



Problems and prospects of ostrich (*Struthio camelus*) production in Bangladesh

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ABSTRACT

Ostrich can be the best options for alternative protein source in Bangladesh for its least cost meat production. It is the most profitable farming which offers a variety of valuable products like meat, feather, fat and hide. This study investigated the status, problems and prospects of ostrich production in Bangladesh through a baseline survey. The data were collected from household survey, secondary data review, individual interview, keen observation and Focus Group Discussion (FGD) from several districts in Bangladesh. The study revealed that average weight of cock and hen were 116.67±8.82 and 92.50±7.50 kg, respectively. Farmers under the surveyed areas stated that the poultry feed, vegetable and forages were fed to their ostrich. Broiler starter, layer starter, (broiler 50%+ layer 50%) starter, broiler grower, fruits, egg and bakery food, pieces of stone along with mixed vitamins-minerals were supplied by about 87.50, 12.50, 12.50, 25.00, 25.00, 87.50 and 62.50% farmers, respectively. Both cock and hen attained puberty at 2.00±0.25 years, a hen in her first laying year laid 14 eggs and each egg was 1466.67±88.19g. None of the farmers performed artificial insemination except natural breeding where, male-female ratio was 1.75±0.25. The main advantages of ostrich rearing over other poultry species as opined by the farmers were disease resistant (100%), low production cost (85%), higher market price (62.5%), higher dressing percentage (37.5%) and low cholesterol in meat (37.5%). About 37.5% farmers had encountered disease incidence, while about 62.5% had not used vaccine. Price of a chick and an adult ostrich were sold at 13.29±1.04, and 137.50±12.50 Tk (BDT in thousand), respectively. In fact, ostrich production is still at very primitive stage which is characterized by poor adaptation to environment, feeding, breeding and healthcare practices. Therefore, vigorous public extension services, training, research and marketing strategies are immediately needed to improve this species in Bangladesh.

INTRODUCTION

About 160 million over populated small country Bangladesh is situated between 88°10' and 92°41' East longitudes and between 20°34' and 26°38' North latitudes in south Asia with flat land area (147,570sq.km). Agricultural land of Bangladesh has decreased on an average sixty six thousand acres each year which is 0.29 percent of total agricultural land (Alam et al., 2015). The research forecasting suggests that, if agricultural land decrease at the present trend and agricultural productivity and population also increase at the present trend, even in 2050, agricultural land decrease' hopefully will not be a threat to the

agriculture sector of Bangladesh (Alam et al., 2015). But we need to have a pre-attention for balancing the agricultural production especially animal protein, against the decreasing of agricultural land. Poultry is one of the rising agricultural sectors in Bangladesh. However, traditional backyard poultry keeping has been practiced in this country since time immemorial. Besbes (2009) reported that the worldwide poultry sector consists of chickens (63%), ducks (11%), geese (9%), turkeys (5%), pigeons (3%) and guinea fowls (3%). The demand of poultry products has been increasing rapidly in Bangladesh due to boost up the levels of income, population and urbanization since last decade. The

climate of Bangladesh is convenient for rearing different poultry species. Poultry meat alone contributes 37% of the total meat production in Bangladesh (Begum et al., 2011).

Among poultry species, ostrich farming is the most profitable agricultural projects which offers a variety of possible valuable products like, meat, feather, fat and hide (Shanawany, 1995). Ostrich farming is a new addition among livestock farming in different countries all over the world including China, Nepal, Japan, Iran, Iraq, Israel, UK, Canada, Mexico, Brazil, etc. Since ancient times, ostrich has aroused people's interest. Markets for ostrich eggs, meat, leather, feathers and related products are developing rapidly throughout the global area. At present, ostrich producers are merely meeting 10 percent of the consumer demands globally. Thus, ostrich farming maybe one of the best options for alternative protein source in Bangladesh due to its least cost and huge amount meat production.

Some choosy and elite peoples in Bangladesh are rearing ostrich as an ornamental bird with very limited extent without having prior experience. Generally, interested farmers started ostrich farming by importing day-old ostrich chicks from South Africa. Its popularity is increasing gradually because of its social attraction, climatic adaptation, least cost production, and high quality red meat with lower fat and cholesterol contents. So, it has a high potential for production and marketing in Bangladesh. However, there is no study conducted till to date regarding ostrich production in Bangladesh. Therefore, this study has been undertaken to investigate the present status, production system, problems and prospects of ostrich production and marketing in Bangladesh.

MATERIALS AND MEHTODS

Study site and duration of the experiment

The study areas covered seven divisions of Bangladesh including Dhaka, Gazipur, Rangpur, Dinajpur, Rajshahi, Tanagail Jamalpur, Narshighdi, Mymensingh, Sylhet, Habigonj, Manikgonj, Narayongonj, Pabna, Chittagong, Khulna and Satkhira districts taking interview with ostrich farmers.

Experimental design

The exploratory research design was followed for this study. The data were collected taking representative samples from household survey, review of secondary data, individual interview, keen observation and Focus Group Discussion (FGD). The questionnaire was prepared with very carefully keeping in mind the objectives of this study. The questionnaire was made with both open and closed forms of questions. To acquire the necessary information, easiest, simplest and direct questions were asked to the respondents. Three (3) questionnaires were pre-tested with farmers for judging suitability for data collection. After validate all feedback from field test, modifications were done accordingly and the questionnaire was finalized for practical implementation.

Sampling technique and sample size

The multistage sampling procedure was followed for sample determination. After all, a limited number of ostrich farmers were outspread over seven divisions, where purposive sampling procedure was followed to select districts giving focus on availability of ostrich farmers. So, considering the research objectives, a list of 30 ostrich keepers was taken under consideration via personal communication, Facebook, YouTube, bikroy.com and other sources. Simple random sampling technique was used to select 30 ostrich keepers. The sample size of the respondents was determined by using proportion sample formula adopted by Slovin (Adanza, 2006). The formula is presented below:

$$n = N / (1 + N(e)^2)$$

Where,

n is the sample size sought;

N is the research population,

e is the level of confidence (taken as 95%).

The sample size (n) for this study was calculated using the formula below:

$$\begin{aligned} n &= 30 / (1 + 30(0.05)^2) \\ &= 27.91 \\ &= 28 \end{aligned}$$

Therefore, primary data were collected from 30 respondent farmers selected from different divisions' of Bangladesh.

Data collection and analysis

Direct observation, interview and farm record analysis methods were applied during collecting data for this study. Primary data were collected from ostrich farmers taking farmers' personal information (age and education level), housing, feeding, breeding, management, disease, marketing, problems and prospects. The sources of secondary data were review of literature from official documents, journals, libraries, research institutes, internet etc. Participatory Rural Appraisal (PRA) tools like Focus Group Discussion (FGD), seasonality analysis of disease and market etc. were also used in relevant cases to collect and verify data. The descriptive statistics was analyzed by SPSS package.

RESULTS AND DISCUSSION

Demography of farmers

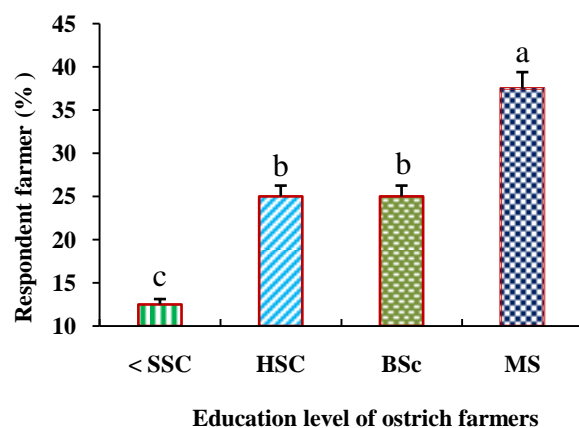


Figure 1: Education level of ostrich farmers in Bangladesh

Ostrich farming is a new farming enterprise in Bangladesh. Comparatively rich and industrialist population get involved with this farming and ownership of farming mostly belonged to male farmers. To understand demographic and socioeconomic context of existing ostrich farmers' data on age, education, sex, access to technical support and prior experience of other farming were collected. The average age of the respondent farmers was 45.75 ± 1.98 years. Moreover, the ownership of 88% ostrich farms was belonged to

the male farmers. Duration of experience in ostrich farming of the respondents was only 4.38 ± 0.94 years. The study also showed that 12.5, 25.0, 25.0, and 37.5% farmers obtained educational qualification <SSC, HSC, Bachelor and Master Degree, respectively (Figure 1).

Educational data revealed that 100% farmers received formal education ranged from less than Secondary School Certificate (SSC) to Master's Degree. The results indicate that in ostrich farming women participation is lower, farmers are educated and they have not prior experience. So, there have big possibility to flourish ostrich farming by these farmers in near future.

Purpose of ostrich rearing

The study showed that 37.5, 37.5 and 25.0% respondent farmers were rearing ostrich for ornamental, commercial and research purposes, respectively. The present study showed that although most of the farmers were rearing ostrich for hatching egg and meat purposes, a large number of farmers were keeping ostrich only for ornamental purpose. But there is a big opportunity to increase ostrich farming for meat purpose because of its least cost of production and palatability of meat are increasing interest among consumers of Bangladesh.

Source of receiving technical support

The study showed that 50.0, 87.5, 25.0 and 37.5% farmers took technical support from Hajee Mohammad Danesh Science and Technology University, internet, chick's supplier, and Zoo experts, respectively. Field study assessed that most of the farmers were dependent on other farmers, YouTube, and chick's suppliers than government livestock offices for having technical support. The interviewed livestock officers talked about the limitations that, ostrich is a very new species to them and they do not have sufficient awareness, knowledge and skill. It was observed that none of the farmers received any kind of training on ostrich rearing.

Flock structure

The study investigated flock size of ostrich farmers under the surveyed areas were 18.29 ± 5.07 . Most of the farmers (75%) were rearing both male and female ostrich, while 25% were rearing only female due to unavailability of male ostrich. Average flock size of ostrich was very small because of higher cost of chicks and newness of the enterprise. It was found that some farmers were keeping ostrich with other domestic animals like cattle and goat in semi-intensive system. The ostrich is a credible competitor in the red meat market that produces very lean and looking red halal meat. The temperature of Bangladesh varies from 25° to 40° C in summer and 5° to 25° C in winter, which indicated the climatic condition of Bangladesh is favorable for ostrich rearing. High feed efficiency rate was found during the first 210 days rearing of ostrich.

Housing, brooding, rearing and other management

Results showed that 37.5 and 62.5% farmers were keeping ostrich in free range and semi-intensive system, respectively. 50% farmers informed that they took extra care during hot period for giving comfort to the ostrich, while 50% did not take any extra care. On the other hand, 62.5% farmers took additional care in winter, while 37.5% did not. About 75% farmers informed that they provide brooding to their chicks about 18.33 ± 2.59 days during winter, while 25% did not offer any extra temperature. During summer, 62.5% farmers followed brooding for 12.00 ± 2.53 days and 37.5% did not provide any brooding (Table 3) and 100% farmers had not provided any lighting system at night for laying ostrich. Ostrich laid eggs only in 03 (three) farms in their own built nest. The ostrich laid eggs in a sandy nest made by them which is around 2 meters diameter with 0.5 meter depth. Male ostrich also assisted female to establish this nest as well as brooding.

Ostrich farmers use sand, rice husk, wood shavings, coarse paper etc. as litter material. But, it was found that farmers had not used any litter for growing stage after of 3 months and mature ostrich too. The ostrich is originated in desert area and they are usually adapted with extreme environment. On the other hand, farmers found ostrich enjoy themselves for 24 hours on the open

space without any shelter along with bathing in morning sunshine, sand and water. In favor of this environment they were found active, running, dancing, and playing. Farmers also commented that it is better to ensure bedding materials during cold wave for their comfort and to minimize stress which may reduce disease incidence. Most of the farmers use traditional broiler and layer brooding system for ostrich. They used electrical brooder and maintained temperature between 90° F to 95° F. But few farmers did not follow standard procedure for brooding which caused death of many chicks at early stage. Farmers had no scientific knowledge on space requirement for rearing ostrich and provided as their own assumption. Moreover, they were not aware of using suitable litter materials and their proper management. Some of farmers take special care during extreme hot and cold situation. By nature chicks always try to pecking unless in rest or felt asleep. Fantastically, it looks like dead body when they are in deep sleep. They are reluctant to eat and drink in the first few days after arrives, because of the journey stress and nervousness. According to ostrich farmers' perception, first 7-10 days less feeding is helpful for chicks to absorb the yolk sac in abdomen; it gathered according to common experiences of chicken rearing. To prevention slip tendon regular running or walking of chicks is necessary from the beginning. So, most of the farmers suggest to ensuring free range area adjacent to the brooding shed. But, after completion the brooding period ostrich can survive fighting against the environmental stress.

Feeds and feeding

The study showed that 100% farmers used commercial poultry feed and roughage like vegetable and fodder as common feedstuffs for ostrich. However, about 87.50, 12.50, 12.50, 12.50 and 25.00 farmers used broiler starter, layer starter, 50% broiler starter+50% layer starter, broiler pre-starter and broiler grower, respectively for feeding their ostrich (Table 1). Besides, about 87.5, 25.0, and 62.5% farmers supplied pieces of stone, fruit, egg and bakery food and vitamin mineral premix as additional feed to their ostrich, respectively (Table 1). None of the interviewed ostrich farmers calculated feed efficiency (FE) and it was found more wastage of feeds in many farms which

happened due to lack of proper feeding knowledge of the farmers. Results indicate that most of the farmers were not aware of ostrich management in terms of housing, lighting, maintenance of hot and cold period. Most of the farmers fed both homemade and commercial poultry feed to ostrich. In case of homemade feed, they used a mixture of maize, wheat, rice polish, canola, soybean meal, limestone and vegetables like cabbage, water spinach, moringa leave (*Moringa oleifera*), Ipil ipil (*Leucaena leucocephala*), neem leaves (*Azadirachta indica*), spinach (*Ipomoea aquatic*), and different types of grass including tree leaves. They allowed ostrich for foraging in grazing land. During 10-14 weeks of age, ostrich chicks fed diets containing 22.5 and 17.5% CP consumed more feed with converting feed more efficiently than birds fed diets containing 12.5% CP, (Ahmed et al., 2011). Most of the farmers ensured supply concentrate feed in the morning and afternoon, simultaneously all farms ad-libitum water.

Table 1: Feeding practice of ostrich in Bangladesh

Type of feed offered	Respondent (%)
Poultry ready feed and forage	100.00
Broiler starter	87.50
Layer starter	12.50
Mixed feed (L/S-50% + B/S-50%)	12.50
Broiler pre starter	12.50
Broiler grower	25.00
Vegetable and fodder as roughage	100.00
Pieces of stone	87.50
Fruit, egg and bakery food	25.00
Vitamin and mineral (premix).	62.50

It was observed that farmers did not follow feed standard for ostrich; even most of the farmers did not know it. But, ostrich chicks need high protein requirements for their first eight weeks. Although, a little numbers of farmers were rearing ostrich as breeding purpose, without knowing actual nutrient requirements for breeder. In fact, the farmers and expertise have lack of knowledge on ostrich feeding. Probable causes are unavailability of ostrich feeding standard. Ostrich feeds are not manufactured by any feed mill in Bangladesh. So,

farmers fed their ostrich homemade feed as well as a mixture of homemade and broiler or layer ready feed. Ostrich is a good forager and the farmers believe that this habit will be helpful to reduce overall production cost.

Health management

The study showed that, while 100% farmers had encountered diseases like paralysis and slip tendon which causes high mortality within 16 weeks of age, but commonly 62.5% farmers usually feel that ostrich had not get any major diseases. Besides these, 37.5% farmers had experienced different diseases in different time like salmonella, coccidiosis, chronic respiratory disease (CRD), E-coli, eye infection, lesion in mouth and malnutrition, while 25% farmers had informed about parasitic infestation, mole, pox and Newcastle disease. Consequently, only 37.5% farmers used vaccine against avian influenza, Newcastle Disease, and pox, while 62.5% had not used any vaccine (Figure 2). It was also found that, the ostrich rearers who were engaged for several years with ostrich farming, had less mortality rate in their flock. The mortality rate varies from 30 to 80% (Fig. 3). Results indicate that prevalence of ostrich disease was comparatively lower after 4 months age. Most of the farmers did not follow vaccination program. ND vaccination through drinking water would not work well for ostriches, as reported by Sakai et al. (2006). The farmers do not know about ostrich vaccination schedule in context of Bangladesh. Victim farmers informed, better disease resistant was found who vaccinated their birds from the beginning. Paralysis or slip tendon is a major disease of ostrich, if once infected, the bird never recovered and most of the birds tend to die. Farmers' perception, the causes of malformed legs of ostrich might be occurred owing to improper incubation, temperature and humidity, eggs collected from those parents who were in malnutrition and more aged. Factors affecting growth in ostriches are similar to those affecting other avian species like diet, rearing environment, genetic potential, management (Bovera et al., 2011). This investigation was stated, that most of the farmers did not administer deworming for ostrich as like chicken.

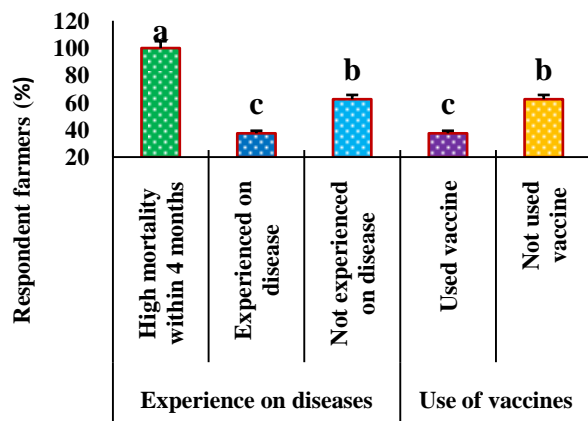


Figure 2: Farmers experience on diseases and vaccination of ostrich

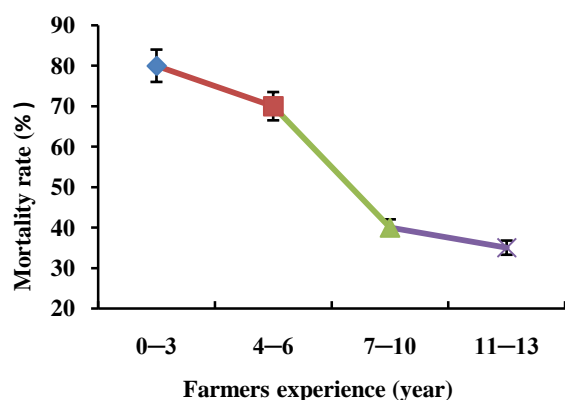


Figure 3: Farmers experience influence on mortality rate of ostrich

Productive and reproductive performance

Productive and reproductive performances of ostrich are presented that, average weights of the male and female ostrich were 116.67 ± 8.82 and 92.50 ± 7.50 kg, respectively (Table 2). Farmers' experiences revealed that both the male and female ostrich attained puberty at the same age and it was 2.0 ± 0.25 years. In this investigation, very little number of ostrich has laid eggs which were obtained only at four farms under the surveyed area. Total number of eggs laid in each farm did not indicate the actual production performance of a female ostrich, because only 37.33 ± 3.93 eggs have been collected from each farm and the average weight of each egg was 1466.67 ± 88.19 g. Till now there is no evidence on ostrich hatching in Bangladesh, because of infertile egg including

insufficient knowledge of farmers on ostrich breeding and egg incubating procedure.

Table 2: Productive and reproductive performance of ostrich in Bangladesh

Parameters	Mean \pm SEM
Weight of adult cock (kg)	116.67 ± 8.82
Weight of adult hen (kg)	92.50 ± 7.50
Age at puberty (yrs)	2.0 ± 0.25
Mating ratio of female : male (σ : ϕ)	1.75 ± 0.25
Weight of egg (g)	1466.67 ± 88.19
Egg laid in each farm till date (No.)	37.33 ± 3.93
Length of brooding in winter (day)	18.33 ± 2.59
Length of brooding in summer (day)	12.00 ± 2.53

Male-female ratio, mating, fertility and hatchability

Interviewed farmers who were involved with reproduction follow natural breeding of ostrich. Although, commercial livestock species completely dependent upon artificial insemination (AI) for fertile egg production (Juliet and Bakst, 2008), none of the respondent farmers used this technique. Male and female ratio maintained by the farmers was $1:1.75 \pm 0.25$. Fertility rate of ostrich egg is till now unidentified in Bangladesh context. The study also revealed that there was no evidence of hatching ostrich eggs by artificial incubation. Though the Department of Genetics and Animal Breeding, Hajee Mohammad Danesh Science and Technology University, Dinajpur has been taken initiatives for several times to hatch artificially but could not success due to infertile eggs. According to ostrich farmers' perception, the probable reasons behind infertility may be due to absence of frequent mating, disturbance during mating and improper nutrition in diet.

Marketing

In Bangladesh, ostrich meat, egg, skin, eggshell, bone and feather have not yet been introduced as the commercial products. The chicks of ostrich are mainly imported from abroad with an average price of 13.29 ± 1.04 thousands per chick. The survey was investigated that each adult ostrich is sold at the rate of 137.50 ± 12.50 thousands in

Bangladesh. Results also showed that 25% farmers sold ostrich meat 2,000 BDT per kg, while most of the interested people arisen question about halal or haram. In fact, the study revealed that 100% farmers do not know about ostrich meat consumers and market. They also claimed either government or non-government agencies had not taken any initiatives to overcome this crisis which can play a role to switch the ostrich farming in Bangladesh. Assumed that, price of adult ostrich was higher in Bangladesh in comparison to international market as newly introduced species in the market. The Main reasons were ostrich farming and marketing only for ornamental purposes. Till now ostrich egg not yet found in market and chicks solely imported from abroad to Bangladesh. Body size, body conformation, parent ages, egg number, heat tolerance and disease resistance are important traits for chick selection, but importer cannot ensure it during chicks purchase because of selection controlling power out of their grip. Ostrich market is completely unconventional in Bangladesh and farmers marketed through personal communication, internet services (bikroy.com, Facebook etc.) and personal contact.

South Australia's Minister for Primary Industries and Regional Development "Tim Whetstone" said ostrich farming could still be viable, despite its poor performance in the past (2018). Though, a few numbers of ostrich have slaughtered and meat is being sold among some curious peoples in capital city Dhaka. Even a number of consumer are not interested to buy ostrich meat consider religious perspective.

Farmers' perception on problems and prospects of ostrich farming

High chick mortality within first 4 months, meat marketing, not familiar as poultry, unavailability of ostrich chicks and lack of feeding standard were identified as major problems in ostrich farming as reported by 87.5, 75, 75, 87.5, and 75% farmers, respectively (Figure 4). According to 100, 85, 62.5, 37.5, and 37.5% farmers' opinion, the main advantages of ostrich rearing over other poultry species were disease resistant, low production cost, high market price, high dressing percentage and low cholesterol in meat, respectively (Figure 4).

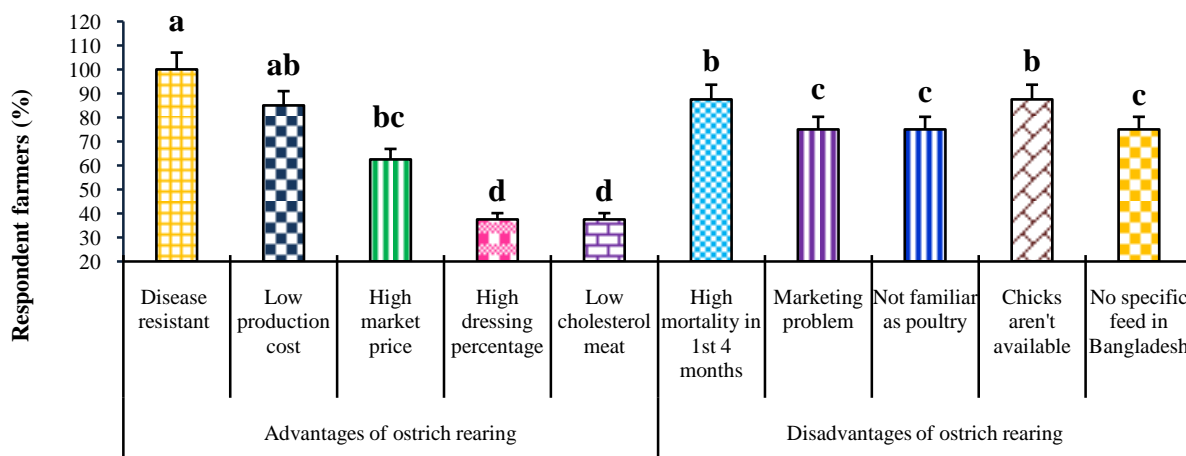


Figure 4: Farmers' perception on advantages and disadvantages of ostrich

Regarding ostrich rearing the farmers do not have adequate access to necessary information and in case of problems they did not get any technical support from different government and non-government agencies. Most of the farmers claimed that there have lacks of experts when need any suggestion on ostrich farming. To mitigate any farming emergencies they depend on internet,

YouTube and chick suppliers. As a result, farmers have to face a big financial loss and frustrated about ostrich farming. In context of Bangladesh, very limited opportunities are there for capacity building of ostrich farmers in terms of receiving training, getting information, participating in workshop and seminar. Overall the concern stakeholders are not aware enough about ostrich

farming in Bangladesh. However, farmers are not getting required knowledge and skill. Therefore, they are using nostrum procedure for ostrich rearing. But egg weight, fertility, hatchability and late embryonic mortality varied greatly between traditional and modern breeding management system (Lariviere et al., 2009).

CONCLUSION AND RECOMMENDATION

Apparently, the overall environment of Bangladesh seems to be in favor of ostrich production but it is still at an initial stage. These are characterized by unskilled management, feeding, breeding and healthcare practices, as well as inadequate scientific information, unrecognized technical services, insufficient credit facilities, lack of training and marketing opportunities. Finally, to increase the ostrich production, technology generation, effective public extension service, training for farmers, opening of different avenues for research on ostrich and identifying marketing strategies are immediately needed in Bangladesh. Present ostrich market is limited to some precise customers as an ornamental bird as well as for meat purposes and its price is higher than other poultry species. Ostrich meat is lean red meat with a good flavor, low cholesterol and high-quality protein which is better for high blood pressure people. Bangladesh is an over populated country with few lands, so that large and economic poultry has to be increased for more protein production. So, there is huge opportunity to expand ostrich production and market in Bangladesh.

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