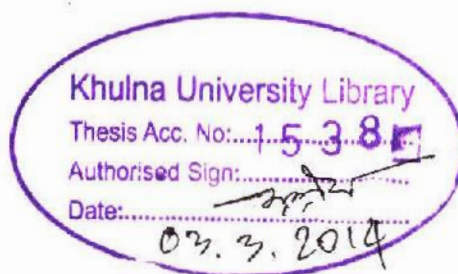


**Economics of Gher Fish Culture Under Different
Management Systems in Fakirhat Thana**



**Fisheries and Marine Resource Technology Discipline
Khulna University**

February, 2004

Economics of Gher Fish Culture Under Different Management Systems in Fakirhat Thana

A Project Work

By

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The project work is submitted to the Fisheries and Marine Resource Technology
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Economics of Gher Fish Culture Under Different Management Systems in Fakirhat Thana

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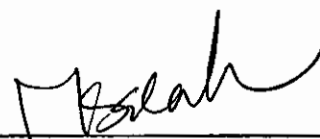
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DECLARATION

The results submitted in this project work are entirely of the candidate's own investigations and no part of the results has been accepted for any degree, nor it is being concurrently submitted for any degree.

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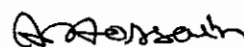
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DEDICATED TO

MY BELOVED PARENTS



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Abstract

This study was conducted in Fakirhat Thana under Bagerhat district to determine the relative profitability of gher fish production under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems and also to find out the constraints which affect the large scale production of gher fish culture. For this purpose, necessary information on gher fish production were collected by direct interviewing method with the respondent farmers under different management systems. The profitability was calculated simply by costs and returns analysis. The relative performance of gher fish farming under the three different management systems was also determined through social, economic and technical factors. In pursuing the study, information on socio-economic characteristics of the farmers and particulars of fish ghers were also collected.

The general finding of the lessons indicates that the highest per acre profitability amounted to Tk. 36,195.65 by farmers of owner operated under self-finance management system and the lowest Tk. 21,254.23 by the farmers of owner operated under mohazon finance management system. The imbalance of net profit of fish ghers under different management systems can be reduced by the proper application of necessary quantity and quality of inputs. The study undoubtedly hints that the fish culture in ghers under any management system is a profitable business in Bangladesh.



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List of abbreviations and acronyms

Abbreviations and acronyms	Elaboration
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
CARE	Co-operation of American Relief Everywhere
CIRDAP	Center on Integrated Rural Development for Asia and the Pacific
DoF	Department of Fisheries
<i>et al.,</i>	Associates
<i>Etc.</i>	Et cetera
FAO	Food and Agriculture Organization
FSMF	Fish Seed Multiplication Farms
GDP	Gross Domestic Product
GNP	Gross National Product
GOLDA	Greater Options for Local Development through Aquaculture
NGO	Non Government Organization
SPARSSO	Space Research and Remote Sensing Organization
SYS 1	Owner operated under self-finance management system
SYS 2	Owner operated under mohazon management system
SYS 3	Multi-owner operated management system
TFO	Thana Fisheries Officer
Tk.	Taka
TSP	Triple Super Phosphate

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Chapter: One

Introduction

1.0 Introduction

1.1 Evolution of fish culture

The practice of fish culture is very old. Egyptian bas-reliefs show fishing scenes and the conservation of fish raised in ponds. The Romans reared fish in fish ponds. For centuries the people of the Indo-Pacific regions and particularly the Chinese reared fish in ponds. Throughout China, Indonesia, India, Vietnam and Cambodia, fish culture is expanding under the pressure of growing population. In the Philippines fish culture is carried out in brackish water and is in full development. This case is also same in Japan with intensive fish culture.

In the Middle Ages, in Central and Western Europe, fish culture developed along with the monasteries. At first it was limited to the production of fish food, carp in particular, but it has been profoundly modified since the nineteenth century.

The North America fish culture has developed considerably since the start of this century. The origins of fish cultivation in Central Africa are far more recent. Only at the end, and above all, after the second world war, efforts were made to introduce and develop fish cultivation there.

Fish cultivation is only beginning in Latin America and most of the Middle East, with the exception of Israel where it is well established and is developing (Huet, 1979).

Fish culture is an old-age practice in Bangladesh and fish has played a vital role in our cultural life for centuries. Fish rearing in tanks and ponds was a very old practice with the Rajas and Zamindars in Bengal who excavated ponds for the tenants and the general public for storing water for drinking and domestic purposes. Fish were observed to have kept the water clean and wholesome for human consumption. Fish culture operations, as it is found today, were unknown at that time, when fish culture or the fish trade was considered to be a disgraceful profession. Brahmins and other highly placed persons in the society never indulged in fish eating. Later, with the scientific development, when it was made know to the people that fish was a very useful source of protein required for the

nourishment of human body and that fish culture and trade were a very profitable job, people of all shades of profession rushed for fish farming (Huet, 1979).

During 1960 a few well off farmers in Fakirhat thana (Bagerhat district) began to experiment with Giant freshwater prawn (*Macrobrachium rosenbergii*) cultivation. One early innovator conceived this idea of growing prawns in freshwater from nature. He first tried to grow prawns in a khas pond in 1978. The results were very good. Over the following years he and some of his neighbours tried it in their beel lands by constructing the high dikes typical to the gher. These early innovators experimented with different types of gher construction design, feeding, stocking and other technical aspects. They profited well from prawn cultivation and for the first 8-10 years it was kept secret. Around 1987, the secret began to spread and gradually more local farmers started to convert their low-lying beel lands into gher for prawn cultivation. In the 1990s, the adoption of gher farming had increased dramatically simply because farmers saw their neighbours making lots of money from gher farming. The news about this technology quickly spread to neighbouring thanas and districts, and the so-called gher revolution had begun (Kendrick, 1994).

The Government has undertaken several revolutionary steps for quick economic development of the country through voluntary participation of the rural people. Fry stocking in open water, digging and re-excavation of derelict village ponds for pisciculture is imperative of them. Under this program high enthusiasm and interest of the peoples have been observed.

1.2 Importance of Fish Culture

As an agro-based developing country, Bangladesh is striving hard for rapid development of its economy. It is often argued that the future development of the country depends particularly on the agricultural sector. Fisheries as one of the major sub-sectors of agriculture, has been playing a very significant role in nutrition, employment, foreign exchange earnings, food supply and more importantly socio-economic stability of the rural areas where majority of Bangladesh population live. This sub-sector contributes about 5.24 percent to the Gross Domestic Product (GDP) and 4.76 percent to foreign exchange earnings (DoF, 2003).

Fish and rice are the main diets of people in Bangladesh. Most of the people in the country depend on fish as principal source of protein. At present fish alone contributes 63 percent of animal protein intake in the diet of the people of Bangladesh (DoF, 2002). It is also important as the source of the high quality and easily digestible protein and fat. Although rice is the staple food of the people of Bangladesh, it is not usually preferred without fish which has led to the popular saying “Maache Bhate Bangali”(Ali, 1991).

The potential for meeting the deficiency of animal protein by increasing production of animal and poultry is very limited due to inadequate supply of necessary grazing and feeding areas. By contrast, the shortage of animal protein can be met by fish farming, as it not only requires least cash investment but also can be done using a land that is not suitable for agriculture. The importance of fish farming as an enterprise is not limited to the nutritive value derived from fish. Among other things, it also aids in diversifying the farming sector of the national economy.

The ecological condition prevailing in Bangladesh provides excellent scope for production of fish. The country is gifted with a large number of waters in her rural and urban areas especially, in the coastal areas. An efficient system for development of fish culture is required. To overcome the known problems and to make feasible plan for fish culture development, existing situation in respect of technical and socio-economic condition must be evaluated.

1.3 Rationale of The Study

In order to meet the shortage of fish and increasing demand resulting from population growth, it is essential to increase the gher fish production in Bangladesh. However, Government and Non-Government Organization (NGO) have been exerting efforts and allocating resources for production oriented research and also initiating and encouraging the rural people to increase gher fish culture. Bangladesh is endowed with a large number of waters especially in the districts near the coastal belt. These productive water bodies have never been utilized properly for fish culture and the people are using these water bodies only for the purpose of fishing. In this regard, gher fish production can be increased by making best utilization of these water bodies through modern and scientific method of fish culture.

The study was conducted on different types of gher management in Fakirhat thana under Bagerhat district. To achieve the objectives of the study, a survey questionnaire was prepared. In order to collect the relevant information, the single interview was followed i. e., primary data were collected directly from the gher owners and farmers.

Farmers and other producers are the resource users, policy makers as well as decision makers. This study is expected to provide information about socio-economic characteristics of gher fish farmers, production practices, inputs used, outputs, costs and returns by using different kinds of inputs and also socio-economic problems associated in gher fish culture under different management systems in Fakirhat thana under Bagerhat district.

The findings of the study are expected to be helpful to generate policy alternatives for fish culture development. This study may also provide information to the researchers for further studies of this nature.

1.4 Limitations of The Study

Though the study was undertaken for the achievement of some important objectives, there were some limitations of the study. The main drawback of collecting data was that the surveyor had to completely rely upon the memory of the farmers. Since farmers did not keep written records, therefore, the farmers had to furnish information mainly from their memory. The study conducted at Fakirhat thana in Bagerhat district may not represent the actual situation

1.5 Objectives of the study

The present study has been conceived with the following objectives:

- To identify the socio-economic characteristics of gher owners.
- To identify different management types and the general feature of the sample gher.
- To assess the profitability of gher fish farming under each of the management systems.
- To identify the factors responsible for variation in yield under each of the management systems.
- To identify problems and to make some recommendations.

Chapter: Two

Review of Literature

2.0 Review of Literature

There are very few studies on use and management of fish/shrimp gher which is relatively a new development of the country. This chapter, however, reviews studies concerning the utilization pattern of gher and the socio-economic problems faced by the gher owners which has so far been made by the different committees and research organizations in Bangladesh.

Isalm (1999) conducted a survey in five unions of Mollahat thana under Bagerhat district on the present status and potentialities of fresh water prawn (*Macrobrachium rosenbergii*) in the gher under the management of CARE Bangladesh. The objectives of the study were to know the physical condition of gher, ownership pattern and prawn culture condition of the gher under the study area. Identification of problems of prawn culture in gher and assessment of training needs for gher owners were also the objectives of the study. The study was carried out in 32 gher under five unions of Mollahat thana. Most of the farmer of the thana introduced polyculture. He conducted the scientific research on prawn culture system of marginal farmers under the management of CARE and reported that production depends on combined interaction between water quality and culture techniques taking from stocking to harvesting. CARE-GOLDA project assist small land holder to improve their present farming practices by supplying necessary information and technical assistance to farmer and help them to adopt improve measure in culture system. Continuous assistance and supervision by CARE personnel had improved the living status of farmers in Mollahat thana.

Hasan (1998) conducted a survey in four unions of Fakirhat thana under Bagerhat district on the present status and potentialities of fresh water prawn culture. The objectives of the study were to know the physical condition, ownership pattern and prawn culture status of gher. Identification of problems of prawn culture in gher and assessment of training needs for farmers or gher owners were also the objectives of the study. In total, 28 gher were surveyed and the distribution of these gher on the basis of bottom soil condition shows that 16, 8, 4 gher represent clayey, loamy and red respectively. Area of 20 gher ranged from 1-3 bigha 5 gher ranged from 3-5 bigha. Only 3 gher were above 5 bigha.

Out of 28 gher single ownership was found in 20 gher, 4 gher were found lease and shareholder were found in 4 gher.

A field survey was conducted by Rokonzaman (2000) in 20 galda polyculture gher in Khulna and Bagerhat districts to assess present culture practices adopted by the farmers. A questionnaire was used to carry out the survey included physical conditions of the gher, pre-stocking management, stocking management, post-stocking management, production and cost-benefit analysis. He reported that on an average 54245 taka was benefited from an acre area of gher.

Sannamat (2001) undertook a research on “the study of the water quality of prawn gher and its surrounding environment in some selected sites in greater Bagerhat region. The objectives of his study were to assess the physico-chemical and biological parameters of water quality in prawn gher and its surrounding environment, variation of physico-chemical and biological parameters in different culture systems of prawn gher and its surrounding environment. The different culture systems in his study were traditional, extensive and improved extensive.

Moniruzzaman (1999) studied the fisheries program of CARE under GOLDA project in Khulna and Bagerhat region and reported that the fisheries program was ended up with output of their activities on fisheries extension services and training methodologies throughout these regions. CARE under GOLDA project had been involved in aquacultural activities associating with poor and marginal farmers. Some salient issues such as linkages with GO's and NGO's, training of farmers and staff, different extension services, provided to the farmers, credit program etc so come out from the study of fisheries activities of CARE under GOLDA project had been addressed in the light of the available knowledge and ideas.

Biswas (1998) undertook a research on semi-intensive culture of tiger shrimp *Penaeus monodon* Fabricius in brackish water ponds to observe the effects of water quality parameters on growth of *Penaeus monodon* Fabricius, survival rate, feed consuming rate, growth rate, production etc.

Manir (2003) undertook an experiment at Fakirhat Thana of Bagerhat district to compare the biological and economical feasibility of monoculture of *Macrobrachium rosenbergii* and its polyculture system with carps (*Labeo rohita* and *Catla catla*).

A study was conducted by Mohashin (2002) on the effects of species combination and stocking density on the production and economic return of fish culture in seasonal ponds. He undertook the study in three adjacent unions Shohagdol, Boldia and Swarupkathi, Nesarabad upazilla under pirojpur district and reported that the cost of fish production per hectare averaged Tk. 32752, 30410 and 25590 in three ponds respectively. The net financial benefit (return) per hectare derived from three ponds were found to be Tk. 76568.84, 75085.60 and 67046.28 respectively.

Ali and Akbar (1979) conducted a research project on "A study on utilization pattern of ponds in some selected areas of Mymensingh District". The authors identified some socio-economic problems including the pattern of utilization, types of pisciculture and other related problems faced by the pond owners. In view of these, the authors suggested that the government need to adopt the introduction of village based multipurpose cooperative society for all round development of the village in general and for full utilization of the fish ponds of the country in particular.

Smith (1973) in his article entitled "Opportunity for village development; The tanks of Bangladesh" discussed briefly on the role of the tanks in water management specially for irrigation, production and marketing of fish and its problems, competing water uses through tank and suggested tank improvement policy through land reforms.

Khan (1977) in his seminar paper on "Culture fishing in ponds and tanks of Bangladesh" mentioned that in this country the use of ponds has been inhibited by several factors including survival rate of fry and resulting low utilization and / or utilization. He suggested that the main reasons might be sought in the ownership pattern, use pattern, awareness and knowledge of aquaculture practices.

Gill and Motahar (1982) conducted a research project on "Social factors affecting prospects for intensified fish farming in Bangladesh". The authors investigated the

possible social and economic constraints on realizing the enormous potential for intensified fish farming in Bangladesh. Multiple ownership was found to be a major constraint to fish farming; other problems identified were non-availability of fish fry, lack of technical training for the farmers, shortage of investment capital and the theft of fish or their deliberate poisoning due to rivalry, enmity or over jealousy.

SPARSSO (1984) surveyed the water bodies of Bangladesh by satellite imagery. They divided the water bodies into two categories, small water (less than 25 ha) and large water bodies.

Rahman and Ali (1986) surveyed the pond fishery of two districts (Rangpur and Mymensingh) in Bangladesh. The result of the survey indicated that 66.6% of the farmers cultivated fishes combining rohu, catla and mrigal in Rangpur while 71.3% did so in Mymensingh. The combination of rohu and catla were found to be cultured in 13.3% of ponds in Rangpur. Rohu, catla, mrigal and kalibaus fishes were found to be cultured in 2.7% of ponds in Rangpur and 23% ponds in Mymensingh. In both the areas 5-7% of ponds were found to culture only singhi and magur.

Islam and Dewan (1986) studied 180 ponds in four districts and observed that 47% fish farmers cultured indigenous carps, 2% exotic carps, and both types in 51% ponds with composite culture covered 96%. They also found 34% farmers using both fertilizer and feed, and either fertilizer or feed was supplied in 8% and 33% ponds respectively.

Rahman (1986) at the FAO workshop on socio-economics of aquaculture, listed the main constraints for the development in aquaculture in Bangladesh as follows: multiple ownership of ponds, land use and land lease of water bodies, marketing problems and lack of adequate extension services.

At the same conference Ranadhir (1986) reported in his paper that the major socio-economic constraints for aquaculture development in India were i) lesser availability of major inputs and services such as land, seeds, feed, credit, marketing, ii) legal constraints: water use right, land use right, iii) lack of technical and managerial skills of small scale

aquaculture, iv) influence by tradition, culture and other related social issues, v) lack of policy.

In the country paper of the Philippines (Anon, 1986), the major socio-economic constraints for development were high costs of major inputs, lack of available services, marketing facilities, conflicts between large and small fish farmers, conflicts between small fishermen and fish farmers, conflicts in using coastal and mangrove resources, land and water use right, land lease, technical and managerial skill of small-fish farmers, tradition, culture, religion, community structure and related social issues.

Kaiya *et al.*, (1987) surveyed pond fishery resources in Mirzapur thana under Tangail district. He determined the physical condition and fish culture status and problems with the pond fish culture. The results obtained from survey revealed that the majority of ponds of the thana were not under fish culture. He noted that fish culture status varied with age and ownership status of ponds. He identified problems such as multiple ownership of ponds, lack of scientific knowledge, fund shortage, incidence of flooding and unavailability of fish fry. The study suggested the following measures: i) leasing out the ponds under multiple ownership to an interested group / person; ii) providing adequate credit facilities to the poor farmers; iii) leasing public ponds through cooperatives; iv) making fish fry available to the pond owners; and v) ensuring proper training on scientific fish culture to fish farmers.

Islam and Dewan (1987) conducted a research project on "An economic analysis of pond fish production in some area of Bangladesh". The authors identified the production practices of both fish ponds and fish seed multiplication farms (FSMF) in Bangladesh. The study was mainly based on economic analysis of pond fish production process and method of distribution of fish seed by the FSMF, of both government and privately owned. They also discussed the different ways of increasing fish production, either by constructing new ponds and / or improving ponds or both.

BARC-CIRDAP (1987) jointly organized a workshop on socio-economic aspects of fishing community in Bangladesh and its role in rural development and recommended that integrated and multidisciplinary approach encompassing both the technological and

socio-economic variables should be adopted and an articulated fisheries policy to these effects should be formulated delineating the objectives, targets and relative priorities of the sector.

Anonymous (1983) conducted a study on "A study on the economic aspects of fish farming in ponds under different management types in some selected areas of Mymensingh district". The author attempted to quantify the costs and returns of pond fish culture from four different types in order to know their relative performance. He also reported demographic and socio-economic characteristics of pond owners.

Das (1993) reported the socio-economic characteristics of shrimp farmers and assessed the relative profitability of cultivating shrimp considering of different tenurial classes. He estimated the contribution of key inputs to the production process of shrimps under different tenurial classes identifying the major socio-economic problems facing the farmers in cultivating shrimps. He also suggested some policy guidelines and recommendation to improve shrimp production.

Chowdhury *et al.*, (1995) conducted a study to determine the relative profitability of pond fish production under owner, institutional and NGO operated management systems and also to find out the major constraints which affect the large scale production of fishes. He calculated the profitability by costs and returns analysis on the basis of both cash costs and full costs. The relative performance of fish farming under the three different management systems was also determined through social, economic and technical factors.

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Chapter: Three

Materials and Methods

3.0 Materials and Methods

3.1 Selection of the study area

The study was conducted in Fakirhat Thana under Bagerhat District. The area was selected to collect information for fish/shrimp gher management systems. According to Yang (1962) the area in which a farm business survey is to be conducted relies on the particular purpose of the survey and possible cooperation from the farmers and other respondents. To fulfill the objectives of the present study some visits were made on golda, golda and bagda gher in the study area. The main reason for selecting the area is that there are a large number of gher which are being operated under different management systems. The other reasons behind selection of the area is easy communication facilities and a relatively homogenous physiographic conditions.

3.2 Selection of sample and sampling technique

Three different types of gher management such as (i) owner operated under self- finance, (ii) owner operated under mohazon finance and (iii) multi-owner operated gher were identified in the selected area. The gher under owner operated type had the sole authority over the management of gher. They operated their activities relating to fish production without any external financial assistance. The owners took their own decision for all activities required for fish culture and management. In case of owner operated under mohazon finance gher, the owners took substantial financial help from mohazon (zaminders) with interest that were paid after the production period. The multi-owner operated gher were managed by more than one owners. Equal share of finance were made from each owner. A total fifty six sample gher under three different management systems were surveyed to perform the study. Among them twenty four were owner operated under self management system, seventeen were owner operated under mohazon finance system and fifteen were multi-owner operated management system.

3.3 Preparation of survey questionnaire

In conformity with the objectives of the study, a survey questionnaire form was prepared. The researcher himself made the survey. In this context much attention was given to any new information which was not designed to be asked and filled in the survey questionnaire form.

3.4 Collection of data

In order to collect relevant information, the single interview technique was followed i. e., primary data were collected directly from the gher owners and farmers. Before going to make an interview, each respondent was given a brief introduction about the nature and purpose of the study and the surveyor assured them that all information would be kept confidential. It was done so that they did not hesitate to answer relevant questions. The questions were asked in turn with replies being recorded directly on the interview form.

3.5 Processing and analyzing of data

After the phase of data collection from the field, these were verified to eliminate errors and inconsistencies. The first step was to look into the data of each and every interview form to ensure consistency. Simultaneously, processing and editing of data were done.

After completing the pre-tabulating task, processed data were transferred to a master sheet and was compiled with a view to facilitating tabulation. Respective tables were prepared depending on the objectives of the study. The tabulated data was then analyzed and condensed by using averages and percentages.

Both tabular and graphical methods were followed in analyzing the collected information to know the effect of using inputs and other related factors of gher fish culture.

Chapter: Four

Results and Discussion

4.0 Results and Discussion

4.1 Socio-economic profiles of sample farmers

To perform the study an attempt was made to identify the main socio-economic characteristics of the sample farmers in study area. It is notable that data on family size, age distribution of family members, level of education, occupation, size of land holding and number of earning members in the family of the respondent farmers were collected for socio-economic study.

4.1.1 Family size

Family was defined as a group of persons living together and taking meal from the same kitchen. Applying such definition, the average family size of the owner operated system, users were found to be 6.04 persons, in case of owner operated under mohazon finance system, users were 7.50 persons and multi-owner operated system users were 6.53 persons as shown in table 1.

The family size of owner operated under mohazon finance system users were observed to be higher than that of other systems. It was found that the number of male members is higher than the number of female members in the family of the farmers of three different management systems (Table 1).

Chowdhury *et al.*, (1995) worked on owner operated, institutional operated and NGO operated management systems of pond fish production in Tangail district and showed that the number of male was higher than the number of female in the family of owner operated and institutional operated management system users but the number of male is lower than the number of female in case of NGO operated management system users.

Taking three management system users together, it was found that the average family size in the study area was 6.61 persons which was higher than the average family size (4.8 persons) of the whole country (BBS, 2001).

Table 1: Distribution of family members of gher fish producers under different management systems.

Management systems	Number of Family member			Average family size
	Male	Female	Total	
Owner operated under self-finance	79	60	139	6.04
Owner operated under mohazon finance	68	52	120	7.50
Multi-owners operated	55	43	98	6.53
All	202	155	357	6.61

4.1.2 Age distribution of family members

The distribution of family members in various age groups was considered important in maintaining profitable operations of gher business. Members of the whole family were classified into five age groups, viz, i) up to 6 years, ii) > 6 to 16 years, iii) > 16 to 25 years, iv) > 25 to 60 years and v) above 60 years. The distribution of family members in various age groups is presented in table 2.

Table 2: Distribution of family members in different age groups according to three management system users.

Age groups (years)	Owner operated under self-finance (%)	Owner operated under mohazon finance (%)	Multi-owner operated (%)
Up to 6	10.07	10.83	11.22
> 6 to 16	29.50	27.50	28.57
> 16 to 25	17.27	18.33	17.35
> 25 to 60	38.13	37.50	39.80
Above 60	5.04	5.83	3.06
Total	100	100	100

Table 2 shows that 10.07 percent, 10.83 percent and 11.22 percent family members fall in category up to 6 years of owner operated, owner operated under mohazon finance and Multi-owner operated management system users respectively. In the same approach 29.50 percent, 27.50 percent and 28.57 percent members fall in > 6 to 16 years; 17.27 percent, 18.33 percent and 17.35 percent members belong to > 16 to 25 years; 38.13 percent, 37.50 percent and 39.80 percent members fall in > 25 to 60 years; 5.04 percent, 5.83 percent and 3.06 percent family members fall in the age group of above 60 years successively for owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management type users.

The numbers of the family members under different management system users of gher fish production within the age group > 25 to 60 years were the highest viz, 38.13, 37.50, and 39.80 percents respectively.

Anonymous (1983) showed study that the highest number of family members was in the age group 16 to 55 years of owner operated under self-finance, owner operated under institutional finance, multi-owners and landless pond cooperative society management types users in some selected areas of Mymensingh district. In 1995 Chowdhury *et al.*, conducted a study in this regards and they state that the highest number of family members was in the age group > 16 to 25 years of different pond management system users in Tangail district.

4.1.3 Level of education

Education has an important impact on modernization of fish culture system, in efficient management and operation as well as in successful production of fish. Educated farmers can have better access to the relevant technical information and can make rational economic decisions. The educational status of the respondent farmers of different management systems is shown in table 3.

Table 3: Literacy levels of farmers of different management systems.

Literacy level	Owner operated under self-finance (%)	Owner operated under mohazon finance (%)	Multi-owner operated (%)	All (%)
Illiterate	8.70	18.75	6.67	11.11
Primary level	56.52	75	60	62.96
Secondary level	21.73	6.25	13.33	14.82
Higher secondary level	8.70	0	20	9.26
Graduate and above	4.35	0	0	1.85
Total	100	100	100	100

It is evident from the table 3 that 11.11 percent of the farmers of all management systems were illiterate, whereas about 62.96 percent, 14.82 percent, 9.26 percent and 1.85 percent of the farmers had primary, secondary, higher secondary and graduate level education respectively. It was also observed that the highest percentage of illiterate farmers was in owner operated under mohazon finance management type. Chowdhury *et al.*, (1995) mention in their study that the highest number of illiterate farmers was in NGO operated

management system. But Anonymous (1983) showed that the highest number of illiterate farmers was found in landless pond cooperative society operated management system.

4.1.4 Dependency ratio

The dependency ratio of a particular family has been calculated by dividing the total number of dependents by the total number of earning members. In this case, dependent member referred to those family members who did not contribute to the family earnings or the contribution was negligible. Young children, under aged, old aged members, unemployed family members, students, crippled members etc fall under this category. Dependency ratio of family members of different management systems is given in the table 4.

Table 4: Dependency ratio of family members of different management types.

Management types	Member/family	Earning member/family	Dependency ratio
Owner operated under self-finance	6.04	1.3	4.65 : 1
Owner operated under mohazon finance	7.5	1.5	5.00 : 1
Multi-owner operated	6.53	1.33	4.91 : 1
All types	6.61	1.38	4.79 : 1

Dependency ratio was highest in case of owner operated under mohazon finance management users. The reason being that the number of under aged children and old aged members per family was higher in this management users than that of other two management users. The average dependency ratio of family members of all management systems unitedly was 4.79 : 1 (Table 4).

4.1.5 Occupation

The farmers of family gher fish production under different management systems were employed at different kinds of occupation such as agriculture, business and service etc. Agriculture was the main occupation of all management system users. It has been shown in the table 5 that 57.33 percent of the farmers of three different management systems are engaged in agricultural activities. The percentages of farmers engaged in agriculture, business and services were 0.62, 0.32 and 0.54 respectively in case of owner operated under self-finance management system. The table also shows that no farmer was involved in service, in owner operated under mohazon finance and multi-owner operated

management systems. In case of owner operated under mohazon finance management system 54.55 percent and 45.45 percent farmers were involved in agriculture and business respectively. But 52.63 percent and 47.37 percent farmers were employed at agriculture and business respectively under multi-owner operated management system. Taking three management systems altogether, 57.33 percent, 40 percent and 2.67 percent farmers were engaged at agriculture, business and service in owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems respectively (Table 5). Chowdhury *et al.*, (1995) in their study showed that agriculture was the main occupation of owner operated, institutional operated and NGO operated management system users.

Table 5: Occupation of the farmers of different management systems.

Management types	Occupation level (%)			
	Agriculture	Business	Service	All
Owner operated under self-finance	61.77	32.35	5.88	100
Owner operated under mohazon finance	54.55	45.45	0	100
Multi-owner operated	52.63	47.37	0	100
All types	57.33	40	2.67	100

4.1.6 Size of land holding

In this study, gher owners family having different sizes of land ownership were classified in to five categories, viz, below 1 acre, 1 to below 3 acre, 3 to below 5 acre, 5 to below 7 acre and above 7 acres. Distribution of land per family under different management systems are presented in table 6. From the table, it appears that 12.5 percent farmers of owner operated under mohazon finance system owned land below 1 acre and there was no farmer in owner operated under self-finance and multi-owner operated management systems. Highest percentage (0.52) of farmers of owner operated under self-finance management system belonged land above seven acre. No farmers of owner operated under mohazon finance management system owned land above seven acre. About 6.67 percent farmers of multi-owner operated management system belonged land above seven acre.

Table 6: Distribution of gher owners' family according to size of land owned.

Management types	Size of land owned (acre)					
	< 1	1 – < 3	3 – < 5	5 – < 7	> 7	All
Owner operated under self-finance (%)	0	4.35	8.7	34.78	52.17	100
Owner operated under mohazon finance (%)	12.5	81.25	6.25	0	0	100
Multi-owner operated (%)	0	13.33	46.67	33.33	6.67	100
All types (%)	3.7	29.64	18.52	24.07	24.07	100

4.2 Particulars of fish gher

In this study, an endeavor was made to make out the features and characteristics of fish gher in study area. It is remarkable that information on means of acquisition of fish gher, size of gher, depth of water in different seasons, color of water and water control system of gher were collected from the respondent farmers of different management systems for this purpose.

4.2.1 Means of acquisition of gher

Table 7 reveals the different means of acquisition of the gher under different management systems. It is apparent from the table that the farmers of different management systems acquired their land through inheritance, purchasing and leasing. Acquisition means only through purchasing, was observed in case of owner operated under self-finance management system. The means of acquisition of gher through inheritance were 37.5 percent, 6.25 percent and 26.67 percent successively for owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems. In terms of three management systems unitedly, the highest parentage (60) of gher was acquired through leasing. Chowdhury *et al.*, (1995) reported similar result in this regard. But Anonymous (1983) mentioned that the highest percentage of means of acquisition of fish ponds was through inheritance.

Table 7: Distribution of sample gher according to acquisition.

Management types	Means of acquisition of gher (%)			
	Inherited	Purchased	Leased	All
Owner operated under self-finance	37.5	33.33	29.17	100
Owner operated under mohazon finance	6.25	0	93.75	100
Multi-owner operated	26.67	0	73.33	100
All types	25.45	14.55	60	100

4.2.2 Size of ghers

The sample ghers were grouped into five categories on the basis of their different sizes, viz., below 2 acre, 2 to below 3 acre, 3 to below 4 acre, 4 to below 5 acre and above 5 acre. On an average, it was found that the highest percentage of ghers fell in the category below 2 acre taking three management systems combinedly. Ghers in the category above 5 acre was found only in owner operated under self-finance management systems. All the ghers in owner operated under mohazon finance management system were below 3 acre (Table 8). Since most of the farmers under this management system acquired their ghers through leasing (Table 7), the small size of gher may be due to the high lease value of gher land. There is another reason why the farmers of owner operated under mohazon finance management system owned land below 5 acre (Table 6).

Table 8: Distribution of ghers according to their size (acre).

Management types	Size of ghers (acre)					
	< 2	2 to < 3	3 to < 4	4 to < 5	> 5	All
Owner operated under self-finance (%)	8.7	39.12	8.7	21.74	21.74	100
Owner operated under mohazon finance (%)	93.75	6.25	0	0	0	100
Multi-owner operated (%)	0	40	26.67	33.33	0	100
All types (%)	31.48	29.63	11.11	18.52	9.26	100

4.2.3 Average size of ghers

The average size of sample ghers was estimated to be 2.24 acre. In the case of multi-owner operated management system, the average size gher was the biggest (2.56 acre) and in case of owner operated under mohazon finance management type, it was the smallest (1.61 acre) among three management types (Table 9). Anonymous (1983) worked on economics of different pond management types and reported that average size of pond was 0.95 acre and the highest (1.54 acre) and lowest (0.45 acre) size of pond were found in the case of landless pond cooperative society and multi-owners respectively.

Table 9: Average size of ghers according to management types.

Management types	Average size of ghers (acre)
Owner operated under self finance	2.32
Owner operated under mohazon finance	1.61
Multi-owner operated	2.56
All types	2.24

4.2.4 Depth of water

The depth of water of the sample gher was considered for one complete year. This was done because water depth varied significantly in different seasons. Seasons taken into consideration in this study were summer, rainy and winter. Water level began to increase with the advent of monsoon. The sample gher was dry i. e., contained no water during summer season. Water remains in the fish gher in rainy and winter season. The depth of water was above 4 feet during rainy season but during winter season it became around 1 foot. The average depths of water during rainy and winter seasons in gher under different management systems were 4.07 feet and 1.02 feet respectively (Table 10). The fish gher in the study area under different management systems did not contain water during summer because of the little depth of the gher and evaporation by the scorching sunlight. Similar reasons may also be responsible for little water during winter.

Table 10: Average seasonal depth of water of fish gher according to different management types.

Management types	Depth of water in gher in different season (feet)			
	Summer	Rainy	Winter	All season
Owner operated under self finance	0	4.06	1.02	1.69
Owner operated under mohazon finance	0	4.04	1.04	1.69
Multi-owner operated	0	4.1	1.0	1.7
All types	0	4.07	1.02	1.69

4.2.5 Color of water

In the present study it was observed that 50 percent gher had greenish water and another 50 percent gher had turbid water. No farmer reported that the color of water of his gher was clear (Table 11). Water color is likely to affect the fish in gher. It provides an indication of the quality and productivity of the gher. Color of water may vary from one gher to another. This may happen due to the variation of chemical and physical composition of water itself. Generally, if manure and fertilizer are applied in proper dose, the color of water will be greenish which is favorable to produce plankton and it is very much essential for fish culture. Islam (2002), report that the water color in the fish gher was clear, greenish and turbid in Satkhira district.

Table 11: Distribution of gher under different management systems according to water color.

Management types	Color of water			
	Greenish	Clear	Turbid	All
Owner operated under self finance	50	0	50	100
Owner operated under mohazon finance	50	0	50	100
Multi-owner operated	50	0	50	100
All types	50	0	50	100

4.2.6 Water control of gers

In the study area all the farmers under different management systems reported that they do not construct any water control systems in their gher. They do not construct water control structures (inlet or outlet systems) because they do not feel the need of removal and inclusion of water from or into their gher.

4.2.7 Management types

Three different management types of gher operation were identified in the study area. The management types are given below:

1. Owner operated under self-finance
2. Owner operated under mohazon finance
3. Multi-owner operated



1. Owner operated under self-finance:

The gher owners under this category had sole rights over the ownership of gher and their management. They operated gher fish culture with no external financial assistance. As regards the improvement of gher embankment, management of different inputs and finally production and marketing of the fish were done by owners' own decision. Each of these gher had single owner and the owner was alone responsible for decision making with respect to inputs and outputs.

2. Owner operated under mohazon finance:

In this case the gher owners had the single legal ownership and the absolute right to the management of gher. In this category of gher, the owner used to receive substantial financial help from mohazon (Zaminder) and had to pay a high rate of interest for the loan money.

3. Multi-owner operated:

Multi-owner operated management system is referred to the management system that was operated under joint ownership for gher fish culture. They were in particular, gher partners for production of fish from ghers under joint management. The partners of ghers did share inputs, output and the management operation.

Quasem (1986), analyzes the status of ownership of water bodies by conducting a survey in 16 selected villages of Bangladesh and found out owner, multi-owner and landless group operated management types. Chowdhury (1995), conducts a survey on different management systems of pond fish production in Tangail district and identified owner operated, institutional operated and NGO operated management systems. Anonymous (1983) undertook an appraisal on different management types of pond fish farming in some selected areas of Mymensingh district and recognized owner operated ponds under self-finance, owner operated under institutional finance, small groups operated and landless pond cooperative society operated management systems.

4.3 Cost items and their pricing

Data on different necessary cost items were collected by direct interviewing the respondent farmers under different management systems to determine the cost and returns of gher fish culture. Different cost items were land use, labor, fish seed, fish seed transport, manures (cowdung), fertilizer, lime, feed, harvesting, marketing, miscellaneous and interest rate on credit.

4.3.1 Land use cost

In the present study land use cost of gher has been calculated by using a rate per unit of land (per acre) as per conditions of leasing arrangement.

The present study reveals that the rate at which the land use cost per acre has been computed is Tk 1687.23, Tk 5136.70 and Tk 3567.45 per acre under owner operated under self finance, owner operated under mohazon finance and multi-owner operated management types respectively.

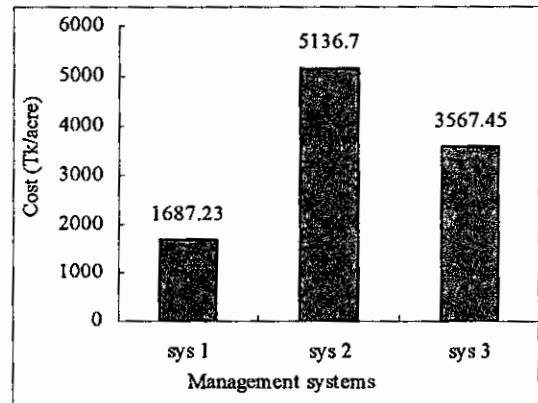


Figure 1: Comparison of per acre land use cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.2 Cost of human labor

Human labor is the most important variable input in the production process of gher fish culture. The sources of supply of human labor can be classified into: (i) Family labor; for which no payment was made; and (ii) hired labor; for which farmers had to pay in cash.

The human labor was required to perform the following functions of fish culture in gher.

- Drying / clearing
- Fish feed application
- Fertilizer application
- Catching of fish

- e) Marketing of fish
- f) Weeding
- g) Watching

Family labor consists of gher operator himself and other member of the family, i. e., brothers, children etc. Family labor was not included in economic analysis.

In working out the cost of hired labor nominal cash wages paid plus the money value of meals and privileges provided by the gher owners were added. Most of the farmers hired laborer for a year. The average wage rate per man-day was Tk 80.00 to 100.00 during the study period in the study area.

The present study shows that the cost of labor per acre to be Tk 6097.61, Tk 2579.95 and Tk 5321.44 per acre under owner operated under self finance, owner operated under mohazon finance and multi-owner operated management types respectively.

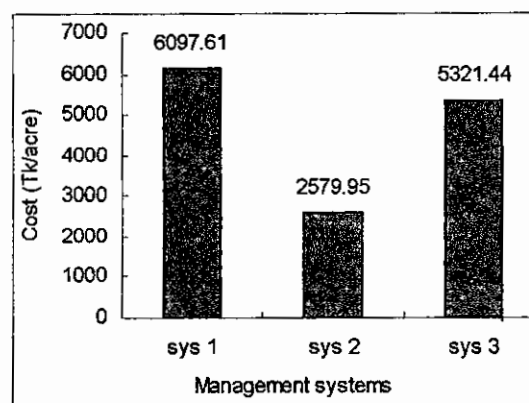


Figure 2: Comparison of per acre labor cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.3 Cost of fish seed

In the study area fish farmers used purchased fish seeds. The cost was calculated on the basis of actual prices paid by the farmers in the locality. It may be noted here that there was a variation in the cost of per acre fish seeds in different management systems. Fish seed cost was Tk 12419.27, Tk 17133.13 and Tk 13390.93 per acre under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

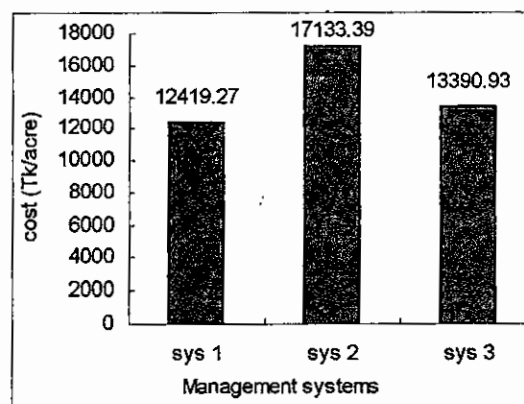


Figure 3: Comparison of per acre fish seed cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.4 Fish seed transport cost

Transport cost for fish seed was different for each of the management systems. This cost vary with the distance between the buying place and gher area, transport accessibility etc. In this lessons fish seed transport cost of per acre gher was 148.77, Tk 329.33 and Tk 174.66 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

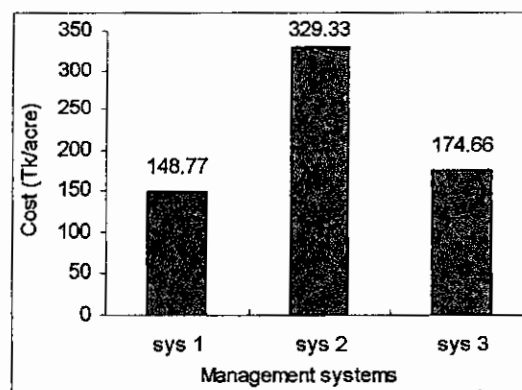


Figure 4: Comparison of per acre fish seed transport cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.5 Cost of fertilizer

The gher owners used two types of fertilizers namely Urea and Triple Super Phosphate (TSP) in their gher. Fertilizer costs were charged according to the actual price paid by the gher owners. In the study area the gher owners used very small amount of fertilizers in their gher. Few farmers did not use any types of fertilizer. There was negligible variation in the cost of fertilizer for the different management systems. However the average cost of fertilizers paid by the pond owners was Tk 79.03, Tk 76.55 and Tk 78.78 per acre under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

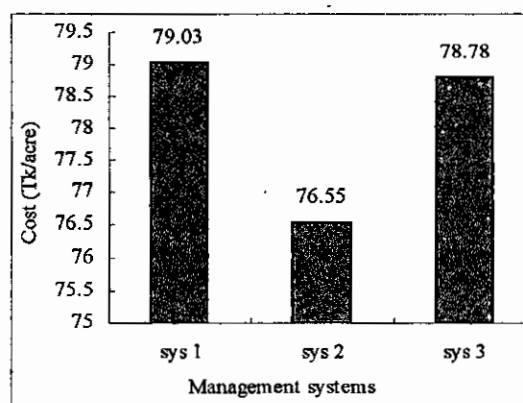


Figure 5: Comparison of per acre fertilizer cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.6 Cost of lime

The gher owners used two types of lime namely lime stone and dolomite in their ghers. All the respondent farmers in the study area used lime. Most of the farmers used lime stone and few farmers used dolomite. Lime costs were charged according to the actual price paid by the gher owners. In the study area the gher owners used lime almost at the same rate per unit area. There was negligible variation in the cost of lime for the different management systems. However per acre average cost of lime paid by the pond owners was Tk 364.84, Tk 387.12 and Tk 366.41 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

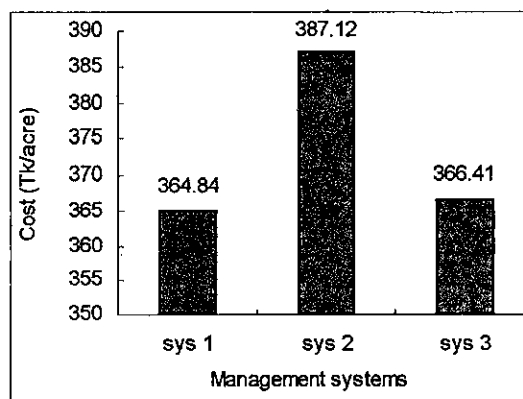


Figure 6: Comparison of per acre lime cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.7 Cost of feed

The gher owners of the study area used different kinds of supplementary feeds i. e., oil cake, rice bran, snails, ready made feed etc which were available in the local market. There was no fixed rate of buying feed in the study area. Rate of price of supplementary feed varied in different areas under different management system users. On the basis of local prevailing rates, average feed costs for per acre fish culture were Tk 23291.55, Tk 25434.96 and Tk 24163.88 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

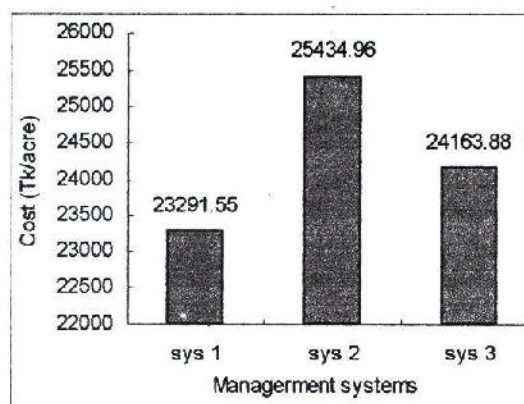


Figure 7: Comparison of per acre feed cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.8 Harvesting cost

Determination of harvesting cost was done on the basis of Tk given each fisherman as wage during harvesting period. The wages varied with the age of fishermen and also different in different areas under different management systems. Computed average costs of fish harvesting per acre gher area were Tk 1980.22, Tk 2775.48 and Tk 1685.25 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

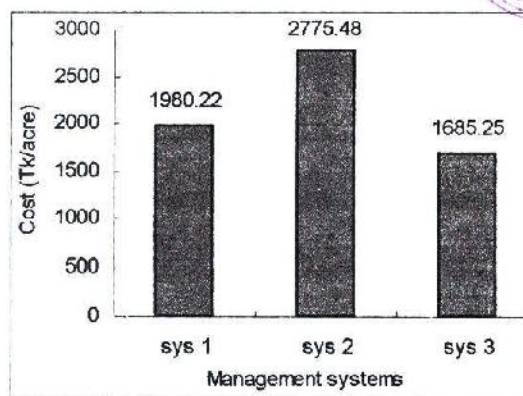


Figure 8: Comparison of per acre harvesting cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.9 Marketing cost

Marketing cost of fish depends mainly on communication, amount of fish, and distance of market where fish will be sold. Hence, these various costs of marketing were varied in different areas. The average marketing costs of fish were Tk 314.77, Tk 430.82 and Tk 228.54 per acre under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

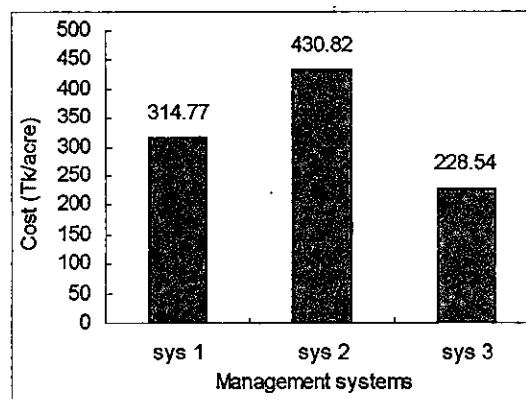


Figure 9: Comparison of per acre marketing cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.3.10 Miscellaneous cost

This includes miscellaneous items like insecticides, transportation for purchasing material inputs by rickshaw and / or bus fare from a distant market or town, dyke repairment etc. which were needed for gher fish culture management. These costs were calculated on the basis of farmers' cash payment made for the purpose. This cost was different under different management systems. The average miscellaneous costs for per acre fish production in the study area were Tk 1238.21, Tk 1222.40 and Tk 717.21 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

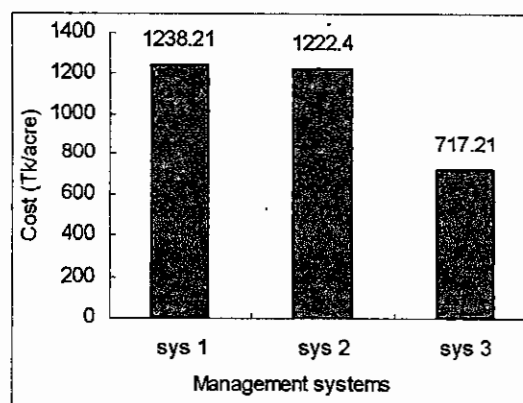


Figure 10: Comparison of per acre miscellaneous use cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys) management systems.

4.3.11 Interest on credit

Among three different management systems only owner operated under mohazon finance culture system was partially operated by the finance from mohazon (zaminder). The farmers of the management system took the loan for a production cycle of 10 months and had to pay back with one hundred percent interests on the credit taken.

4.4 Returns and Profitability

4.4.1 Gross costs

Gross costs under different management systems were calculated by summing up all the costs items *i. e.*, land use, labor, fish seed, fish seed transport, fertilizer, lime, fish feed, harvesting, marketing and miscellaneous costs etc. Gross cost under owner operated under mohazon finance culture system was computed by adding all the above mentioned cost items including total interest on the loan money. The average gross costs for gher fish production per acre were Tk 47621.48, Tk 70916.45 and Tk 49694.54 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

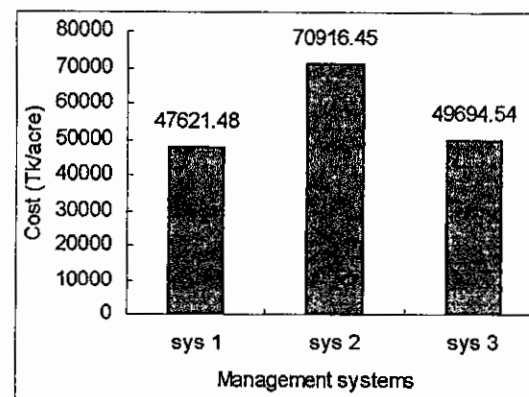


Figure 11: Comparison of per acre gross cost of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.4.2 Gross returns

The average gross returns per acre fish production were calculated by adding the total money made from the production without subtracting the costs of production. The average gross returns per acre for gher fish production were Tk 83817.13, Tk 92170.67 and Tk 79059.83 under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types respectively.

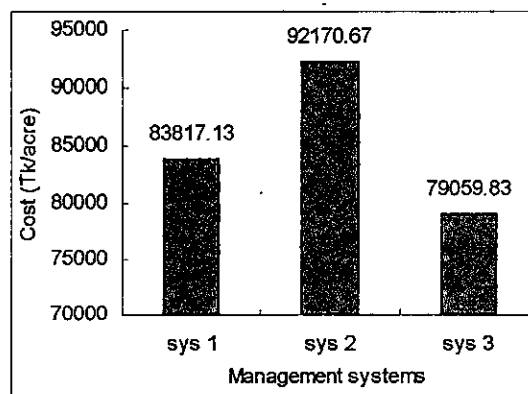


Figure 12: Comparison of per acre gross returns of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.4.3 Net returns

The per acre net returns from gher fish production/culture under three different management type users were arrived at by subtracting the total cost of production from their gross returns. The total costs of gher fish production per acre were Tk 47621.48, Tk 70916.45 and Tk 49694.54 for gher under respectively owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management types. The gross returns per acre of these systems amounted to Tk 83817.13, Tk 92170.67 and Tk 79059.83 respectively. Therefore, per acre net returns were calculated at Tk 36195.65, Tk 21254.23 and Tk 29365.29 for the corresponding owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems.

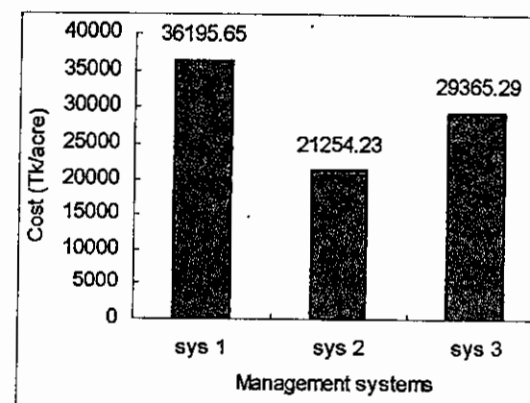


Figure 13: Comparison of per acre net returns of gher fish culture among owner operated under self-finance (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

4.4.4 Profitability

The results presented in figure 14 clearly indicates that gher fish culture is a profitable business, but there is a difference in profitability among individual management systems. It can be stated from figure 13 that gher under owner operated under self-finance were making highest amount of net returns (Tk 36195.65) while gher under owner operated under mohazon finance were earning the lowest net returns (Tk 21254.23) from their fish production. The profitability of gher fish culture can be noted more obviously by showing the profit in percentage. The profits of gher fish culture were 76.01%, 29.97% and 59.09% respectively under owner operated under self-finance, owner operated under mohazon finance and multi-owner operated culture systems users.

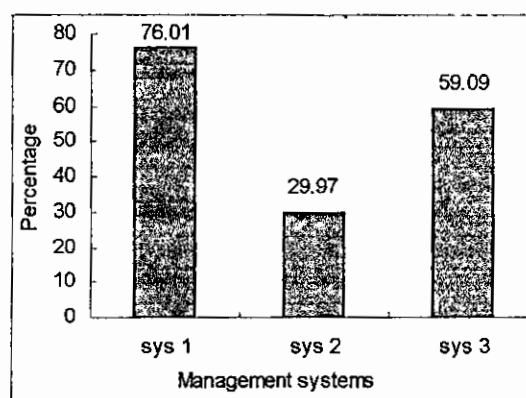


Figure 14: Comparison of profitability of gher fish culture among owner operated (sys1), owner operated under mohazon finance (sys2) and multi-owner operated (sys3) management systems.

The average ratio of profit to total cost from traditional gher is about 98.32%, which indicates a poor profitability of the culture system in brackish water, while the average ratio of profit to total cost from improved traditional gher is about 149.97%, which indicating a good profitability through extensive system (Hoq *et al.*, 1994). Islam (2002), undertook a research on comparative profitability between traditional and improved traditional gher fish culture in Satkhira district. He reports that the overall average production cost, gross profit and net profit per acre of three traditional gher were Tk. 21324.91, Tk. 35203.32 and Tk. 27979.53 respectively. The overall average production cost, gross profit and net profit per acre of three improved traditional gher were Tk. 45940.68, Tk. 87613.65 and 80176.58 respectively. Khan (2003), conducts a study on

gher fish culture and reports that the profitability in gher fish culture is 207.93%. In contrast to the profitability reported by the researcher mentioned above, the profitability ratio was poor that had been observed in the present study. This may be due to the difference of culture techniques, knowledge in gher fish culture, natural phenomena, proper use of resources etc.

In this study, among three different management systems the highest percentage of profit was earned through owner operated under self-finance management system. The farmers of owner operated under mohazon finance management system earned the lowest profitability. The farmers under this system earned lowest profitability because they had to pay a high rate of interest on their credit money. It was clear that owner operated under self-finance management system is economically more feasible than that of other two management systems in terms of land use cost, labor cost, fish seed cost, fish seed transport cost, fertilizer cost, lime cost, feed cost, harvesting cost, marketing cost, miscellaneous cost and total production cost, gross returns, net returns and ratio of profit.

Chapter: Five _____

_____ *Problems and Recommendation*

5.0 Problems and Recommendations

As regards pisciculture, the gher owners under different systems of management were found to be confronted technical, social and economic problems. In order to increase fish production in gher and at the same to supply cheaper protein essential for nutritional requirement, immediate attention should be paid to alleviate the problems of gher owners. Problems and constraints which prevailed behind fish production practices are discussed below. These are categorized under three general groups such as technical, social and economical.

5.1 Technical problems

Technical constraints are related to production techniques and technologies such as lack of scientific knowledge and technology, attack of diseases and fish parasites, insufficient cooperation of concerned authorities, non-availability of fish seeds and insufficient water in dry season etc.

Lack of scientific knowledge and technology is one of the major problems obstructing better fish culture. Almost all the respondent farmers under owner operated, owner operated under mohazon finance and small group operated management systems reported that lack of scientific knowledge is a problem in gher fish production. They also reported that almost no technical suggestions were available from the extension workers and Thana Fisheries Officer (TFO) in all systems. The farmers did not report any technical problem to concerned agencies was another problem in all management systems. Insufficient water in gher in dry season was also a serious problem for the producers. Table 1 shows that all the respondent farmers under three different management systems reported that there remain little or no water during dry season in the gher.

5.2 Social problems

Social problems faced by the farmers in the process of fish production are related to fear for thieves and enemies, interference by the influential persons and contraction of land.

Table 1 shows that 82.61, 81.25 and 40 percent farmers of owner operated, owner under mohazon finance operated and small group operated management systems respectively

faced the problem of theft from the ghers. No farmers under the three management systems did face the problem of interference by the influential person and contract of land.

5.3 Economic problems

Economic problems of the farmers were related to financial difficulties such as lack of sufficient fund, lack of institutional credit, complicity in credit system, high interest on credit, lack of marketing facilities and low product price etc.

Regarding problems relating to economic aspects 73.91 percent owner farmers and cent percent farmers of owner operated under mohazon finance and small group management systems reported that they faced financial difficulties to purchase various inputs (such as fish seed, fertilizer, fish feed etc.) and for repairment of ghers. Table 1 shows that 78.26 percent owner management users and entire farmers of owner operated under mohazon finance and multi-owner operated management systems experienced problems due to complicated procedures of credit system. All the owner operated under mohazon finance users reported that although they got the mohazon credit facilities but they had to pay a high interest for it.



Table 12: Major problems faced by the farmers under different management systems.

Nature of problems	Percentage of respondents		
	Owner operated under self-finance	Owner operated under mohazon finance	Multi-owner operated
A. Technical:			
1. Lack of scientific knowledge	95.65	100	100
2. Attack of disease	100	100	100
3. Insufficient cooperation of concerned authorities	100	93.75	100
4. Non-availability of fish seeds	—	—	—
5. Insufficient water in dry season	100	100	100
B. Social:			
1. Fear for thieves and enemies	82.61	81.25	40
2. Interference by influential person	—	—	—
3. Contract of land	—	—	—
C. Economic:			
1. Lack of sufficient fund	73.91	100	100
2. Lack of institutional credit	91.30	100	100
3. Complicacy in credit system	78.26	100	100
4. High interest on credit	8.70	100	—
5. Lack of marketing facilities	—	—	—
6. Low product price	—	—	—

5.4 Recommendations:

- The study has revealed some information regarding gher fish production which have substantial policy implications. The study found that gher fish production is a highly profitable business from the view points of owner operated, owner operated under mohazon finance and small group operated management systems. The results, however, clearly show that per acre yield of fish varies from gher to gher especially due to different management systems. So the production of gher fish should be increased by sound and efficient management.
- Government and other agencies should play their assigned role by disseminating information to the farmers and arranging necessary training on scientific methods of gher fish farming. Such training will assist farmers to identify and solve the problems related to gher fish farming.
- Credit facilities should be extended to the farmers and supervise properly by the relevant bank officials so that the loan can be utilized for further production of fish. Risk and uncertainty may be covered by insurance.
- In addition to this, policy makers should pay an immediate attention to develop sound marketing facilities both for inputs and outputs. So that the producers can have fair prices round the year.
- Gher preparation may be the key to successful fish culture. Gher should be drained and the bottom should be exposed to sunlight for a period of at least one month. It eradicates predators, destroys harmful insects and snails.
- Lime should be sprayed over the gher bottom as a part of the maintenance of gher. It has a varied and favorable action on the health of fish. Liming produces a considerable improvement of the gher bottom through liberation of bases, the neutral action, the increase in biological activity and the acceleration of decomposition of mud.
- Fertilizers and manures play a very important role for the success of fish culture. Fish can be produced in a gher without manures and fertilizers but the yield would

fall below the expected level. Fertilizers and manures are not eaten by fish but it stimulates growth of plankton and larger aquatic organisms which are important food for fish.

- A fish gher should be stocked with the right kinds and numbers of fish. Most stocking failures are due to poor condition of the fish when they arrive at the gher. Healthy, nice looking, disease free fish should be chosen for stocking.
- Agricultural credit meant for pisciculture should be supervised properly. The bank officials must ensure that loans are being utilized for the production of fish cultivation only and loan amount should in no way be diverted to meet up family consumption need.
- Collected fish seed should be reared for a period of one month in the nursery and rearing tanks before releasing them in the stocking ghers.
- Additional care must be taken by the fish farmers after releasing fish seed in the stocking ghers. The food distribution must be simple, cheap and easily available.
- The ponds should be checked periodically to examine health of the growing fish. Gher owners should seek suggestion for diseased fish from concerned authorities as soon as these were identified.
- To meet market demand, selective harvesting should be practiced from time to time. The marketable size after sorting them out from the undersized fishes should be separated.
- More fish seed multiplication farms should be established adjacent to the natural breeding ground so as to meet the fish demand for quality fish seed.
- Extra incentive to increase fish production from the landless gher cooperative society may be given by providing and in severe cases with financial assistance.

➤ Modern fish culture is a recent enterprise in Bangladesh. Some allocation of funds are coming in but it is very shocking due to the spread of corruption and insecurity in this sector. This may seriously affect enthusiasm and rising expectations of the potential producers. Large-scale fish lifting from the ghers has already caused a serious dampening effect. The government should immediately pass an ordinance prescribing severe punishment for the arresting corruption with regard to bank loans, unauthorized fish lifting and diversion of the production loans.

Chapter: Six _____

_____ *Summary and Conclusion*

6.0 Summary and Conclusion

In the agro-based country, Bangladesh, fisheries sector plays a paramount role in the development of the country. Fisheries is one of the major sub-sector of agriculture. It contributes 5.24% to GDP, Tk. 137,486 million in the GNP, 63% to animal protein supply and 4.76% to foreign exchange earning (DoF, 2003). Though fish farming in Bangladesh is an old practice, unfortunately the per hectare fish production is very low in this country due to improper culture and management practices. Therefore, there is an ample scope of increasing fish production through the intensive and scientific gher fish farming.

In this perspective, the present study was undertaken on golda, golda and bagda gher: (i) to identify the socio-economic characteristics of gher owners, (ii) to identify different management types and the general feature of the sample gher, (iii) to assess the profitability of gher fish farming under each of the management systems, (iv) to identify the factors responsible for variation in yield under each of the management systems and (v) to identify problems and to make some recommendations.

Keeping in view the objectives of the study, Fakirhat thana under Bagerhat district was selected purposively for the study. Three different management types of gher management, namely owner operated under self-finance, owner operated under mohazon finance and multi-owner operated systems were identified in the selected area.

With respect to socio-economic characteristics of sampled farmers, the results of the study revealed that the average members per family under different management systems were 6.61 which is higher than the average family size of Bangladesh. Age group > 25 to 60 years bears the highest number of family members. The levels of literacy were 91.30 percent, 81.25 percent and 93.33 percent in the farmers in owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems respectively. Agriculture is the main occupation of the respondent farmers under different management types. Dependency ratio under three management systems is 4.79 : 1.

Regarding the characteristics of gher the study revealed that 60 percent of the gher were acquired through lease and the remained were acquired through inheritance and purchased. Description were made also on size of gher, depth of water, color of water and water control systems of the gher under various management systems.

In the study gher fish production was largely influenced by the combination of shrimp (Bagda), prawn (Golda) and white fish. All the farmers used supplementary feeds which were rice bran, wheat bran, snails, oil cake and readily available feed in the market. Cost items were identified as human labor, fish seed, seed transport, fertilizer, lime, fish feed, land use, harvesting, marketing, miscellaneous and interest on credit money. Labor cost, seed cost, feed cost were main cost items under various management types in the study area. Among the cost items, per acre labor costs were computed at Tk. 6097.61, 2579.95 and 5321.44 respectively for owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems. Per acre seed cost and feed cost were Tk. 12419.27, 17133.39 and 13390.93; Tk. 23291.55, 25434.96 and 24163.88 for owner operated under self-finance, owner operated under mohazon finance and multi-owner operated management systems successively. Among three different management systems highest net returns was obtained by owner operated under self-finance management system.

The study identified some of the problems and constraints associated with gher fish culture. These are categorized into technical, social and economical. In this respect, lack of scientific knowledge and techniques, lack of capital, attack of disease, fear of thieves, lack of water in dry season etc were the major problems in gher fish culture.

The possible step to remove the problems and constraints associated with gher fish culture could be: provision of training to producers from the proper authority, application of scientific methods in fish farming, simplification of lending procedures by bank, availability of credit at a low interest rate, judicious price policy for inputs and improvement of marketing facilities, provision of financial support with the assistance of government and initiative of the farmers themselves.



Chapter: Seven _____

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Chapter: Eight

Appendices

8.0 Appendices

Appendix 1: Comparison of per acre land use cost of gher fish culture among different management systems.

Management types	Land use cost (Taka/acre)
Owner operated under self-finance	1687.23
Owner operated under mohazon finance	5136.7
Multi-owner operated	3567.45

Appendix 2: Comparison of per acre labor cost of gher fish culture among different management systems.

Management types	Labor cost (Taka/acre)
Owner operated under self-finance	697.61
Owner operated under mohazon finance	2579.95
Multi-owner operated	5321.44

Appendix 3: Comparison of per acre fish seed cost of gher fish culture among different management systems.

Management types	Fish seed cost (Taka/acre)
Owner operated under self-finance	12419.27
Owner operated under mohazon finance	17133.39
Multi-owner operated	13390.93

Appendix 4: Comparison of per acre fish seed transport cost of gher fish culture among different management systems.

Management types	Fish seed transport cost (Taka/acre)
Owner operated under self-finance	148.77
Owner operated under mohazon finance	329.33
Multi-owner operated	174.66

Appendix 5: Comparison of per acre fertilizer cost of gher fish culture among different management systems.

Management types	Fertilizer cost (Taka/acre)
Owner operated under self-finance	79.03
Owner operated under mohazon finance	76.55
Multi-owner operated	78.78

Appendix 6: Comparison of per acre lime cost of gher fish culture among different management systems.

Management types	Lime cost (Taka/acre)
Owner operated under self-finance	364.84
Owner operated under mohazon finance	387.12
Multi-owner operated	366.41

Appendix 7: Comparison of per acre feed cost of gher fish culture among different management systems.

Management types	Feed cost (Taka/acre)
Owner operated under self-finance	23291.55
Owner operated under mohazon finance	25434.96
Multi-owner operated	24163.88

Appendix 8: Comparison of per acre harvesting cost of gher fish culture among different management systems.

Management types	Harvesting cost (Taka/acre)
Owner operated under self-finance	1980.22
Owner operated under mohazon finance	2775.48
Multi-owner operated	1685.25

Appendix 9: Comparison of per acre marketing cost of gher fish culture among different management systems.

Management types	Marketing cost (Taka/acre)
Owner operated under self-finance	314.77
Owner operated under mohazon finance	430.82
Multi-owner operated	228.54

Appendix 10: Comparison of per acre miscellaneous use cost of gher fish culture among different management systems.

Management types	Miscellaneous cost (Taka/acre)
Owner operated under self-finance	1238.21
Owner operated under mohazon finance	1222.40
Multi-owner operated	717.21

Appendix 11: Comparison of per acre gross cost of gher fish culture among different management systems.

Management types	Gross cost (Taka/acre)
Owner operated under self-finance	47621.48
Owner operated under mohazon finance	70916.45
Multi-owner operated	49694.54

Appendix 12: Comparison of per acre gross returns of gher fish culture among different management systems.

Management types	Gross returns (Taka/acre)
Owner operated under self-finance	83817.13
Owner operated under mohazon finance	92170.67
Multi-owner operated	79059.83

Appendix 13: Comparison of per acre net returns of gher fish culture among different management systems.

Management types	Net returns (Taka/acre)
Owner operated under self-finance	36195.65
Owner operated under mohazon finance	21254.23
Multi-owner operated	29365.29

Appendix 14: Comparison of profitability of gher fish culture among different management systems.

Management types	Profitability (%)
Owner operated under self-finance	76.01
Owner operated under mohazon finance	29.97
Multi-owner operated	59.09

Appendix 15: Survey form on

Economics of gher fish culture under different management systems in Fakirhat Thana

Date:

A. Identification of Farmer:

Name: Village:

Union:

B. Socio-economic characteristics of the farmer:

1. Family size: Male: Female:
2. Age distribution of family members:
3. Level of education:
4. Occupation:
5. Size of land holding:
6. No. of earning member:

C. Particulars of fish ghers:

1. Means of acquisition of ghers: Inherited/purchased/lease/excavated
2. Size of ghers (decimal): No. of gher:
3. Depth of water (feet): Summer: Rainy: Winter:
4. Color of water: Greenish/clear/turbid
5. Water control of ghers: Inlet/outlet/shallow tube well/none

D. Cost items and their pricing (Taka):

1. Land use cost:
2. Human labor cost:
 - Family labor:
 - Hired labor: Meals & privileges cost:
3. Cost of fish seed: Shrimp: White fish:
4. Fish seed transport cost: Shrimp: White fish:
5. Cost of manures (cowdung):
6. Cost of fertilizer: Urea: TSP:
7. Cost of lime:
8. Cost of feed: Types: Cost:
9. Cost of harvesting:
10. Marketing cost:
11. Miscellaneous (insecticides/watching/weeding/feeding rings/transport for purchasing material/others) cost:
12. Interest rate on credit: Amount of credit:

E. Returns and profitability:

1. Gross costs:
2. Gross returns: From shrimp: From white fish:
3. Net returns:
4. Profit:

F. Problems:

- | Technical | Social | Economic |
|---|--------------------------------------|--------------------------------|
| • Lack of scientific Knowledge | • Fear of thieves and enemies | • Lack of sufficient fund |
| • Attack of disease | • Interference by influential person | • Lack of institutional credit |
| • Insufficient co-operation of concerned agencies | • Contract of land | • Complicacy in credit systems |
| • Non-availability of fish seeds | | • High interest on credit |
| • Insufficient water in dry season | | • Lack of marketing facilities |
| | | • Low product price |

Signature of the surveyor