groove in the regulation of growth, protein synthesis by their interaction with growth hormone (Dorup, 2004).

### 3.3. Feed intake

The results showed that differences in feed intake were statistically significant ( $p < 0.05$ ) among the treatment. The highest feed intake was observed at 12<sup>th</sup> week for 50 g dietary group was 3667.48 g/b, for 25 g dietary group was (2266.64 g/b) and no supplementation group duckling allow to fully scavenging in environment. It was thought that feed consumption to be related to the response of each individual to take advantage of the nutrients, especially protein content in diet. Alleman *et al.* (2000) and Pesti (2009) stated that each type of poultry had different response to the nutrition, especially protein content and amino acid obtained through diet consumed.

Provision of various levels in the treatment ration was significantly ( $P < 0.05$ ) affected the FCR. The average FCR of Jinxing ducks under 50 g dietary group (2.91) was significantly different ( $P < 0.05$ ) when compared to no supplementation group and 25 g dietary group treatments. There were decline pattern of FCR with increasing dietary feed supplementation. The lowest FCR was found under 25 g dietary group treatment (2.06) while the highest was found in 50 g dietary group (2.91). The results are consistent with the research results of Kamran *et al.* (2008) who reported that in addition to the role of supplementation in the ration not only served to sustain growth, but also reduced feed consumption and lower FCR. Bons *et al.* (2002) also noted that the increasing content of feed supplementation decreased FCR of growing Jinding duck. The decrease of FCR due to increasing feed supplement in this study also confirmed by other researchers who claimed that application of feed supplementation in the grower-balanced diet causing low FCR due to the more efficient in forming muscle fibers in the form of meat (Dorup, 2004; Fan *et al.*, 2008). Ketaren (2006) found that FCR of duck fed diets contained pollard at level of 30, 40 and 50% respectively were 3.42; 3.39 and 3.47, while feed intake respectively were 6059, 6190 and 6111 g/bird for ducks raised up to 8 weeks of age.

Survivability percentage of Jinding duck observed in the present study in Table 5. The results showed that differences in Survivability percentage were statistically significant ( $p < 0.05$ ) among the different treatments. The average Survivability percentage of 50 g dietary group was found higher than that of 25 g dietary group and no supplementation group throughout the experimental period. This finding is almost similar with the works of Padhi *et al.* (2009) and Jalil *et al.* (1997) they that found average survivability percentage of duck is 82.2% that were much less in comparison to the present observation which might be due to the fact that in both the later cases, commercial feed were provided throughout the experiment. Hamid *et al.* (1988) who found that Survivability percentage ranged between 71 to 83% in three different dietary group. Islam *et al.* (2016) reported that Survivability percentage of ducks ranged between 95 to 65% with an average of 80%. Mortality is a serious problem in haor duck production and it needs intervention. Vaccination of flocks is effective but most farmers were unable to vaccinate mainly because of lack of information, skills and high cost of vaccines (Njue *et al.*, 2006). It was noted from the famers that the causes of high mortality in farmer's house ducks under six weeks of age were lack of quality feeds, theft and predators (dogs and eagles). Ducks can be protected from predators by providing shelters and supplementary feeds can be given to ducklings under six weeks of age to improve survivability. It is believed that ducklings older than six weeks might be able to escape attacks from the predators and also successfully search for food. The high costs involved in provision of housing and feeds to ducklings might be challenging in the poverty restricted rural haor communities and it might be necessary but feasible to use locally produced feed resources and building materials.

### 3.4. Economic analysis

Economics of ducklings fed on different level of supplementation are shown in Table 6. The results showed that differences in average net return were statistically significant ( $p < 0.05$ ) among the different dietary groups. The highest net return of per duck was observed at 12<sup>th</sup> week for 25 g dietary group was 38.49 BDT, no supplementation group was 28.08 BDT and lowest net return was 50 g dietary group was 16.98 BDT per duck. The average net return of per duckling of 25 g dietary group was found higher than that of no supplementation group and 50 g dietary group throughout the experimental period. Net return per batch were 1924 BDT in 25 g feed supplementation group at 12 weeks and yearly net profit was 6735 BDT by rearing of 50 ducklings. Benefit–cost ratio was 1:1.30.

**Table 1. Feed ingredients and nutrient composition of duck diets.**

Ingredients (kg)	Duck starter	Duck grower
Maize	48	50
Rice Polish	21.25	23.85
Soybean Meal	25	20
Meat and bone meal	2	2
Soybean oil	0	0.5
DCP	2	2
Methionine	0.22	0.2
Lysine	0.2	0.1
Salt	0.22	0.22
Na-Bicarbonate	0.24	0.24
Lime stone	0.6	0.6
Vit. Mineral	0.25	0.25
Phytase	0.02	0.02
Toxin binder	0.02	0.02
Total	100	100
Calculated Nutrients		
ME (Kcal/kg)	2850	2900
CP %	20	17
CF %	6.73	6.7
Ca %	1.08	1.04
P %	0.62	0.60
Lysine %	1.13	0.88
Methionine %	0.51	0.45

**Table 2. Status of duck farmers in Haripur village.**

Parameters	Category	Farmers (%)
Age (year) of the farmers	Young (<35 years)	35
	Middle-Aged (36-50)	45
	Old (> 50 years)	20
Level of Education	Illiterate	25
	Can sign only	30
	Primary	20
	Secondary	20
	HSC or above	5
Family Size of the farmers	Small (up to 4)	20
	Medium (5-6)	45
	Large (> 6 members)	35
Occupation of duck farmers	Duck farming	25
	Agriculture Service	45
	Business	20
	Service	10
Number of duck rearing of the farmer	Small (<25 duck)	70
	Medium (26-100 duck)	15
	Large (> 100 duck)	15
Amount of the land of farmer	Small/Landless (<0.05 acre)	15
	Medium (0.051-2.5 acre)	65
	Large (> 2.51 acre)	20

**Table 3. Duck feeding and management practices by duck farmers in Haripur village, Sylhet.**

Parameters	Category	Farmers (%)
Duck feed Source	Only Scavenging	40
	Scavenging and supplementation	60
Amount of feed	Adequate	35
	Inadequate	65
Feed ingredients used for ducks	Paddy	10
	Rice and broken rice	10
	Rice polish and wheat bran	25
	Mixed feed	55

**Table 4. Farmer categories on the basis of egg and meat consumption per person per year.**

Parameters	Category	Farmers (%)
Egg consumption/person/year	Low consumption (<50 egg)	10
	Medium consumption (51-100)	55
	High consumption (>100 egg)	35
Meat consumption (Kg)/person/year	Low consumption (<2 kg)	40
	Medium consumption (2-5 kg)	55
	High consumption (>5 kg)	5

**Table 5. Growth performance of duck fed on different levels of feed supplementation at 12 weeks of age.**

Parameters	Level of feed supplementation (g)			Level of significance
	0	25	50	
Day old body wt (g/b)	35.87±0.29	36.15±.19	35.96±.20	NS
4th week body wt (g/b)	548.33±33	550±2.88	557.5±3.81	NS
12th week body (g/b)	717c±2.14	1100b±5.77	1256.66a±3.81	*
Body weight gain (g/b/d)	8.13c±.02	12.69b±.07	14.55a±.04	*
Feed intake (g/b)	-	2266.64±6.78	3667.48±7.92	*
FCR	-	2.06±.01	2.91±.01	*
Survivability%	84.66c±.21	88.27b±0.40	89.83a±0.47	*

0= only scavenging, 25g = Scavenging + 25g feed supplementation, 50g= Scavenging + 50g feed supplementation, NS= No significance, \*=0.05% significance. FCR= Feed conversation ratio

**Table 6. Economics of ducklings fed on different level of supplementation.**

Parameters (BDT)	Level of feed supplementation (g)			Level of significance
	0	25	50	
Total cost	79.34 <sup>c</sup> ±0.30	126.87 <sup>b</sup> ±.65	171.15 <sup>a</sup> ±.96	*
Gross Return	107.62 <sup>c</sup> ±.32	165.00 <sup>b</sup> ±0.86	188.50 <sup>a</sup> ±0.57	*
Net return/duck	28.08 <sup>b</sup> ±0.16	38.49 <sup>a</sup> ±0.67	16.98 <sup>c</sup> ±1.38	*
Net return /batch	1420.5	1924.5	849	*
BCR	1.35a±0.004	1.30b±0.010	1.10c±0.008	*

0= only scavenging, 25g = Scavenging + 25g feed supplementation, 50g= Scavenging + 50g feed supplementation, NS= No significance, \*=0.05% significance. FCR= Feed conversation ratio

#### 4. Conclusions

The current study reveals that duck farming significantly contribute to farmer livelihoods in terms of nutrition and income. Based on the findings of this study, it is fair enough to note that duck rearing is a profitable business in the study area. Promotion of this enterprise would largely enhance the process of employment generation, income potentiality and poverty reduction which are now considered as the major concern in the development planning process of Bangladesh. The farmers made a profitable use of improved breed of Jinding duck. From growth performance and economic cost analysis on this experiment we found that if we supplied 25 g feed supplementation per day with scavenging of duck, farmers were economically more benefited than the

other dietary groups. The result revealed that duck interventions improved haor women's source of income and significantly contributes to rural livelihoods.

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### Conflict of interest

None to declare.

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