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## **GENDER ROLE IN POND FISH CULTURE IN TERMS OF DECISION MAKING AND NUTRITION SECURITY**

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### **ABSTRACT**

Fish culture activities are commonly done by men but there is enough scope of women's participation in pond fish culture in Bangladesh. This study was undertaken to know the extent of women's participation in pond fish culture and their decision making capacity in fish farm and household nutrition security. To fulfill this objective some literature from past fish farming activities done by women was reviewed. Women were engaged in activities like sorting of fingerlings, repairing and maintaining fishing gears, fish processing and transportation. This complementary role of women is changing and pond fish culture activities like feeding and other management activities including marketing are increasing. Data were collected from ten purposively selected villages of Jamalpur Sadar and Melandah Upazilas of Jamalpur district. A pre-tested and structured interview schedule was used to collect data from rural women during the period of January to May, 2015 and 60 sample farm women were selected for the study. A multiple regression analysis was done to determine the effect of women's participation in fish farming and socioeconomic conditions on their income from fish farming. About 40 percent of the farm women were educated at SSC level and above and 67% women had farming experiences more than 5 years. Average participation of women was 2.83 hours per week and 24 percent of which for feeding the fishes. About 60 percent of the rural farm women regularly fed the fishes and 23.3% of them regularly processed the fish. Only 55 percent women had attitudes to use of scientific methods of fish culture, 76.7 percent to fish processing regularly and 51.7 percent had decision making capacity with their husbands for fish production activities. A large proportion of the studied women faced socioeconomic and technical problems in pond fish farming which could be solved by taking appropriate measures by the fisheries sector and adequate and timely supply of inputs.

**Key words:** Pond fish, Women's participation, Decision making capacity and Nutrition security

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## I. INTRODUCTION

Bangladesh has both the world's largest delta system and the greatest flow of river to the sea. It also has vast and enriched water bodies such as ponds, dighi, beel, baor, haor, lakes, rivers, estuaries etc. It is blessed with vast fisheries resources due to favorable climatic condition and geographical location. The country is dominated by floodplains and rivers, which are rich ecosystems for freshwater fish. Bangladesh is an agro-based developing country and is uniquely endowed with natural fisheries resources. Fish and fishery resources play a vital role in improving socio-economic conditions, combating malnutrition, earning foreign currency and creating employment opportunities. Annual fish production is about 34.10 million metric tones and per capita fish consumption is about 18 g/day (DoF, 2014). There are 5277571 hectare of water bodies of which 915506 hectare are ponds which are suitable for fish culture, but most of them remain unused (BBS, 2008). A large portion of these ponds is derelict and not cultured due to poor socio-economic conditions and lack of proper knowledge of fish culture. Although there is a wide scope for farming pond fish, nevertheless, pond fish farming is underdeveloped and non-scientific. Fisheries sub-sector contributes 4.43% to the total GDP and 22.21% to the agricultural GDP (BER, 2012). The country's export earnings from this sector are 2.73% in 2010-11 (BER, 2012). In recent years, this sector performs a significant GDP growth rate over the last ten years which is almost steady and encouraging varying from 4.76 to 7.32 percent with an average growth rate 5.61 percent, whereas, for the last four years average growth rate of this sector was 6.22 percent.

According to available statistics, it was found that the total fish production of the country showed a consistently increasing trend during the last 25 years. The overall growth performance from inland aquaculture showed a moderate increased trend due to dissemination of improved technology package and needed based extension services at farmers level (DoF, 2012). Fisheries is the second-sub sector of agriculture in Bangladesh. Fishing has become a way of life and the primary occupation of the coastal dwellers, men and women that depend on it for their livelihood and subsistence. Fisheries have a greater promising and maintaining a steady rise in contribution of GDP. Presently 1.4 million people are engaged full time and 12 million as part time in fisheries sector for livelihood and trade (DoF, 2011; Ahmed, 2012). The export earning of fisheries sector is also the second (4.09%) and fish provide 60% animal protein. One fundamental contribution of fish to food security and nutrition derives from its "cash crop" function for fish-dependent communities (Béné *et al.*, 2009). It is estimated that between 660 and 820 million people like workers and their families depend totally or partly on fisheries, aquaculture and related industries as a source of income and support (Allison *et al.*, 2013). Due to extreme poverty, millions of people, particularly women and children, suffer from severe malnutrition and under nutrition mainly due to the lack of animal protein in their diet. Fish food has a nutrient profile superior to all terrestrial meats. In fact, if there is a single food that could be used to address all of the different aspects of world malnutrition, it is fish - the staple animal protein source of traditional fishers.

About half (49.96%) of the population in Bangladesh are female (BBS, 2011) and maximum of them live in the rural areas. Rural women are absolutely contributing to seasonal fish

drying, processing and many other assorted types of work associated with fisheries. They spend a major part of their day at ponds performing a variety of tasks such as washing, bathing, collecting water for the cattle. After fulfilling their traditional responsibilities in the household, women can simultaneously be involved pond fisheries activities; this enables their male counterpart to work elsewhere, and women to supplement the family income. However, one of the major problems is the socio-cultural taboos against women who strive to earn their livelihood in rural areas and these give rise to gender bias in fish culture activities. Women play a critical role in every link of the value chain in small-scale fisheries; their best-known roles are in processing and marketing of fish and other fishery products and participation in fisheries resource management and policy decision-making (Lentisco and Lee, 2015). The contribution of women in aquaculture has impact positively on the social status and economic power of women. Women are struggling hard to earn their livelihood and trying to overcome poverty. Generally poor women do not get any incentive from the influential people of the locality. The woman's involvement in aquaculture has helped increase her family's income, thereby contributing to sustainable livelihood and enhancing the social well-being.

A full understanding of the role of women in sustainable fisheries development is significant in assuring food security, income generation, trades, and improved living standards in many developing countries. Their involvement in pond fish culture is one issue that needs to be addressed when dealing with rural communities and poverty alleviation among the rural women. Demographic information is useful to get an insight into the profile of the household and the intervention for planning for development. Socio-demographic background and characteristics of farm women have a vital role in farm activities to a great extent. Thus, the socio-demographic characteristics of farm women like, education level, fish farming experiences, family background, etc, are essential components to prescribe any policy for women's contribution in fisheries development. Pond fisheries activities of women contribute to the family income considerably; ensure constant supply of much needed family nutrition; generate an opportunity for self-employment; uplift their overall socio-economic condition; and contribute to become more skilled. Pond fish culture will be helpful to explore the socio-economic status of women particularly rural women, their level of income and participation in farm activities, their problems and potentials and their contributions to agricultural and household decisions. So, the information of different activities of women, their decision making capacity and problems faced by them in fish culture is essential for policy makers as well as to fisheries development.

Rural women, in particular, who live on poverty, with no purchasing power, and who suffer from malnutrition due to low protein intake, has taken the lead in small scale pond fish culture for improvement of their social status and economic power. Gupta (1990) reported that in Bangladesh, rural women engage in subsistent aquaculture, which has helped in improving the quality of their families' lives. So, in poor rural communities, aquaculture can be an integral component of development, contributing to sustainable livelihoods and enhancing social well being. Pond fish culture by women has, therefore, contributed significantly to food security, income generation, trades, and improved living standards in many developing

countries. The result of this study may be helpful to the policy makers and planners in formulating plans for national development. Moreover, the findings may be useful to extension workers and researchers who are directly involved in different development programs particularly in relation to women development. Therefore, the study was undertaken to know the role of women in pond fish culture and their decision making capacity in pond fish culture and nutrition security at household level. The specific objectives were as: to know the role of women in pond fish culture, socio-demographic characteristics of farm women, extent of women's participation, decision making capacity in fish farming and nutrition security, and problems regarding farming by women.

## **II. METHODOLOGY**

### **Study Area and Sampling Design**

The locations for the study were selected purposively where the fish cultures were intensive. On the basis of pond fish production done by the women, two Upazilas (Jamalpur Sadar and Melandah) were selected purposively. Ten villages (five from each Upazila) were chosen where women were involved in pond fish culture. The main reasons for selecting above ten villages were: this type of study was not conducted before, comparatively easy accessibility and good communication facilities and women farmers were cooperatives so that the reliable data would be obtained. Villages were selected from each of the Upazila by simple random sampling method and the ultimate sampling units (households) were selected by stratified random sampling method where villages were the stratum. Sample survey method was used for primary data collection and secondary data were collected from different sources such as BBS, FAO, DAE, journal, thesis, abstracts, report and the internet. The researcher also collected documents from various organizations like Upazila Fisheries office for this purpose.

### **Data Collection**

The survey schedule was designed in accordance with the objectives of the research. The survey schedule was prepared in such a way that all important information relating to socioeconomic aspect of fish producing women farmers and all necessary items for determining the economic analysis of fish production were included. As the survey was mainly dependent upon the preparation of the survey schedule, a draft schedule was prepared for pre-testing to verify the relevancy of the questions and nature of response of the farmers. Data were collected during the month of January to May in 2015. Data relating to inputs used and outputs produced were collected through field survey. The data were collected through direct interview method through personal visit to the houses of the selected farmers. Before beginning of the interview a brief introduction about the nature and purpose of the study was given to the respondents. Afterwards the questions were asked in an understandable language with necessary explanation and the information supplied by the respondents was recorded directly on the schedule. After completion of each interview, the interview schedule was checked to be sure that information of each of the items had been properly recorded.

### Measurement of indicators

To examine the educational status of the sample women, the sample households were divided into four categories. These were illiterate, having primary education, secondary education, and SSC & above. Family size in this study has been defined as the total number of persons living together and taking meals from same kitchen under the administration of the same family heads. The family size includes wife, son, daughter, father, mother, brother and sister. In addition, fish farming experience, number of children per family, women participation, women's attitude, decision making capacity, income, expenditure, food consumption, nutrition, health and sanitation etc were measured.

### Analytical Techniques:

For the analysis of data, data entry was made in computer and analyses were done using the concerned software Microsoft Office Excel and IBM SPSS Statistics (Statistical Package for Social Science) software package. The study was based on both descriptive analysis and functional analysis, where some descriptive statistics were averages, percentages, standard deviations and percentages, per capita food consumption, calorie and protein intakes. Per capita calorie and protein intakes were calculated using food conversion factors. As functional analysis, fish income functions were estimated. To identify the impact of women's participation on fish income, regression with dummy independent variable was carried out as below:

$$Y_i = \beta_0 + \beta_1 D_i + \beta_2 X_{1i} + \beta_3 X_{2i} + \beta_4 X_{3i} + u_i \quad (i)$$

Where Y is income from fish farming, D is dummy variable which assumes 1 in case of women's participation and assumes 0 in cases no participation of women. X<sub>1</sub> is education and X<sub>2</sub> is year of farming experience, X<sub>3</sub> is area of pond in decimal. Besides, the following regression was also carried out estimating the amount (total score) of participation.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + u_i \quad (ii)$$

Where Y is income from fish farming, X<sub>1</sub> is amount of participation (percentage score), X<sub>2</sub> is education (year of schooling) and X<sub>3</sub> is farming experience (years) and X<sub>4</sub> is area of pond in decimal. u is random error component which is assumed to be independently and normally distributed with zero mean and constant variance  $\sigma^2$ .

In addition, poverty indices were calculated using Foster-Greer-Thorbecke (FGT) method. On the basis on Direct Calorie Intake (DCI) method 'Absolute Poverty' and 'Hard Core Poverty' were calculated. The threshold per capita per day calorie intake is 2122 kcal. A person, whose daily calorie intake is less than 2122 kcal is considered to be in the 'Absolute Poverty'. Similarly, a person having daily calorie intake is less than 1805 kcal is considered to be in the 'Hard Core Poverty'.

### III. RESULTS AND DISCUSSION

#### **An Overview on Role of Women in Pond Fish Farming**

Fisheries activities are commonly perceived as men's work but in our subsistence rural economy, women play a vital role in producing fish. However, while there exists difficulties of different magnitude for women to be fully involved in fisheries, there are also vast potentials for women to contribute meaningfully in the fisheries sector. Traditionally, women have played a major role in agriculture, however, studies on various development endeavors have also endorsed the fact that female members of farm-based households are playing a significant role in fish farming. Together with their male counterparts, women are engaged in activities like making fishing nets, gears, repairing or maintaining the gears, sorting of fingerlings, fish processing, transportation and marketing. Most of the women managed the pond regularly in two ways: first, most routine operations such as fertilization and feeding could easily be managed and second, husbands are often busy in other work, away from the home for long hours, and hence the wife had to take the lead role in day-to-day operations. In several cases, harvest of fish for family consumption is done by women with the help of children. Husbands only help when they are at home or when the ponds water is too deep, requiring more specialized gear to be used for fish harvesting. They like to spend more time in aquaculture because of the high economic return. Participation of women with modern technologies in aquaculture makes enough income to sustain their families and save the society from risk of fish scarcity. However, as time progresses, this complementary role of women is changing and women's involvement in these activities have been becoming a full-time occupation.

Women in Bangladesh had diversified roles in fisheries with substantial in small-scale fisheries (Jahan, 1990). Homestead farming is generally carried out by women. On an average women spent 30% of a day time for household activities and another 30% on homestead agriculture operation, weeding, irrigation and post-harvest activities (Aireen, 1992). Bangladesh Fisheries Research Institute (BFRI, 1992) observed that involvement of women in aquaculture increased production as women could take routine work for pond management. Parvin (2003) found that fish production was increased due to the involvement of women and estimated fish production was 2420 kg/ha/year. In some NGO's and Government programs, women from landless households cultivate fish individually or jointly in leased ponds, either within or near the homestead. Cage culture is another activity that has been successfully introduced in Bangladesh and several women are engaged in this activity. Women's groups have been able to nurse the fish in cages using various types of waste materials and ensured effective cage management. Through creating access to water bodies even those women who do not have any land or pond can take part in cage culture. The increase in cage culture, particularly by women groups, has helped to increase the consumption of fish. Women generally tend to place a higher priority on family nutrition rather than selling all fish for cash.

In Bangladesh, many women are involved in making fish feed at home for their own used. It has also become an important income-generating activity as they can sell the feed to other farmers in the area. Most fish preservation methods, such as smoking, drying, and even

fermentation are performed by women near or inside the house. Women are involved in various aquaculture activities such as preparation of feed and feeding of fish, pond preparation, fertilizer application, pre-stocking management, harvesting and marketing of fish etc. (Bulbul, 2005). Women are more involved in the trade of fish smoking (Tettey and Klousseh, 1992). This kind of work is an ample opportunity for women that can do easily at home. The majority of the employees in fish processing plants in Chittagong and Khulna are women. Women are also predominantly involved in net making, the main income generating occupation in many families and freshwater fish farming (FAO, 1980). Women have traditional participation primarily as family labour in preparing fish nets in some area and also in fish processing. Begum (1995) identified the women in Bangladesh are engaged in fish net marking, fish food preparing, raring, processing, washing, cleaning, salting, drying and also packaging. The highest per hectare profit amounted in Tk. 1,37,480 earned by farmers under NGO management due to women involvement and the lowest profit Tk. 65,900 was earned by owner operated farmers (Rahman, 1995).

Increased economic activities leading to income generation opportunities for the rural women are the most important benefits that have resulted from small-scale aquaculture development in rural Bangladesh. Women's growing participation in aquaculture has been a significant indicator of increased empowerment at the household level as well as society. With increased participation in aquaculture, women's socioeconomic conditions within the households and communities have risen significantly. This has begun to change giving women increased decision-making power on household management and income generation activities.

### **Socio-Demographic Characteristics of the Farm Women**

Education is an important factor to increase income and educational status affects the implementation of appropriate technology and fish production. Women have limited access to education, skills, resources and opportunities lead to gender inequality in all spheres of women's lives. Khan (1993) found that rural women's educational level had a positive relationship with their participation in community activities and income generation. In this study, the highest percentages (40%) of total sampled women were SSC level educated or more and lowest percentage (11.7%) was found in the illiterate category (Table 1) which indicated that the women of the studied area were educated. According to BBS (2007), their literacy rate is only 49.8 percent, much lower than that of men (57.1%). The highest percentages of women (51.7%) involved with fish farming had 5 to 14 years of experience and 15 percent women involved with fish farming for the last 15 years and more. In the study area it was found that women had sufficient experience in pond fish farming because majority of rural women and their family members also involved in different farming activities.

The highest proportion (58.3%) of the rural women had 5 to 8 members which were considered to be medium family size. About 26.7 percent of the respondents had above 8 members and was considered to be large family size and only 15 percent of the respondents had up to 4 members and considered as small family size. Thus, the study showed that women with large and medium size of family were engaged potentially in fish culture activities



compared to small size family. About 81.7 percent of the women's household's head were engaged in farming which was the main occupation for them, 11.7 percent were engaged in business and 6.6 percent were engaged in both farming and business occupations. So it was clear that most of the women's household's head occupations were farming. About 46.7 percent household had 0-2 children, 38.3 percent had 3-4 children and the remaining 15 percent had more than 4 children. Household's land resources in term of own pond was maximum 2.64 hectore with an average of 0.21 hectore. The culture fish area in leased pond was maximum 0.40 hectore with an average of 0.03 hectare. Thus, the study showed that majority of the women and their family members had own or lease ponds for fish culture.

**Table 1. Socio-demographic characteristics of farm women**

Characteristics	Number	Percentage
Women's level of education		
Illiterate	7	11.7
Primary education	12	20.0
Secondary education	17	28.3
SSC & above	24	40.0
Fish farming experience		
Below 5 years	20	33.3
5 to 14 years	31	51.7
15 years and more	9	15.0
Main occupation of household head		
Farming	49	81.7
Business	7	11.7
Farming and business	4	6.6
Family size		
Up to 4 members	9	15.0
5 to 8 members	35	58.3
Above 8 members	16	26.7
Number of children in the family		
0 to 2	28	46.7
3 to 4	23	38.3
More than 4	9	15.0

### **Women's Participation in Fishculture Activities and its Impact on Household's Development**

In the study area, the women are involved in various aquaculture activities, including stocking of ponds, feeding of fish, pond management, fertilization, liming, and fish harvesting and marketing. Based on a sample of 60 women farmers, it was found that women were involved in aquaculture activities with various degrees of participation (Table 2). According to the survey, the majority of women were regularly involved in feed preparation, feeding of fish, fertilization, pond supervision and management, and fish harvesting. In general, women provide partial assistance to men in pond supervision and management, by applying feed, lime and fertilizer. Female worked 0.40 hour per week for pond preparation where 20 percent

female did this regularly, 10 percent occasionally and 70 percent never did this. They spent 0.20 hour per week to release fish fry where 20 percent female did this regularly, 43.3 percent occasionally and 36.7 percent never did this. Similarly, they spent 0.67 hour per week for feeding the fish and 60 percent female did this regularly, 33.3 percent occasionally and 06.7 percent never fed fish. They spent 0.29 hour per week for fertilization, 26.7 percent female did this regularly, 40 percent occasionally and 33.3 percent never did fertilization. Women spent 0.40 hour per week for other management of fish with 16.7 percent female did this regularly, 50 percent occasional and 33.3 percent never did this. Whereas they spent 0.17 hour per week for harvesting with 20 percent female did this regularly, 36.7 percent occasionally and 43.3 percent were never involved in harvesting. As in other cases, they spent 0.17 hour per week for transportation where 16.7 percent female did this regularly, 30 percent occasionally and 53.3 percent were never involved in transportation. They spent 0.20 hour per week for fish selling where 23.3 percent female did this regularly, 43.3 percent occasionally and 33.3 percent were never involved in fish selling. Similarly, they spent 0.42 hour per week for fish processing where 23.3 percent female performed this regularly, 40.0 percent occasionally and 36.7 percent did never process fish. Naoroze (2004) observed that age of rural women had no significant relationship but farm size had positive correlation with their empowerment through participation in aquaculture. Majority (67%) of women had very low participation on aquaculture activities and farm size had negative relationship with rural women and participation of aquaculture activities whereas family size didn't show any relationship between rural women and participation of aquaculture activities (Amin, 2004).

In the study area, women had highly positive attitude towards fish culture. Hundred percent sufficient attitude was found for fish production, 55 percent sufficient attitude for use of scientific methods, 23.3 percent somewhat and 21.7 percent no interest for use of scientific methods. Similarly, 50.0 percent sufficient attitude was found for pond management activities, 46.7 percent somewhat and 3.3 percent had no interest for management activities. However, 20 percent women showed sufficient attitude for fish harvesting whereas 76.7 percent showed sufficient attitude for fish processing. On the other hand, 25 percent women showed sufficient attitude for fish marketing, 40 percent somewhat and 35 percent had no interest for fish marketing (Table 3).

**Table 2. Extent of participation of women in pond fish farming**

Activities	Average time devoted by the women (hour per week)	Percent of total time devoted	Extent of participation in each activity (%)		
			Regular	Occasional	Never
Pond preparation	0.40	14	20.0	10.0	70.0
Release fish fry	0.20	07	20.0	43.3	36.7
Feeding the fish	0.67	24	60.0	33.3	06.7
Fertilization	0.20	07	26.7	40.0	33.3
Other management	0.40	14	16.7	50.0	33.3
Harvesting	0.17	06	20.0	36.7	43.3
Transportation	0.17	06	16.7	30.0	53.3
Fish selling	0.20	07	23.3	43.3	33.3
Fish processing	0.42	15	23.3	40.0	36.7

**Table 3. Women's attitude towards pond fish production and marketing**

Activities	Ranking of attitudes		
	Sufficient	Somewhat	No
Fish culture	100	00	00
Use of scientific methods	55.0	23.3	21.7
Management activities	50.0	46.7	3.3
Fish harvesting	20.0	41.7	38.3
Fish Processing	76.7	16.6	6.7
Fish Marketing	25.0	40.0	35.0

To achieve the impact of participation of women in pond fish culture, two regression functions were estimated, one was done using participation as dummy independent variables along with some other independent variables. The second one was done with amount of participation (percentage) as independent variable along with some other independent variables. Both the estimated regression equation have been presented below:

$$Y_i(\text{income}) = - 47555.1 + 56102.41^* \text{Education} + 349.51^{**} \text{Pond area} + 4667.88^{**} \text{Experience} + 34280.8 D_i \quad (F=3.12^*) \quad (i)$$

$$Y_i(\text{income}) = - 3691.25 + 47225.51^* \text{Education} + 279.25^{**} \text{Pond area} + 5442.91^{**} \text{Experience} + 2262.71^{**} \text{participation} \quad (F = 5.71^*) \quad (ii)$$

The above estimations show that level of education, pond area and farming experience and women participation had positive impact on the income from fish culture. The contribution of rural women in the fish culture is enormous and changes household's development indicators. They are not only income generators but also expenditure saver in their main earning members. They increased 81.7 percent income in their families and increased 68.3 percent expenditure which was used in own and their family activities. They also changed 70 percent technical knowledge (education) about fish culture. They increased assets like ornament 20.0 percent, lands 15 percent, furniture 13.3 percent, money 51.7 percent and others 43.3 percent (Table 4).

**Table 4. Change of household development indicators due to fish culture by women**

Indicators	Positive response (%)
Income	81.7
Expenditure	68.3
Level of education	70.0
Assets	
Ornament	20.0
Lands	15.0
Furniture	13.3
Money	51.7
Others	43.3

### Decision Making Capacity of Women and Their Opinion on Health and Nutrition

The contribution of women in agricultural activities is not properly recognized in economic terms in a subsistence economy like Bangladesh. They are also less concerned in the decision making process even at the family level. In traditional agriculture, practically all agricultural decisions are predominantly made by male members. The role of women in small-scale aquaculture related activities is potentially very important for their empowerment. The women involvement in aquaculture provides three basic improvements: economic, nutritional and social benefits, those are assumed to be interlinked in order to empower women. Women's participation in aquaculture has changed the attitudes of family members, including their husbands, mothers-in-laws and other female relatives as their aquaculture activities willingly offer help in meeting their household responsibilities because of increased income through increased fish production. In this study, men and women jointly took part in decision making process on a specific matter. The level of women participation in decision making process has been calculated by different scores given on the basis of decision maker. About 76.7 percent of the farm women had decision making capacity to educate children, 51.7 percent for fish production activities, 15 percent to perform social and cultural activities and 75 percent to maintain food and nutritional activities (Table 5) which indicated that women had the power to take decision. Kusakabe (2003) reported that women's decision making power in aquaculture in the households was stronger when women had greater material, resources and knowledge than their husbands.

**Table .5. Decision making capacity of women**

Activities	Positive response (%)
To educate children	76.7
To use resources for crop production	46.7
To use resources for fish production	51.7
To run family activities	60.0
To own other Business	26.7
To perform social and cultural activities	15.0
To develop leadership	23.3
To maintain food and nutritional activities	75.0

Women have improved their income through increased profitability in fish farming and such improved conditions can be described on the basis of qualitative indicators, including food consumption, sanitary and drinking water facilities through tube-wells, improvement of housing structures and children education. For home consumption, women contribute significantly to the nutritional needs of the family. When women are involved in aquaculture production, it will open a path to achieve huge development to reduce extreme poverty, hunger and malnutrition. Women are more vulnerable to effects of changes in the environment (Women Watch, 2008), they learn about nutrition in preserving the environment and natural resources and can secure water, food, and fuel and overseeing family health and diet. Farm-women's and her family also joined fish related training and activities, rural development activities like NGOs. They trained women about nutrition, health and sanitation.

So farm women had 70 percent opinion during cooking to keep nutrition of vegetables and rice. About 86.7 percent women responded that they covered the cooked foods, 80% stored waste around homestead, 71.7 percent had regular cleaning of homestead and house, 40 percent had regular cleaning their poultry house, 40 percent had storage of cow-dung and poultry waste in confined place, 80 percent had separation of poultry and cattle house from own house and 70 percent had a hygienic latrine (Table 6).

**Table 6. Farm-women's opinion about nutrition, health and sanitation measures**

Measures	Response of positive opinion	
	Number	Percentage
During cooking, keep nutrition of vegetables and rice	42	70.0
Cover the cooked foods	52	86.7
Store waste around homestead	43	80.0
Regular cleaning of homestead and house	40	71.7
Regular cleaning poultry house	24	40.0
Storage of cow-dung and poultry waste in confined place	24	40.0
Separation of poultry and cattle house from own house	48	80.0
Have a hygienic latrine	42	70.0

Table 7 reveals daily per capita consumption of different food items. The consumption of rice, wheat, potato, vegetables, mustard oil, soybean oil, meat, egg, fish, onion, garlic, chili, fruits, sugar, milk, pulses, ginger, other spices, salt were 338.1, 49, 106.3, 86.4, 4.5, 28.5, 47.2, 15.3, 131.4, 39.7, 11.6, 51.6, 18.0, 64.5, 19.5, 4.2, 4.4 and 18 g respectively. The various food items consumed by the farm households were similar and consistent with Rahman and Islam (2011-2012), PMS (2004), and HIES (2010) with a few exceptions. Rice supplied the highest amount of calorie (1098.83 kcal) and protein (28.74 g) to household. Wheat was the second largest calorie supplier (158.82 kcal) followed by fruits (148.29 kcal), fish (139.32 kcal), soybean oil (121.74 kcal), potato (97.81 kcal), sugar (67.11 kcal), pulses (64.21 kcal) and meat (64.17 kcal) respectively. Daily per capita calorie intake from all food items was 2,129.18 kcal. On the other hand, fish was the second largest protein supplier (22.86 g) to people in the study area followed by soybean oil (12.31 g) and meat (12.23 g) respectively. Average daily per capita protein intake was 96.35 g. As mentioned earlier, daily per capita calorie and protein intakes were calculated using food conversion factors. It was observed that 35% of the people were affected by absolute poverty and 20% people were affected by hard core poverty in the study area.

### **Problems and Suggestions Regarding Pond Fish Farming by Women**

The women were found to face a number of problems while participation in fish farming activities. The major socioeconomic issues in pond fish culture are the prevalence of traditional method, limited extension program, lack of credit facilities for investment in pond management and fishing inputs, inadequate supplies of fries and fingerlings, fish diseases, theft, lack of marketing facilities, etc. Women also face these problems in pond fish farming. In this study, nineteen problems were selected to measure the extent of rural women's difficulty in pond fish farming and they were categorized into four groups (Table 8).

Regarding socioeconomic problems 27 percent respondents had lack of financial problems, 37 percent respondents had lack of credit, 43 percent had lack of education/ training, 20% had thief or crime, 43 percent had social barriers for women and 23 percent had improper communication. Khan et al. (1991) stated that lack of knowledge and poor role of women due to social condition were the constraints to pond fish culture. Lack of financial support was one of the major constraints as claimed by 55% women (Bulbul, 2005). Nahar (2005) observed that lack of capital was the main problem in fish farming and other major problems were the insufficient water in dry season, flood, fry collection, disease and multiple-ownership.

**Table 7. Consumption of food items of sampled households**

Food items consumed	Consumption (grams/day/capita)	Calorie (kcal)	Protein (gram)
Rice	338.1 (162.67)	1098.83	28.74
Wheat	49.0 (48.35)	158.82	5.93
Potato	106.3 (75.17)	97.81	1.70
Vegetables	86.4 (71.14)	25.95	1.90
Mustard oil	4.5 (2.98)	1.48	0.99
Soya bean oil	28.5 (12.06)	121.74	12.31
Meat	47.2 (88.02)	64.17	12.23
Egg	15.3 (08.70)	26.89	2.04
Fish	131.4 (103.25)	139.32	22.86
Onion	39.7 (25.92)	18.44	0.48
Garlic	11.6 (9.30)	15.88	0.10
Chili	11.9 (10.44)	28.18	0.19
Fruits	51.6 (27.35)	148.29	0.52
Sugar	18.0 (17.81)	67.11	-
Milk	64.5 (54.09)	42.58	2.06
Pulses	19.5 (148.5)	64.21	4.90
Ginger	4.2 (2.83)	3.90	0.10
Other spices	4.4 (3.0)	5.59	0.10
Salt	18.0 (13.06)	-	-
Total	1049.9 (566.56)	2,129.18	96.35

High feed cost is a main problem in fish farming by women as a result of which cost of production is increased and profitability decreased. The lack of fingerlings is another problem for fish farming which is the most important material input in pond fish culture method. The constraints related to input use were the shortage of land for ponds (27%), inadequate amount and low quality of fish feeds (20%), shortage and higher rate of labor wages (43%), high price of inputs (43%) and difficulties as women to input use. About 18.33% of the respondents claimed non-availability of seed fish and 91.67% of the respondents claimed high feed cost as their big problem (Rahman et al., 2015). In the study area 47 percent respondents had lack of technical knowledge, 53 percent had inefficient knowledge and facilities of disease control and 70 percent women did not get extension services and rural women were not interested to contact with extension worker. The constraints regarding harvesting and marketing were lack of knowledge on fish harvesting (27%), fish processing (16%), transportation (67%) and fish selling (40%). Forty three percent women's opinion about problems in pond fish farming was

lack of education and social barriers. Kamrunnahar (2005) found that 80% of the rural women involved in feed preparation, feeding and releasing of fry in ponds whereas less than 20% were involved in pond preparation, harvesting and marketing of fish and net making.

**Table 8. Problems Regarding Pond Fish Farming By Women**

Problem	Number	Percentage
<b>Socioeconomic</b>		
Lack of money	15	25
Lack of credit	24	40
Lack of education/training	21	35
Thief/crime	9	15
Social barriers for women	23	38
Improper communication	10	17
<b>Input Use</b>		
Shortage of land for pond	15	25
Inadequate amount and low quality of fish foods	22	37
Crisis of fish fry near house	16	27
Shortage and higher rate of wages of labor	13	22
High price of inputs	27	45
Difficulties as women to input use	14	23
<b>Technical</b>		
Lack of technical knowledge	18	30
Inefficient knowledge and facilities of disease control	16	27
Non existence of extension services	27	45
<b>Harvesting and Marketing</b>		
Harvesting	18	30
Processing	8	13
Transportation	28	47
Selling	18	30

**Table 9. Suggestions Regarding Pond Fish Farming by Women**

Suggestions	Number	Percentage
Need assistance from husband and children	16	27
Availability and low price of feeds	35	58
Timely and adequate supply of inputs at affordable costs	28	47
Harvesting and transportation facilities should be improve	26	43
Women should be educated and gather knowledge through training	21	35
Extension services should be increased and strengthened	27	45

The study shows that women play an important role in fish production activities. Economic pressure in forcing them to break away their traditional roles of housewives into farm labors. In order to improve the overall economic condition and ensure women's involvement in fish production 37 percent women suggested that they needed assistance from husband and children, 63 percent women suggested to make available and low price of feeds, 30 percent suggested for timely and adequate supply of inputs at affordable costs, 53 percent suggested for harvesting and transportation facilities to be improved 70 percent respondent suggested

that women should be educated and gather knowledge through training , 70 percent suggested for extension services to be increased and strengthened (Table 9).

#### IV. CONCLUSIONS AND POLICY RECOMMENDATIONS

The required data were collected from a limited area covering a small number of respondents. Thus, the scope of generalization from the findings of the study is limited. The researcher faced some problems to collect the reliable information as they had no written records of their transactions and hesitated to provide data. They provided data from their memories. Moreover, women always remained busy in their household works and often they felt discouraged in providing family information to an outsider. Therefore, efforts were made to minimize errors as far as possible.

The extent of participation of women in fish culture is higher in this study which indicates that there has been a scope to increase performance of the rural women in fish culture activities by introducing gender specific development program and proper extension strategies. There is much scope for increased participation of women in pond fish production. Women should be encouraged to participate fully in fisheries activities by establishing cooperative society; providing soft loans and enhancing their skills through more participatory extension programs. Education, training and capacity building are necessary for participation of rural women. Training might increase their knowledge and skill and may create opportunities of employment and increase income earning for improving their participation in the family decision making process which in turn empower the rural women in their family and society. Their involvement needs recognition and women need to be taken seriously in the planning process. With the support of local and national governments, NGOs and international organizations, the participation of rural women in pond fish culture can be increased through well-planned projects which put emphasis on manpower development at the grassroots level. It may also necessary to establish institutional and policy support, financial support as well as extension services to women for active participation in pond fish production activities.

Apart from the in-depth analysis of the situation of women in fishing communities, it is important to promote women as social actors with the potential to improve their family situation, communities, fishery and their country. A large portion of the rural people was affected by absolute and hard core poverty. Thus, various income generating projects should be established particularly for women. However, poverty reduction should be prioritised in the Government's intervention programs for women's development based on dignity and equality to reduce gender discrimination as poverty is the main cause of disparity. Health and nutritional status of the studied population are well but they should be more careful about their health & nutritional conditions. A large proportion of the rural women faced problems regarding socioeconomic, technical, shortage of inputs, and transportation. Thus, Government should take measures to reduce these problems. There is ample scope and reason to sustain and even subsidize women in fishing communities so that they continue to exist along with the development of the fishing industry.



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