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Duck-fish integration to improve food and nutrition security of poor farmers in haor areas of Netrokona district, Bangladesh

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ABSTRACT

This study evaluated duck-fish integration to the diet of households to improve food and nutrition security. The study was undertaken at Bolli village in Netrokona of Bangladesh for a period of 3 months from October to December 2017. It was done by questionnaire interviews of households, key informant interviews, and secondary data. Most of the households have belonged to the age groups of 31 to 50 years (70%). About 22.5% of the farmers had small family size with 2-4 members, 65% had a medium family size with 5-8 members and 12.5% had large family size with above 8 members. Over 20% of the household primary occupation was fishing, 20% was engaged in agriculture and 25% in daily labor. Under natural calamities, 15% households depend on rice and dried fish, 20% on dried food like chira, 17.5% on rice and pulse and 47.5% on usual foods like rice, vegetables, fish, eggs, etc. The per capita daily food intake was 1089.51 grams due to less chance of diversified food intake in haor areas. This study reveals that the average per capita daily calorie intake is 2204.28 kcal and the average per capita daily protein intake is 76.55 g. This study concludes that protein intake of farmers is high due to availability of duck egg, meat and fish to improve the nutrition security of farmers in Haor areas of Netrokona district.

Key words: Duck-fish integration, Livelihood, Social status, Netrokona District.

INTRODUCTION

Geographically Bangladesh is a low lying country with huge natural water bodies along with a network of certain rivers. Most of the water bodies, popularly known as Haor are located in the North-Eastern part of the country constituting Sylhet, Sumangonj, Moulvibazar, Hobigonj, Brahmonbaria, Kishorgonj and Netrokona. As its natural diversity, it seems to be one of the great sources of natural resources. People reside near and/or alongside the haors pass their lives through the water bodies using such resources. The periphery of the water bodies is used as duck grassland and fishing purposes. Natural and man-made calamities like environmental degradation increased flooding, and changes in the seasonality of rains cause food and water insecurity. Insufficient access to economic activities and nutritious food also leads the people of haor area nutritionally insecure.

Netrokona, for being disadvantaged and vulnerable regions in the country in terms of almost all major development indicators, such as income; employment; poverty; health & nutrition; water environment and sanitation; education; women employment; access to infrastructure and national building institutions; inter-community confidence, etc, the community residing in haor areas faces many problems regarding livelihood issues including the food and nutrition. However, there have vast opportunities to improve food and nutrition security of the resource-poor farmers through duck and fish integrations. Ducks rank second, next to chicken in the country in terms of total egg and meat production (Ahmed 1986). It has been stated that the national share of egg production from commercial and family poultry is almost equal and that of meat production is 60:40 (Bhuiyan 2011). Recently, Pervin et al (2013) reported that the growth performance of *desi* ducklings could be improved by supplementation of improved diets under the scavenging system of rearing. The geographical location, climate and

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environmental condition of Netrokona districts particularly haor areas are favorable for successful duck production. This is due

system. Farmers, who cannot afford to keep large animals because of the big investment required, can easily maintain a few ducks
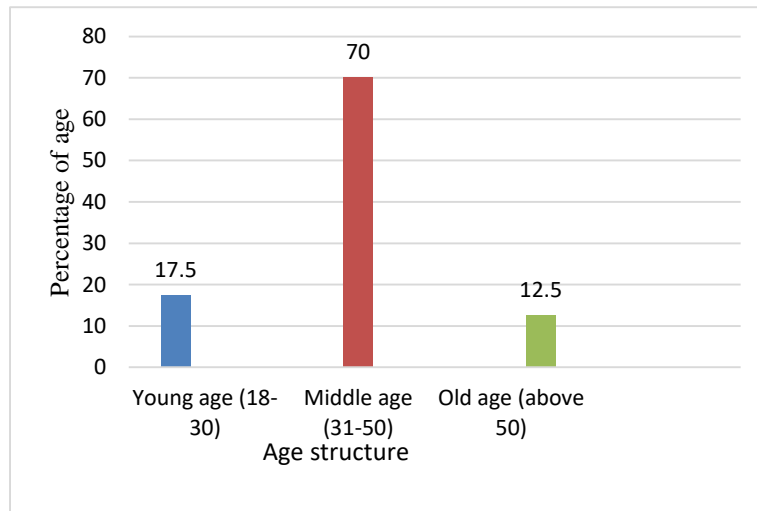

Fig.1: Age distribution of the respondents; young-age18-30; middle-age31-50; old-age >50.
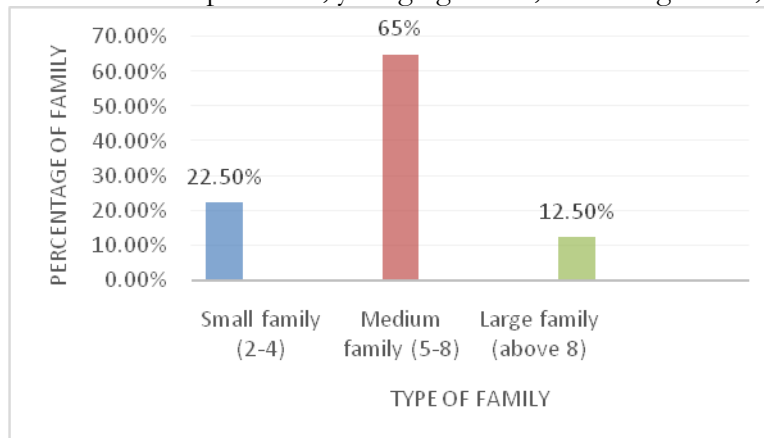

Fig. 2: Family size of respondents; small family 2-4; medium family 5-8; large family >8.

to the availability of natural feed resources in large areas of low lying water reservoirs, abundant marshy land, and waterlogged areas. Natural feed resources like aquatic weeds, various types of insects, tadpoles, earthworms, oysters, snails and crabs, a variety of small fishes, green forages and different fallen grains are good sources of nutrients for ducks. Duck population in Bangladesh has been reported to be 45.12 million (BER 2012) mostly of indigenous type although genetic dilution in some regions has occurred due to distribution of high yielding breeds or strains. Ducks in Bangladesh are traditionally reared as family poultry following free-range scavenging

poor farmers of haor areas in Netrokona district.

MATERIALS AND METHODS

A mixed-method approach combining quantitative and qualitative methods was applied to collect and validate the data and findings under the study. The overall study is based on the Participatory Rural Appraisal (PRA) method. A questionnaire was developed as a tool to collect data in such that this would be consistent with the nature of the study, its objectives and the intended type of data.

Selection of the Study Location

The location of the study area includes an outreach village of the North-Eastern part of Bangladesh. An island like Bolli village of 2 No. Chakua union under Khaliajuri Upazila of Netrakona district of Bangladesh.

Method of Data Collection

A total of 40 families were randomly chosen

families were taken for an interview to collect information according to the schedule.

Tool Finalization

An interview schedule as a tool was carefully prepared considering the objectives of the study. The interview schedule was
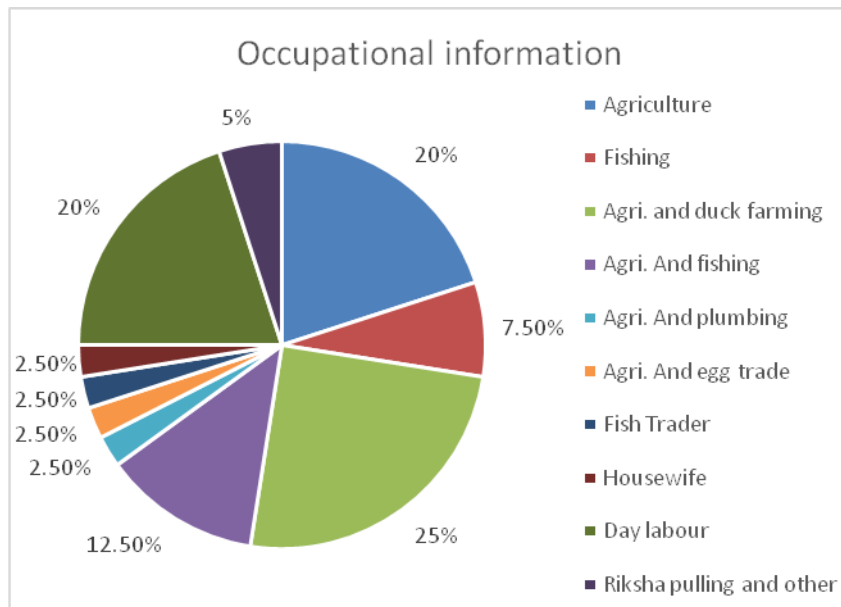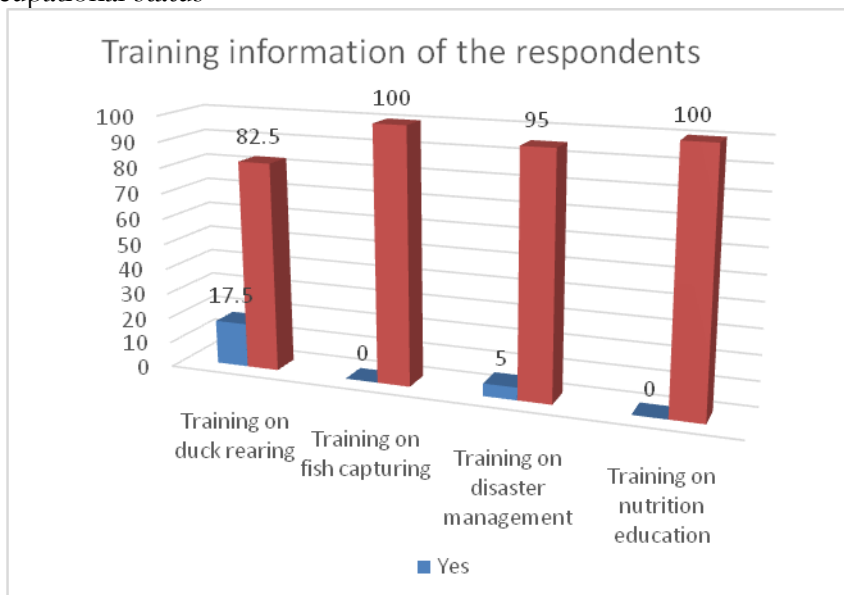

Fig. 3. Occupational status

Fig. 4. Training information of the respondents

with a simple random sampling technique for data collection in order to satisfy the objectives of the study. Thirty six male-headed families and 4 female headed

developed in a simple manner to avoid misunderstanding and to get an accurate answer.

Data Collection

Data was collected through a finalized interview schedule one by one interview by 7 days recall. The researcher was engaged to collect data through one by one interview from the individual respondent for 100% of the data. The researcher collected the orientation of the respondents. Brief information regarding the nature and purpose of the study was made to the respondents before the actual interview. Questions were asked systematically and

Table 1. Proportionate households consumption during natural calamities.

Items	Frequency	Percent	Cumulative Percent
Rice and pulse	7	17.5	17.5
Rice and dried fish	6	15.0	32.5
Dried food like chira	8	20.0	52.5
Usual foods	19	47.5	100.0
Total	40	100.0	

Table 2. Average per capita daily food intake by the respondents (in grams).

Food Items	Minimum	Maximum	Mean
Cereals			
Rice	238.10	500	383.20
Wheat	0	75.71	71.44
Puffed rice	0	57.14	21.05
Chira	0	71.43	10.31
Potato	35.71	238	92.40
Vegetables	61.22	476.19	156.90
Pulse	5.95	47.62	21.11
Oil	10.20	71.43	28.64
Meat and eggs			
Beef	0	47.62	4.40
Mutton	0	3.57	0.56
Chicken	0	71.43	20.13
Duck	0	85.71	16.56
Chicken egg	0	17.14	2.85
Duck egg	0	120	19.06
Fish	35.71	250	115.53
Spices			
Onion	17.86	142.86	37.88
Garlic	3.57	23.81	10.42
Chilies	5.10	35.71	17.05
Turmeric	1.43	35.71	5.00
Ginger	5.10	35.71	13.08
Other spices	0	17.86	3.41
Milk	0	100	27.05
Sugar	0	35.71	13.36
Fruits	0	95.24	28.58
Total=	783.98	2070.48	1089.51

information through the personal interview. An introductory visit was made to the study area when the aims and objectives of the study were explained to most of the respondents. This helps to have a friendly

explained whenever it was felt necessary. The information supplied by the respondents was recorded directly on the interview schedule. The information was checked carefully before leaving the study standard unit. The respondents were interviewed at their own house so that they could give accurate information without any hesitation and sound mind. Data were collected from October/2017 to

Table 3. Average per capita daily calorie and protein intake.

Food Item	Amount		
	Minimum	Maximum	Mean
Calorie (Kcal)	1584.71	2890.23	2204.28
Protein (g)	48	163.06	76.55

Image 1. Free raising area for ducks in open large water bodies

Image 2: Duck drooping with soil as fertilizer

Image 3: Fish biodiversity in the study are

area in order to minimize errors. Data were collected in a local unit. These were subsequently converted into an appropriate December/2017. Interview schedule used for data collection presented in the Annexure.

Data Validation

The analysis was done based on the data collected from primary sources, though secondary data was also used to understand dynamics related to the study.

Data Entry and Statistical Analysis

The collected data were scrutinized and summarized carefully before the actual tabulation. The data were processed to undergo statistical analysis using SPSS 20 windows program. Microsoft Word, Microsoft Excel was used to represent the tabular and graphical forms to understand the present status and constraints of the households of the studied area.

RESULTS AND DISCUSSION

Demographic information Age

Different categories of age groups, such as young (18 - 30 years), middle-aged (31 - 50 years) and old (above 50 years) were considered to examine the age structure. It was observed that the age group of 31 - 50 years was the highest (70%) and above 50 years was the lowest (12.5%) considering all respondents (Fig.1). Ali et al. (2009) found that most of the fish farmers (50%) belong to the age group of 31 to 40 years in Mymensingh district. Bhaumik and Saha (1994) reported that the age structure of fishers at Sundarbans was ranged from 20 to 70 years which was more or less similar to the present findings.

Family size is an important socioeconomic indicator as it affects the income, food consumption and socioeconomic wellbeing of the households. The family size of the respondents was divided into three categories as small, medium and large according to the number of the family members (Fig. 2). It was found from the survey that about 22.5% of the farmers had small family size with 2-4 members, 65% had medium family size with 5-8 members and 12.5% had large family size with above 8 members. The family size is much bigger compared to other areas and communities of Bangladesh as because they were economically poor. The highest percentage (45%) of family size belonged in the 4-5 member's family in the Mymensingh district (Ali et al., 2009), which was more or less similar to the present study.

Occupational status

In this study area, people were involved in agriculture, livestock/duck and fisheries activities. Some people were involved in only fisheries and some people were involved in seasonal agriculture. There was some diversification among the occupation. The people depend on different occupations on the basis of the fishing season and offseason. In the offseason some people go to other areas as day laborer for agricultural activities. But in the fishing season, their main earning purpose was fishing and selling them into the market. From the present study, there were 20% people who were involved in agriculture and fishing, 20% people were involved only in agriculture, 25% were involved as day laborer, 2.5% were in engaged business purpose and 4% were engaged in other activities (Fig. 3). Kamruzzaman and Hakim (2016) reported that most of the respondents (72.86%) were engaged in the fishing while agriculture 10% and daily labor 17.14% in Dhaleshwari River, which is consistent to the present study.

Training Information

Training is an important tool for changing dynamics. Limited numbers of farmers have exposure in training sessions on various traits. Fig. 4. shows that only 5% and 17.5% of respondents were received training on disaster management and duck rearing respectively. No respondent have received any training on fish capturing and nutrition education yet.

Now people of haor areas used to produce crop from their farms, fish from their ponds and fruits from their homestead areas. With the changes in the farming system, social value, economic wellbeing the land use is changing day by day. Freshwater fish farming plays an important role in the livelihoods of rural people in Bangladesh (Rahman et al., 2017). It creates diverse

livelihood opportunities for many people, many of whom living below the poverty level, in the form of farmers, operators, employees, traders, intermediaries, day laborers and transporters (Pravakar et al, 2013). Fish culture has been practiced for thousands of years for regretting protein nutrition, recreational and commercial purposes. Day by day pond fish farming is getting importance in fish production and it is more profitable than crop and livestock/poultry production. Now a day's small scale fish farming becomes very popular with the rural people due to its highly profitable and year-round production. Pond fish farming has been proved to be a profitable business than rice cultivation. Therefore, many farmers in rural areas are converting their rice fields into aquaculture ponds (Rahman, 2007). So the agricultural farmers are converting fish farming as their principal occupation and by converting their whole possession of farmland into the fish farm. On the other hand, many pond fish farmers in rural areas have also taken fish farming activities as their secondary occupation by converting partial agricultural land into a fish farm. Most of the people involved in fish farming improved their socio-economic condition through pond fish farming activities (Ara, 2005).

Food habit
Proportionate household consumption during natural calamities was presented in Table 1. Under natural calamities 15% of households depend on rice and dried fish, 20% on dried food like chira, 17.5% on rice and pulse and 47.5% on usual foods like rice, vegetables, fish, eggs, etc (Table 1). The food habit of the respondents greatly varies on the variation of the season. Paddy is the only agricultural crop so that they depend on imported foodstuffs like vegetables, fruits, etc. They shop all kinds of family ingredients from the village market except rice that was grown by them. Most of the respondents depend on wheat, potato, pulses, and some dry food as they grow no vegetable and/or less amount of vegetables

all around the year. The interesting fact is that most of them consume cultured fish as of the lower price. Some respondents who catch wild fish from the haor and sell to the Arotdar (local agent) to transport the city market to take the opportunity of getting high price. Similarly, some respondents who raise duck sell eggs to the Arotdar (local agent) to transport to the city market to take the opportunity of getting a high price.

Food intake in the study area (1089.51gm/capita/day) is comparatively high to the national level (975.50gm/capita/day)(BBS: preliminary report of HIES 2016) as they consume higher amount of foodstuffs due to their food habit, eventually, availability of fish, duck meat and eggs greatly influence their food habit. The average per capita daily food intake by the respondents was presented in table 2

Intake of calorie and protein
Along with food consumption, calorie and protein intake are the two main indicators to determine the nutritional status for all level of people. Average per capita daily calorie and protein intake were presented in table 3. This study reveals that the average per capita daily calorie intake was 2204.28 kcal and the average per capita daily protein intake was 76.55 g. The estimated national requirements, based on physical activity level and desired body weights, are 2,200 kcal (FAO/WHO- 1975). According to HIES 2010 reported annual fish consumption of 16.71 kg/person/year (equivalent to 45.8 g/person/day). In addition, Belton et al., 2014, reported that in 2006-2007 per capita fish consumption in the mid-range of the above surveys, 54.0 g/person/day. This difference from the present study might be related with the season of data collection and different regions of Bangladesh.

Raising large groups of ducks in open water
The farmers raise ducks on a seasonal basis in this region once a year for 6 months period just after autumn when the haor

getting dry. The ducks are generally let loose to allow free-ranging in open water during the day but are kept in pens at night. This method is advantageous to the large water body for promoting fish production without causing any water degradation. It also reduces the inputs of animals and plant feeds. This method can be considered as an integrated management model for large water body development. The free-raising area for ducks in open large water bodies was presented in image 1.

Environmental impact

The rims of the water bodies are used for winter (boro) rice cultivation. The flooded fields in the monsoon became rich with minerals and are very fertile. On the other side, the rims also use as a housing base for the free-ranging duck at night that which has great beneficial effects to the soil. The dropping of duck plays a role as fish feed and in the growing process of planktons. However, haor biodiversity remains strong. But in recent years fish population and diversity are under threat due to discriminate fishing. Like most of the haor in Bangladesh, this study area (Bolli village, Netrokona) is under threat. There is huge population pressure, climate change impact, and development interactions. The major threats to the village are pollution, over-harvesting of the natural resources, increase risk of flood, land erosion, siltation, road construction, and other development activities. Duck drooping mixed with soil and fish biodiversity in the study were shown in image 2 and image 3.

Socio-economic constraints of the farmers

The socioeconomic status of the farmers' community in the study area was not satisfactory. The farmers of the study area, were encountered by many constraints in terms of livelihood status. The main constraints were inadequate government services, inadequate credit facility, inadequate communication for eggs and fish marketing, lack of knowledge of duck management and fishing, lack of appropriate gears, reduction in fish catches in recent years, low wage rate in fishing and fishing-related activities, limited access to land for home, duck raising and crop cultivation. Most of the farmers were very poor and they had an inadequate resource to buy ducks and nets and other necessary equipment. Being very underprivileged, their children often go fishing rather than going to school.

CONCLUSION

Calorie and protein intake per capita per day in the study area are satisfactory due to their food habit and availability of fish, duck eggs and duck meat. Integrated management of duck cum fish farming can be further developed towards achieving a higher nutrients supplement and economic efficiency. By utilizing the natural water body to cultivate high yield aquatic plants as vegetable feeds of ducks and the utilization of waste food from city or municipality to grow earthworm as animal-based feeds. The produce in terms of eggs, meat, and fish can be further processed before marketing, thus, raising the economic efficiency and revenue in the utilization of energy and nutrient resources in Haor areas. If the farmers get proper training programs, credit facilities on easy terms and conditions, more profitability would be reflected. It is therefore recommended that Government and other support organizations should take initiatives to uphold their socioeconomic condition for the betterment of the livelihood of farmers in the haor area of Bangladesh.

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