STUDY ON THE IMPACT OF FISHERIES EXTENSION AND TRAINING PROGRAM IN FISHERY VILLAGE OF FOURTH FISHERIES PROJECT IN TARASH UPAZILLA, SERAJGONJ.

Fisheries and Marine Resource Technology Discipline
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July, 2003

STUDY ON THE IMPACT OF FISHERIES EXTENSION AND TRAINING PROGRAM IN FISHERY VILLAGE OF FOURTH FISHERIES PROJECT IN TARASH UPAZILLA, SERAJGONJ.

A Thesis

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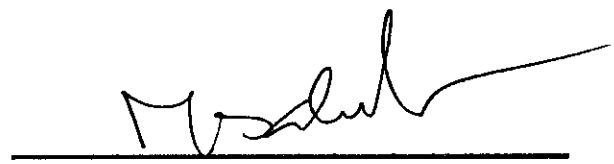

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DECLARATION

The results submitted in this thesis 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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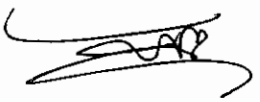

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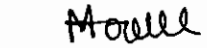

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ABSTRACT

The study was conducted in Tarash upazilla of Serajgonj District. Fisheries village extension strategy was launched where the fourth fisheries extension project targeted all pond owners in resource rich village. The most striking aspect of this concept was that no inputs were provided under extension program where the beneficiaries (pond owners) plan for themselves and fins out ways and tools to execute their own programs. The extension agent merely plays the role of motivator and facilitator, through training and occasional visits provided to the pond owning community. The purpose of the study was to determine how effective a community based aquaculture extension approach was for the adoption of improved management practice. Socio-economic profiles of the selected farmers were presented in terms of age structure, household size, educational level, annual household cash income and status of previous training on management of small scale aquaculture. Among the fishery villages, the age group of less than or equal to 25 years found to be the highest. The largest household size was found to vary between 5 to 7 persons. The principal occupation of the most farmers was agriculture. Farmers of fishery village had the maximum size of greater than 20 to 50 decimal aquaculture resource (pond). Annual household cash income of farmers were observed to vary between taka15,001 to 20,000. Before training and extension program the base line production of fishery villages of Manikchaper, Washin, Shorafpur (north), Shorafpur (west), Chandpur and Goalgram were 4.09 Kg/decimal, 5.55 Kg/decimal, 4.65 Kg/decimal, 5.44 Kg/decimal, 5.07 Kg/decimal and 4.96 Kg/decimal respectively. After extension and training program the production has increased to 10.19 Kg/decimal, 10.52 Kg/decimal, 9.98 Kg/decimal, 11.07 Kg/decimal, 10.09 Kg/decimal and 11.51 Kg/decimal respectively. The highest fish production has increased to 149.14% in the fishery village of Manikchaper.

CONTENTS

LIST OF ABBREVIATION

Abbreviation	Elaboration
Anon	Anonymous
FFP	Fourth Fisheries Project
NFEP	North-west Fisheries Extension Project
FVP	Fishery Village Program
DoF	Department of Fisheries
GDP	Gross Domestic Product
BARC	Bangladesh Agricultural Research Council
GOB	Government Of Bangladesh
UNDP	United Nations Development Program
BWDB	Bangladesh Water Development Board
LGED	Local Government Engineering Department
PMU	Project Management Unit
DFID	Department For International Development
BBS	Bangladesh Bureau of Statistics
BFRI	Bangladesh Fisheries Research Institute
PRA	Participatory Rural Appraisal
FAO	Food and Agricultural Organization

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Chapter 1

INTRODUCTION

1.0 INTRODUCTION

Bangladesh is a Southeast Asian developing country. Its economy is predominantly agricultural with rice being the main staple and export crop. Bangladesh have extensive areas of freshwater including ponds, lakes, canals, haors, baors, rivers, flood plains and marine water that covered two third (20,946,694 hectares) of the total area of the country. Bangladesh has 4.0 million and 0.2 million hectares of open and closed water bodies respectively, plus 480 Km of coastline and its exclusive economic zone in the Bay of Bengal covers 16.6 million hectares. There are 260 indigenous and 12 exotic species of freshwater fish and 24 species of freshwater prawns available (DOF, 2001). The enormous water resources and great biodiversity of fish and shrimp species offer Bangladesh tremendous potential to develop both aquaculture and fisheries.

The water resources were very rich in past but the production of fish has failed to keep face with the population size that is increasing in geometric rate-over 130 millions of people of the country depend on this sector for their animal protein and about 12 millions of people are directly or indirectly depends on fisheries sector for their livelihood. The competent fisheries manpower can play an ever important role to bring a change in fisheries production and profitability that have such a crucial place in the nation economy, nutrition and employment.

In Bangladesh, it is second to agriculture in the overall national that contributes 3.4% to the national GDP. Fisheries contribute 63% of an animal protein to our daily diet (DOF, 2001). Per capita per day fish consumption, which was 32 gm in mid sixties, declined to the level of 20 gm in mid eighties (FAO/UNDP, 1985). Fish production has increased significantly over the last few years. During 2000-2001 total fish production in Bangladesh was 20,01 lakh MT. This production level reflects per capita per day availability of 25 gm of fish where the minimum requirement is about 38 gm per day (DOF, 2001). The further 1.3 million and an estimated 2 million people are also evolved in fishing either year round or on a seasonal basis (Bjerken, 1996).

However, while Bangladesh has one of the most productive fisheries resources in the world per capital consumption of fish has dropped from 12 Kg in 1960 to 7 Kg in 1991 because rapid

population growth has meant that fish supply has not kept pace with demand, despite significant increases in aquaculture production and productivity (ITDG, 1993).

Islam (1994) identified the following social and technical constraints to fish culture development in the northwest region of Bangladesh.

- Many ponds are seasonal, have a wide variation in functional depth and dry out in winter.
- Ponds are often over shadowed by trees, embankments are over growth with vegetation and household refuse is thrown into the ponds leading to organic matter build up, high BOD and oxygen deficits.
- Un screened inflows of water in the rainy season allow the entry of wild predator and competitor fish species.
- Farmer's stock very high densities of fish for culture in addition to the wild fish. Fertilizer and feeding if practiced at all, is irregular.
- Poisons and insecticides are used indiscriminately to kill fish and insets.
- Disease outbreaks are common caused by poor water quality, high stocking densities and the entrance of wild fish.

While neighboring countries like India, Thailand and China have made dramatic increases in aquaculture production and productivity in the last decade, from the above it is evident that there must be scope to significantly increase aquaculture productivity in northwest region of Bangladesh. Balarin (1984) stated that this could be done by introducing efficient production from existing systems and/or by the adopting of new technologies and more intensive culture methods. Both require extension services to disseminate information, to provide training and technical support.

In Bangladesh the Government is unable to provide aquaculture extension services to all pond owners because of budget, resource and manpower constraints. For this reason, government has taken a big project of Fourth Fisheries Project to operate already in 200 Upazillas. The FFP is a special project of the Govt. of Bangladesh (GOB) sponsored by the ministry of Fisheries and Livestock and implemented by the Department of Fisheries (DOF) in collaboration with the Bangladesh Water Department Board (BWDB) and the Local Government Engineering Department (LGED).

FFP is managed by a project management unit (PMU) based at the Department of Fisheries Headquarters in Dhaka. The PMU is supported by a Technical Assistance team comprising seven full time and several past-time international consultant 18 full-time national consultants and ancillary staff. The project works in partnership with DoF field staff throughout the country.

The main activities of the FFP centered on a program of island fisheries enhancement thought the stocking of flood plains with hatchery reared fish fingerling, development of the physical and social infra structure for shrimp culture polders, other more minor fisheries and aquaculture activities and institutional support.

The "Fourth Fisheries Project" (FFP) aims to train a total 2,00,000 small farmers, at least 25% of whom will be women. The approach used is based on the "model village" system of the DFID- founded North-west Fisheries Extension Project. "Fourth Fisheries Project" (FFP) is already operating approximately 200 Upazillas in each of which a trained Extension officer is working under supervision of the "Upazilla Fisheries Officer" A total of about 8,000 villages will be reached within the projects life.

In Tarash Upazilla only aquaculture extension and training program is operating. A total 40 villages will be reached within June 2003. To provide extension services to the fish farmers in region a group or community based aquaculture extension program called the "Fishery Village Program (FVP)". In each fishery village 25 farmers are needed to build a group, which has at least a pond, canal or rice field. Since farmers are unaware of even basic fish culture practices the present production can be increased two or three fold by sound low pond management practices.

The "Fourth Fisheries Project" implements aquaculture extension and training programs. Because many ponds suitable for production of fish are currently under utilized. Yields can be increased substantially by application of basic improvements in management. Currently many projects are providing aquaculture extension training in Bangladesh. Though the technical messages are generally the same, there are significant different in training systems and approaches to provision of inputs. The aquaculture extension and training component of the

FFP seeks to harmonize these approaches whilst at the same time train farmers in the many parts of the country.

The present study was undertaken to understand the socio-economic profiles of the selected farmers to determine the gross performances through the indicators such as adoption of training messages, assessment of fish production in per unit area after training of selected fish farmers in small-scale aquaculture in the selected area, Tarash upazilla under Serajgonj district.

The main objectives of the study were as follows:

- To assess the fish production in per unit area of pond after training for the fish farmers in the selected fishery villages.
- To determine the adoption rate of training messages for the fish farmers in the selected fishery villages.
- To understand the socio-economic condition of the farmers in the selected fishery villages.

Chapter 2

REVIEW OF LITERATURE

2.0 REVIEW OF LITERATURE

The purpose of the study is to determine how effective a community or group based aquaculture extension approach is for the adoption of improved management practices. In this chapter, related and available literature, studies, research findings from home and abroad are reviewed.

Hassanullah (1979) reported that those countries, which work on the basis of extension theories, developed appropriate administrative structure of extension services and made desirable development of farmers and farming. These countries are USA, Canada, Japan, Denmark, Netherlands, Taiwan, and Korea etc with all favorable environment Bangladesh could not develop and ideal extension services, which could be effective in educating farmers.

Day (1979) a World Bank Specialist, concluded that in Bangladesh there are thousands of workers under dozen of extension organizations; but real extension work was really absent. A specialist team of IBRD, after reviewing the extension system, concluded that in Bangladesh real extension work has not been started. They further advised that on the basis of existing structure and working policy of extension organizations it would be unwise to conclude about the utility or non-utility of extension services.

About training and visit system, World Bank Mission (1994) concluded that, despite providing a sound administrative discipline to the extension service experience has shown that the training and visit concept in Bangladesh has failed to fully develop a communication linkage with the farming community. Due to weak technical messages and skill limitations of extension workers, service had difficulties in maintaining sufficient number of contact farmer.

The mission further pointed out that another weakness in the training and visit system, as presently operated in Bangladesh, is that the messages were mainly generated centrally in Dhaka and passed down to the District technical Committees (DTC). Further more, many issues of local concern were not addressed by those messages. Even messages, which addressed issues relevant to local conditions, were not adapted to local needs. In adequate output from the research system, as reported by the mission, had also contributed to the weakness of technical messages.

Sharma and Sunoria (1983) found no significant differences of educational level between the contact and non-contact farmers. But they found significant differences in knowledge of both contact and non-contact farmers. However, adoption of innovations varied significantly with the education incase of non-contact farmers only. They stated that the success of an extension agency would depend to large extents, on the qualification and skills of the staff.

In rural areas observation report (Anonymous, 1994) on the training and visit system of Extension work observed that organizations were interested to meet the educational and operational upliftments of the farmers. But in actual practice the co-operation among organizations were not found to be very effective for overall success of the program. To ensure optimum growth and development of T and V program, it was necessary for the related organizations to extend their possible help and co-operating as and when necessary. It will then be possible to achieve the highest possible attainment of success in terms of meeting their objectives of extension work.

Agricultural extension has always been an iterative changing process. This is because no single extension methodology has proved to be the most effective and the best under all condition. Agriculture extension can be categorized as the single approach, group or the community based approach. In Bangladesh, most government extension to dale has concentrated on the training and farm visit system and demonstrations targeted at individuals. Meanwhile NGOs typically use the group extension approach. Recently questions have been asked on the effectiveness and impact of demonstration methods popularly used by many development projects. Radiation where assessed and quantified has been found to be only limited (Morrice et, in prep.). Fish culture is a recent technology and fisheries extension in particular is still at the development stage.

Fourth fisheries project, DoF (2001) conducted a study in its project areas, for purpose of the study it studied on 10 villages (two villages from each upazilla) among 250 trained fish farmers by the project itself from the 10 upazilla under 5 district namely, Manikgong from Dhaka division, Natore from Rajshahi division, Chandpur from Chittagong division, Barisal from Barisal division and Jessore from Khulna division. The study revealed that only 18% of women were trained for hand on motivation by the project staff. Highest participation of women recored in Barisal (48%) followed by Rajshahi (28%) and Khulna (22%), it also

reported that female farmers' performance in fish production was better than male. Trained female pond operators produced higher (average 4.8 Kg/decimal) than that of trained male pond operators (average 6.7 Kg/decimal).

Chapter 3

MATERIALS AND METHODS

3.0 MATERIALS AND METHODS

3.1 Study area

Tarash upazilla under Serajgong district was selected for the study. It is located between an area of $24^0 20'$ and $24^0 34'$ north latitudes and between $89^0 15'$ and $89^0 26'$ east latitudes. The upazilla is bounded on the north by Sherpur upazilla of Bogra district and Raygonj upazilla, on the east by Raygonj and Ullapara upazilla, on the south by Chatmohar upzilla and on the west by Singra and Gurudaspur upazillas of Natore District. The study was conducted for a period of sixteen months from March' 2001 to June' 2002 in the study area. Samples have been collected from 6(six) villages such as Manikchaper, Washin, Shorappur (north), Shorappur (west) Chandpur and Goalgram.the location of the upazilla is presented in figure 1.

3.2 Selection of sample farmers

A total of 150 (one hundred and fifty) sample farmers under this study were selected randomly from six villages under Tarash upazilla of Serajgonj district. The fishery villages were selected using the criteria regard to fisheries resources rich villages, there was no other aquaculture / fisheries activity from Government organizations.

3.3 Training sessions and monitoring of the selected farmers

A quick preliminary survey was conducted January 2001 to identify the resources rich villages. After selecting fishery village, a motivation/awareness meeting was held in the selected fishery village in March' 2001 to gauge the level of interest in aquaculture, to discuss the role of aquaculture in community development and the importance of training various persons were invited of this meeting such as: Local leaders (Chairman and members) teacher, NGO representative, illiterate persons and fish farmers. At this motivation meeting the village was encouraged to form an informal group and in each village a total of 25 farmers were selected on the criteria regard to: To be interested, have owning or leasing ponds, canals or rice fish field. Then select a group leader in the fishery village. A baseline survey was conducted

for the village in the month of March' 2001. The pond owners were interviewed to collect baseline data on aquaculture practices in a questionnaire form the interview schedule of the questionnaire is presented in appendix.

All selected farmers received three full day pond side training sessions at appropriate times of year on (1) Pond preparation, (2) Fingerling stocking and pond management and (3) Partial harvesting, disease and marketing. Training was provided by Upazilla team (Upazilla fishery officer, Extension officer, Assistant fishery officer and field assistant). Upazilla team also made regular follow-up visits throughout the culture period. Farmers were advices to follow project guidelines for pond management practices.

Overhanging tree branches on pond banks were first cut back to increase sunlight penetration to the ponds. Very few farmers wanted to drain their ponds at the start of the trial, because pond water was used for bathing, washing clothes and watering vegetables. Aquatic weeds, floating and macrophytic were there fore removed manually and then both predatory and undesirable fish species were poisoned with rotenone (derris root powder) where necessary. Rotenone powder was added at the range of 25-30 gm/decimal for each foot of water depth. The amount will depend on the amount of active ingredient in the rotenone. One hour after the application of rotenone, dead fish were collected by netting.

One week after poisoning ponds were limed because it kills pathogenic organisms and increase water hardness and alkalinity, it helps to build the scale and bone of fish and also helps to clean the water. Lime applied at a rate of 1 Kg/decimal pond water.

One week after liming, the inputs of cow dung, T.S.P and Urea were added to promote and maintain phytoplankton production. Basal doses of cow manure, Urea and T.S.P were as follows:

Table – 01: Basal doses of cow manure, urea and TSP.

Name of fertilizer	Basal doses
Cow dung	5-7 Kg/decimal
Urea	100-150 gm/decimal
T.S.P	50-75 gm/decimal

Lime, Urea and T.S.P were applied to ponds following dissolving in a bucket of water.

One week after basal fertilization, ponds were stocked with fish obtained from nearby government and private nurseries. Every effort was made to stock even sized, healthy fingerling of each species. Two stocking models were used in the trial. Models 1 and 2 had 60 and 40-50 fish species respectively. Species combination and stocking densities per decimal for the modules are given below:

Module – 1

Table – 02: Species density in pond fish monoculture

Species name	Scientific name	Number of fish /decimal
Thai shorputi	*Puntius gonionotus*	30
Silver carp	*Hypophthalmicthyes molitrix*	20
Common carp/ mirror carp	*Cyprinus carpio*	10
Total		**60**

Module – 2

Table – 03: Species density in pond fish polyculture

Species name	Scientific name	Number of fish /decimal
Silver carp	*Hypophthalmicthyes molitrix*	8 - 10
Catla	*Catla catla*	4 - 6
Rui	*Labeo rohita*	8 - 10
Mrigal	*Cirrhinus mrigala*	6 – 7
Common carp/ mirror carp	Cyprinus carpio	2 - 3
Thai shorputi	Puntius gonionotus	10 - 15
Grass carp	*Ctenopharyngodon idella*	2 - 4
Total		40 - 50

Fourth Fisheries Project (FFP) recommends the seven species polyculture combination shown in module-2, of Silver carp (*Hypophthalmichthys molitrix*), Catla (*Catla catla*), Rui (*Labeo rohita*), Thai silver barb (*Puntius gonionotus*), Grass carp (*Ctenopharyngodon idella*) and Common carp (*Cyprinus carpio*).

Total stocking density is 40-50 fish/decimal pond water. This high stocking density is used because FFP recommends harvesting all Thai silver barb and large silver carp after 3-4 months of culture.

After stocking ponds were fertilized weekly with urea, T.S.P and cow manure at the rates shown below:

Table – 04: Basal doses of cowmanure, urea and TSP after stocking.

Fertilizer	Doses/ decimal / week
Cow manure	1.5 Kg
Urea	30 g
T.S.P	20 g

Some farmers used only fertilizer for fish growth and some farmers used fertilizer and supplementary feeding such as rice bran. Duckweed, soft grass, vegetable leaves etc. Were supplied to satiation for Thai silver barb and grass carp. The rate at rice barn applied are shown below.

Table – 05: Supplementary feed for fish culture (rice bran)

Month	Feed	Doses/decimal/day
First	Rice bran	40 g
Second	Rice bran	90 g
Third	Rice bran	170 g
Fourth	Rice bran	215 g
Fifth	Rice bran	250 g
Sixth	Rice bran	300 g
Seventh	Rice bran	300 g

Fish were sampled to examine the health of fish, to know the growth of fish, to remove the gas from water sample was done two times in a month. Fork lengths, bulk weights and numbers of fish were recorded for each species.

Partial harvesting was done four months after fingerling stocking. After 3-4 months or when fish reach sizes given below partial harvesting was done:

Table – 06: Partial harvesting species and size

Species name	Weight/Size
Silver carp/Grass carp/Mirror carp	500g/79 inches
Rui, Catla, Mrigal	400g/79 inches
Thai shorputi	50-57g/76 inches

Weekly supports visits were made by the Upazilla fishery officer, Extension officer, Assistant fishery officer and field assistant to reflect upon the progress of the previous week to discuss problems and to make future plans. The essence of this approach was that pond owners planed for themselves and work together from a single plat form. Two follow-up training were given to the farms in each fishery village of 25 pond owners (Each fishery village). In the first follow-up training the farmers were asked questionnaire by Upazilla team, how did they culture of fish in their ponds. In the second-follow-up training (March 2001), the production data were collected from the fishery village farmer by asking the questionnaire and to follow the pond record book.

Each farmer was provided with a record book where all pond inputs, production and visitors comments were recorded, together with the recommendations made by the Upazilla team. A pond side farmer's day rally was arranged near a successful fishery village pond later in the culture season (June 2002) to disseminate the benefits of the programs to nearby villages. Neighboring villages, local leaders and officials were invited to attend the rally and farmers shared their experiences of success and failure with others.

3.4 Preparation of interview questionnaire for the study

3.4.1 Preparation of interview baseline questionnaire for collecting socio – economic information

To collect the baseline information, an interview schedule was prepared and in –depth survey was conducted among the selected farmers. Before preparing the final interview questionnaire, a draft interview questionnaire was developed keeping in view the objective of the study. The draft questionnaire was pre-tested in the selected area by direct interviewing with some selected fish farmers by the researcher himself. The interview questionnaire was then changed modified and rearranged according to the experience obtained during pre-testing. A final interview questionnaire was then developed in logical sequence, so that, the fish farmers could provides information chronologically (appendix-1).

3.4.2 Preparation of the questionnaire for collecting the degree of adoption of training massages after applying training massages

To collect the information about degree of adoption of the given training massages through training, a draft format was developed keeping in view meeting up the objectives of the study. Before finalizing the draft format that was pre-tested it among the some selected-trained fish farmers then it was finalized according to the experienced gathered during pre-testing. The following training massages were given through training such as De-weeding, Dike repairing, removal of predator / unwanted species, liming, pre-stocking fertilization, species selection, stocking density and ratio, feeding, post-stocking fertilization, partial harvesting and problem & hazards management (appendix-1).

3.4.3 Preparation of the format for Assessment of Fish production after training

To contrast the per unit fish production between the selected-trained men and women fish farmer after training a format was prepared according to the objectives of the study to asses fish production, the researcher himself developed a draft format. Some selected trained farmers who completed one production cycle was taken under data collection with the experience gained through field survey.

3.5 Collection of data

3.5.1 Socio-economic profile of fish farmers

The relevant data on socio-economic profile of the selected farmers was collected through single interview technique from the selected farmers by the researcher himself Tarash upazilla fisheries officer before training. Visits were made in the study area with the assistance of personnel of upazilla fisheries office to collect data accurately relate to the objectives of the study. After each visit the collected data were checked for accuracy, clarity and any confusion arisen then corrected in the next visit. Data were collected from the study area before conducting the training during the period from March "2001" to May "2001".

3.5.2 Adoption of training messages

The rate of adoption of training messages was collected by researcher himself with the assistance of Assistant Fishery Officer, Upazilla Fisheries office, Tarash by using of the techniques of particular rural appraisal (PRA) i.e., Focus group discussion (FGD). For each activity devised during the training session were asked the degree to which applied or not applied the training messages learnt. According to Chambers (1992), PRA is indented to enable local people to conduct their own analysis and often to plan and take action. Participatory rural appraisal (PRA) methods are considered by certain academadics, as a better alternative to traditional survey /questionnaire methods in socio- economic research. Of late, these methods have not only gained prominence but also propagated as an alternative paradigm in social science research (Chambers, 1994a, b and c).

Through PRA boast of twenty-seven methods, most of them are being used in the standard approaches of socio-economics research in from or other, of course under different names or even at informal (Ready, 1998). During focus group discussion data were collected from the sampled fish farmers respectively those were trained. Several visits were made for the above purpose and the confused information in the next visit. The data regarding the degree of adoption of the training messages were collected during the period of June '2002' when culture cycle was almost finished.

3.5.3 Assessment of fish production

The data about fish production after training were collected by using single interviewing technique from the sample trained fish farmers by research himself with the assistance of Assistant Fishery Officer, Upazilla Fisheries office, Tarash. These data were collected just after completing the one production cycle during June'2002'. For this purpose several visits were made.

3.5.4 Analysis of data

The design of this study was descriptive in nature. A formula was used to calculate the adoption index and adoption score that was introduced and used by Kashem (1995) in the calculation of agricultural knowledge of farmers.

Formula:

AI = F*2+P*1+N*0

Here,

AI=adoption index

F=%of farmers were fully adopt training messages

P= %of farmers were partially adopt training messages.

N=%of farmers were not adopt training messages.

Descriptive statistics (numbers, percentages, standard deviation and range) were used to summarize the data pertaining to the Socio-economic profiles of the selected fish farmers, adoption of training messages and fish production attained. The MS Excel and SPSS version 11.0 packages were used to analyze the data.

Chapter 4

RESULTS AND DISCUSSION

4. 0 RESULTS AND DISCUSSION

4.1 Socio-economic information of selected fish farmers

In this section socio-economic condition of the fish farmers whose are selected in the study area is understood. Here age structure; household size, educational status, principle occupations, aquaculture resource (pond), annual household cash income and previous training status of fish culture and management of the selected farmers were mainly emphasized. The results obtained are presented under the following headings.

4.1.1 Household size

The highest number (13 families ≡ 52%) of the households had 5-7 members in their family that was followed by 36 percent had 2 to 4 numbers of their family and only 12 percent had more than 7 members of their family in case of Manikchaper village. In case of Washin village, the highest number (10 families ≡ 40%) of the households had more than 7 members of their family that was followed by 32 percent had 2 to 4 numbers of their family and only 28 percent had 5-7 members in their family. In case of Sorafpur (north) village, the highest number (13 families ≡ 52%) of the households had 2 to 4 numbers of their family more than 7 members of their family that was followed by 32 percent had 5-7 members in their family and only 16 percent had more than 7 members of their family. The highest number (56 percent) that have 5 – 7 members in their family.

Table – 07: Household family size of the fish farmers

Village	Family size (members in number)			
	2-4	5-7	Above 7	Total
Manikchaper	9	13	3	25
Washin	8	7	10	25
Shorafpur (north)	13	8	4	25
Shorafpur (west)	3	14	8	25
Chandpur	10	10	5	25
Goalgram	14	9	2	25

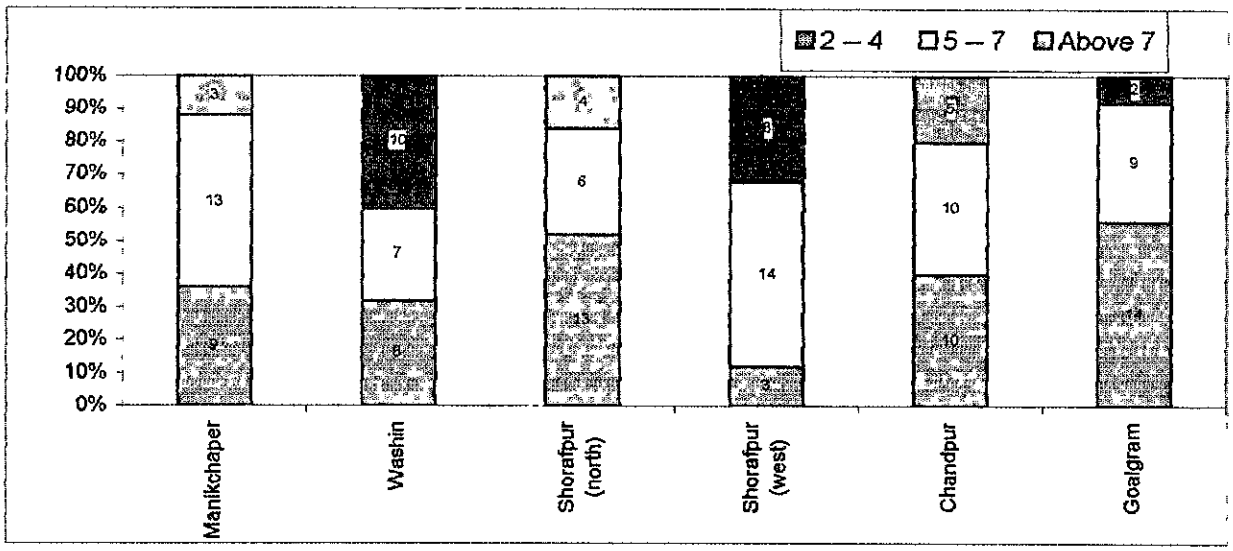

Figure – 01: Household size of the fish farmers

4.1.2 Age structure

The age structure was examined of the trained fish farmers in different types of age groups; less than or equal to 25 years, 26 to 35 years, 36 to 45 years and more than 45 years. Among them in case of Manikchaper village the age group of 26 to 36 was highest, 11 persons (44 %). In case of Washin, Shorafpur (west), Chandpur and Goalgram village, age group of 26 to 35 years were highest whereas only in Shorafpur (north) village less than or equal to 25 years age structure was highest (18 persons, 72 %). It is observed that average number of farmers of the age structure less than or equal to 25 years and 26 to 35 years imparted training activities. Here it is prominent that, lowest numbers of farmers of age structure greater than 45 years imparted farming as well as training. Only 4 farmers of Goalgram village of the age structure greater than 45 years were taken training. Figure 4.1 shows that as stated above.

Table – 08: Age structure of the fish farmers

Village	Age (years)				
	≤ 25	26-35	36-45	>45	Total
Manikchaper	6	11	7	1	25
Washin	11	12	2	0	25
Shorafpur (north)	18	7	0	0	25
Shorafpur (west)	12	13	0	0	25
Chandpur	10	10	4	1	25
Goalgram	6	13	2	4	25

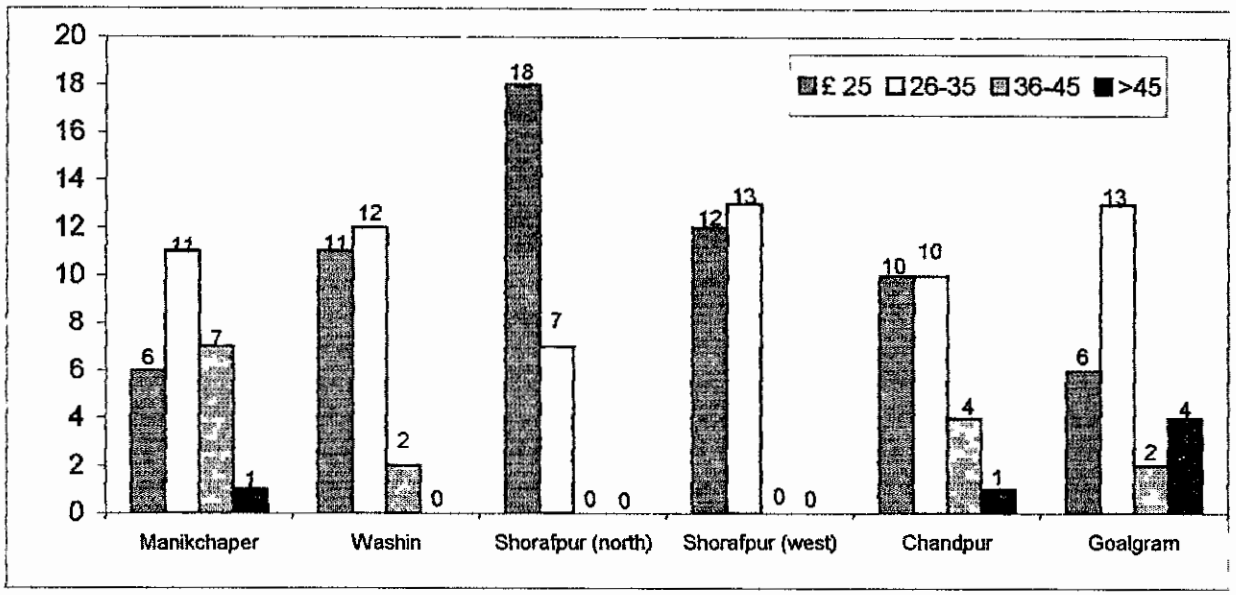

Figure – 02: Age structure of the fish farmers

4.1.3 Educational status

Among the trained fish farmers of the village Manikchaper was 11 numbers (44 percent) had up to secondary level that was followed by illiterate (can sign only) 8 percent. In case of Washin village, 8 numbers (32 percent) had up to primary level that was followed by illiterate (can sign only) 20 percent. In case of Sorafpur (north) village, 12 numbers (48 percent) had up to secondary level that was followed by illiterate (can sign only) 24 percent. In case of Sorafpur (west) village, 8 numbers (32 percent) had up to secondary level that was followed by illiterate (can sign only) 16 percent. The highest number (20 families ≡ 80 percent) had up to secondary educational status of Goalgram village.

Table – 09: Educational status of the fish farmers

Village	Educational status				
	Can sign only	Up to primary	Up to secondary	Higher secondary	Total
Manikchaper	2	9	11	3	25
Washin	5	8	6	6	25
Shorafpur (north)	6	4	12	3	25
Shorafpur (west)	4	7	8	6	25
Chandpur	4	6	10	5	25
Goalgram	0	3	20	2	25

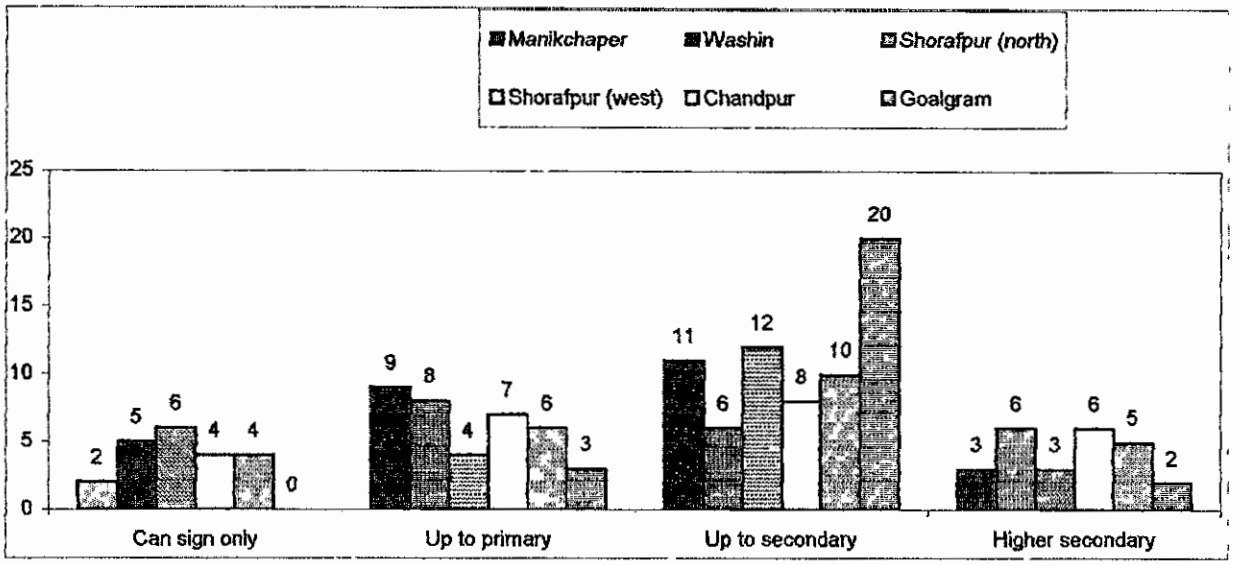

Figure – 03: Educational status of the fish farmers

4.1.4 Principle occupation

Among the trained fish farmers of the Manikchaper village, highest number (68 %) farmers were engaged in agriculture that he followed by 12 % in household works. It was also found that never persons were engaged in fish culture, small business and day labor. In case of washin village, maximum (19 trainees ≡ 76 %) were engaged in agriculture occupation. In case of Goal gram village, every occupational trainee was available averagely. Here it is observed that, major portion of the trainees' main occupation is agriculture whereas business holders follow it, household workers and students were small in numbers. And very few trainees' main occupations were fish culture, service, small business, and day labor.

Table – 10: Principle occupation of the fish farmers

Village	Principle occupation								
	Agriculture	Fish culture	Business	Service	Small business	Day labor	Household works	Student	Total
Manikchaper	17	0	1	2	0	0	3	2	25
Washin	19	0	0	0	0	0	6	0	25
Shorafpur (north)	6	0	6	1	1	0	5	6	25
Shorafpur (west)	11	0	5	0	0	0	3	6	25
Chandpur	10	0	3	0	0	3	5	4	25
Goalgram	8	3	2	4	0	1	5	2	25

4.1.5 Aquaculture resource

Among the fish farmers of Manikchaper village, the highest (8 farmers ≡ 32 %) had the ponds covering less than or equal to 10 decimals that was followed by the number (24 %) had the pond covering greater than 10 to 20 decimals. It was found that only 8 percent had the pond covering the greater than 100 decimal size. In case of Sorafpur (west) village, the highest (14 farmers ≡ 56 %) had the ponds covering greater than 20 decimals to 50 decimals that was followed by the number (36 %) had the pond covering greater than 10 to 20 decimals. It was found that never had the pond covering the greater than 100 decimal size and less than or equal to 10 decimal size. The maximum number of fish farmers of every villages had the pond covering greater than 20 to 50 decimal followed by the pond size of greater than 10 to 20 decimals.

Table – 11: Aquaculture resource of the fish farmers

Village	Pond size (decimal)					
	≤ 10	>10-20	>20-50	>50-100	>100	Total
Manikchaper	8	6	5	4	2	25
Washin	4	6	6	5	3	25
Shorafpur (north)	0	9	14	2	0	25
Shorafpur (west)	0	9	12	3	1	25
Chandpur	1	16	5	3	0	25
Goalgram	0	8	12	2	3	25

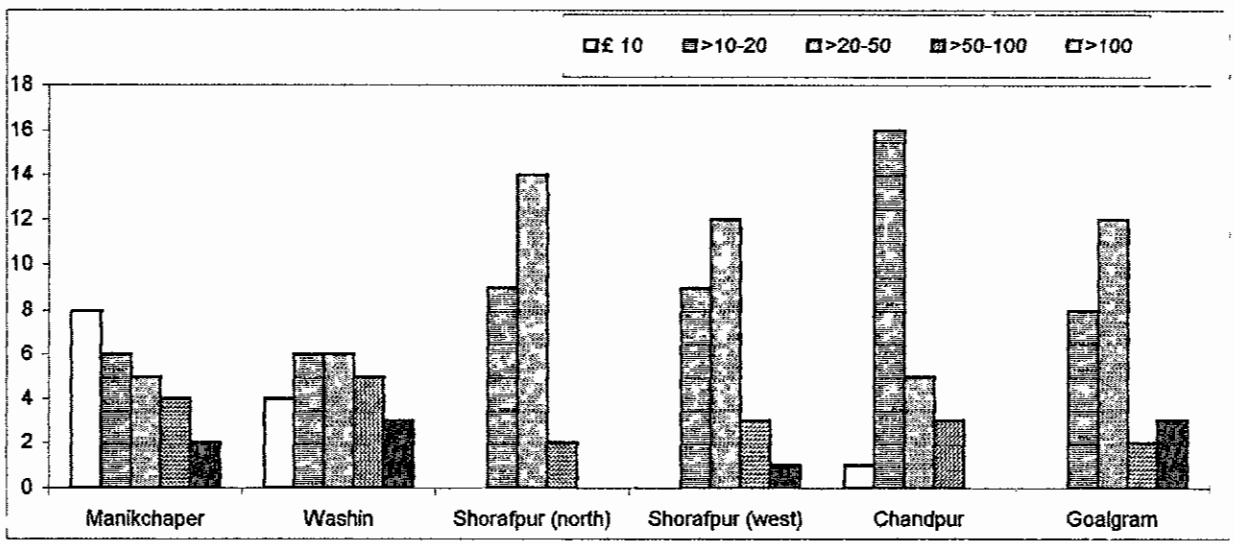

Figure – 04: Aquaculture resource of the fish farmers

4.1.6 Annual household cash income

Among the fish farmers of Manikchaper village the annual cash income group of 10,001 to 15,000 taka was the highest (32 %) that was followed by the annual cash income group of 15,001 to 20,000 taka and from 20,001 to 30,000 taka (both were 28 % individually). It was found that no farmers were available of earning annual cash income of greater than 30,000 taka in Manikchaper village. In case of Washin village, the farmers of annual cash income group of more than 75,000 taka was the highest (44 %) whereas no farmers were available of annual cash income group of 15,001 to 20,000 taka. The maximum portions of fish farmers were available whose annual cash income was 10,001 to 30,000 taka in case of every village.

Table – 12: Annual household cash income of the fish farmers

Village	Annual household cash income (Taka in thousand)							
	≤ 10	>10-15	>15-20	>20-30	>30-50	>50-75	>75	Total
Manikchaper	3	8	7	7	0	0	0	25
Washin	0	1	0	3	9	1	11	25
Shorafpur (north)	0	8	7	7	3	0	0	25
Shorafpur (west)	0	0	11	9	5	0	0	25
Chandpur	2	14	5	2	0	0	2	25
Goalgram	0	4	9	5	1	1	5	25

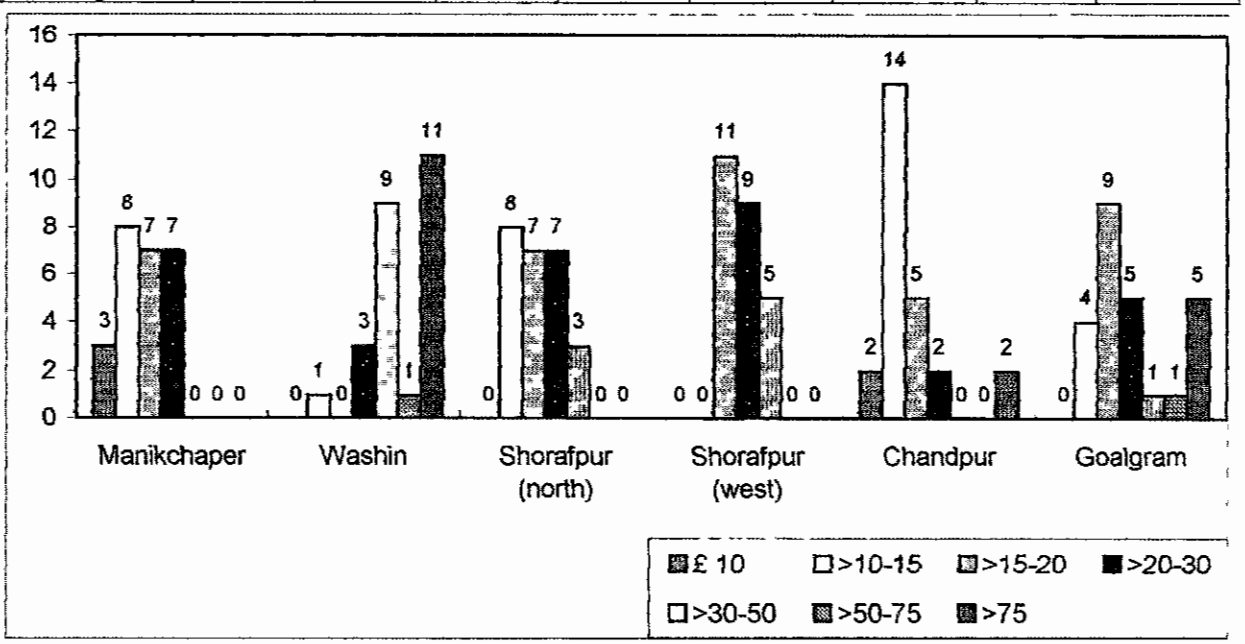

Figure – 05: Annual household cash income of the fish farmers

4.1.7. Fish production rate (Before Training)

The annual production of fish was recorded from selected farmers before the adoption of the training messages. The fish production rate varies from 2 to 11 kg/ decimals. In case of Manikchaper village, maximum (52 %) farmers' fish production rate before training were greater than 3 to 5 kg per decimal that was followed by 32 percent farmers had the fish production rate before training was of less than or equal to 3 kg per decimal. There were highest farmers of every village except Chandpur village had the fish production rate of greater than 3 to 5 kg per decimal. Farmers of greater than 8 kg per decimal fish production before training were not available from every village except Manikchaper village. The highest group of farmers (92 %) of Goalgram village had the fish production rate before training was greater than 8 kg per decimal.

Table – 13: Fish production rate before training of the fish farmers

Village	Fish production rate before Training (Kg per decimal)				
	≤ 3	>3-5	>5-8	> 8	Total
Manikchaper	8	13	2	2	25
Washin	0	19	6	0	25
Shorafpur (north)	2	14	9	0	25
Shorafpur (west)	0	10	15	0	25
Chandpur	0	17	8	0	25
Goalgram	0	23	2	0	25

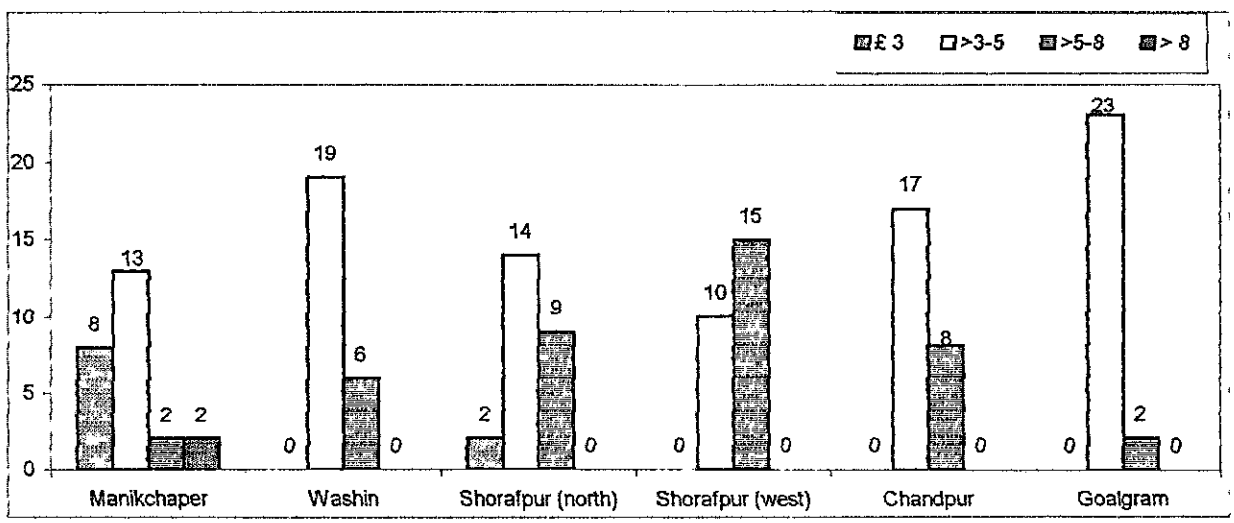

Figure – 06: *Fish production rate before training*

4.2 Adoption scale of training messages to the fishery village farmers

4.2.1 Manikchaper

Among the trained fish farmers, embankment preparation was fully adopted by the highest proportion (68 %) of farmers that was followed by the farmers (24 %) with adoption partially and 8 % with not adoption at all the training message given. In case of removal of weed, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. Again, removal of predatory fishes were fully adopted by the highest proportion (64 %) that was followed by the 24 percent were partially adopted whereas only 12 % farmers didn't take the training message. In case of liming, highest proportion (80 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. On the other hand, pre-stocking fertilizer using were fully adopted by the highest proportion (72 %) that was followed by the 16 percent were partially adopted whereas only 12 % farmers didn't take the training message. Species selection were fully adopted by the highest proportion (60 %) that was followed by the 20 percent were partially adopted whereas only 20 % farmers didn't take the training message. Density of species control were fully adopted by the highest proportion (76 %) that was followed by the 12 percent were partially adopted whereas only 12 % farmers didn't take the training message. In case of post-stocking fertilization, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 12 % with not adoption at all the training message given. In case of supplementary feeding, highest proportion (84 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 4 % with not adoption at all the training message given. In case of partial harvesting, highest proportion (64 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 20 % with not adoption at all the training message given. In case of restocking, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 20 % with not adoption at all the training message given. In case of hazard management, highest proportion (56 %) of farmers were fully adopted that was followed by the farmers (24 %) with adoption partially and 20 % with not adoption at all the training message given.

4.2.2 Washin

Among the trained fish farmers, embankment preparation was fully adopted by the highest proportion (60 %) of farmers that was followed by the farmers (20 %) with adoption partially and 20 % with not adoption at all the training message given. In case of removal of weed, highest proportion (52 %) of farmers were fully adopted that was followed by the farmers (28 %) with adoption partially and 20 % with not adoption at all the training message given. Again, removal of predatory fishes were fully adopted by the highest proportion (64 %) that was followed by the 16 percent were partially adopted whereas only 20 % farmers didn't take the training message. In case of liming, highest proportion (84 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 4 % with not adoption at all the training message given. On the other hand, pre-stocking fertilizer using were fully adopted by the highest proportion (56 %) that was followed by the 24 percent were partially adopted whereas only 20 % farmers didn't take the training message. Species selection were fully adopted by the highest proportion (68 %) that was followed by the 24 percent were partially adopted whereas only 8 % farmers didn't take the training message. Density of species control were fully adopted by the highest proportion (72 %) that was followed by the 16 percent were partially adopted whereas only 12 % farmers didn't take the training message. In case of post-stocking fertilization, highest proportion (80 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. In case of supplementary feeding, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. In case of partial harvesting, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. In case of restocking, highest proportion (64 %) of farmers were fully adopted that was followed by the farmers (24 %) with adoption partially and 12 % with not adoption at all the training message given. In case of hazard management, highest proportion (76 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 12 % with not adoption at all the training message given.

4.2.3 Shorafpur (North)

Among the trained fish farmers embankment preparation was fully adopted by the highest proportion (76 %) of farmers that was followed by the farmers (12 %) with adoption partially and 12 % with not adoption at all the training message given. In case of removal of weed, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 12 % with not adoption at all the training message given. Again, removal of predatory fishes were fully adopted by the highest proportion (60 %) that was followed by the 12 percent were partially adopted whereas only 28 % farmers didn't take the training message. In case of liming, highest proportion (88 %) of farmers were fully adopted that was followed by the farmers (4 %) with adoption partially and 8 % with not adoption at all the training message given. On the other hand, pre-stocking fertilizer using were fully adopted by the highest proportion (80 %) that was followed by the 12 percent were partially adopted whereas only 8 % farmers didn't take the training message. Species selection were fully adopted by the highest proportion (72 %) that was followed by the 16 percent were partially adopted whereas only 12 % farmers didn't take the training message. Density of species control were fully adopted by the highest proportion (60 %) that was followed by the 20 percent were partially adopted whereas only 20 % farmers didn't take the training message. In case of post-stocking fertilization, highest proportion (76 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 12 % with not adoption at all the training message given. In case of supplementary feeding, highest proportion (60 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 20 % with not adoption at all the training message given. In case of partial harvesting, highest proportion (76 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 12 % with not adoption at all the training message given. In case of restocking, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 12 % with not adoption at all the training message given. In case of hazard management, highest proportion (60 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 28 % with not adoption at all the training message given.

4.2.4 Shorafpur (West)

Among the trained fish farmers embankment preparation was fully adopted by the highest proportion (80 %) of farmers that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. In case of removal of weed, highest proportion (72 %) of farmers was fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. Again, removal of predatory fishes were fully adopted by the highest proportion (56 %) that was followed by the 28 percent were partially adopted whereas only 16 % farmers didn't take the training message. In case of liming, highest proportion (80 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. On the other hand, pre-stocking fertilizer using were fully adopted by the highest proportion (72 %) that was followed by the 16 percent were partially adopted whereas only 12 % farmers didn't take the training message. Species selection were fully adopted by the highest proportion (60 %) that was followed by the 20 percent were partially adopted whereas only 20 % farmers didn't take the training message. Density of species control were fully adopted by the highest proportion (80 %) that was followed by the 12 percent were partially adopted whereas only 8 % farmers didn't take the training message. In case of post-stocking fertilization, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. In case of supplementary feeding, highest proportion (60 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 20 % with not adoption at all the training message given. In case of partial harvesting, highest proportion (76 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 12 % with not adoption at all the training message given. In case of restocking, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 12 % with not adoption at all the training message given. In case of hazard management, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (24 %) with adoption partially and 8 % with not adoption at all the training message given.

4.2.5 Chandpur

Among the trained fish farmers embankment preparation was fully adopted by the highest proportion (64 %) of farmers that was followed by the farmers (16 %) with adoption partially and 20 % with not adoption at all the training message given. In case of removal of weed, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 20 % with not adoption at all the training message given. Again, removal of predatory fishes were fully adopted by the highest proportion (56 %) that was followed by the 24 percent were partially adopted whereas only 20 % farmers didn't take the training message. In case of liming, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. On the other hand, pre-stocking fertilizer using were fully adopted by the highest proportion (60 %) that was followed by the 20 percent were partially adopted whereas only 20 % farmers didn't take the training message. Species selection were fully adopted by the highest proportion (76 %) that was followed by the 12 percent were partially adopted whereas only 12 % farmers didn't take the training message. Density of species control were fully adopted by the highest proportion (68 %) that was followed by the 20 percent were partially adopted whereas only 12 % farmers didn't take the training message. In case of post-stocking fertilization, highest proportion (68 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 12 % with not adoption at all the training message given. In case of supplementary feeding, highest proportion (60 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 28 % with not adoption at all the training message given. In case of partial harvesting, highest proportion (80 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. In case of restocking, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. In case of hazard management, highest proportion (60 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 20 % with not adoption at all the training message given.

4.2.6 Goalgram

Among the trained fish farmers embankment preparation was fully adopted by the highest proportion (80 %) of farmers that was followed by the farmers (8 %) with adoption partially and 12 % with not adoption at all the training message given. In case of removal of weed, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. Again, removal of predatory fishes were fully adopted by the highest proportion (68 %) that was followed by the 12 percent were partially adopted whereas only 20 % farmers didn't take the training message. In case of liming, highest proportion (80 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. On the other hand, pre-stocking fertilizer using were fully adopted by the highest proportion (72 %) that was followed by the 16 percent were partially adopted whereas only 12 % farmers didn't take the training message. Species selection were fully adopted by the highest proportion (80 %) that was followed by the 12 percent were partially adopted whereas only 8 % farmers didn't take the training message. Density of species control were fully adopted by the highest proportion (72 %) that was followed by the 16 percent were partially adopted whereas only 12 % farmers didn't take the training message. In case of post-stocking fertilization, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (20 %) with adoption partially and 8 % with not adoption at all the training message given. In case of supplementary feeding, highest proportion (76 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 12 % with not adoption at all the training message given. In case of partial harvesting, highest proportion (80 %) of farmers were fully adopted that was followed by the farmers (12 %) with adoption partially and 8 % with not adoption at all the training message given. In case of restocking, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given. In case of hazard management, highest proportion (72 %) of farmers were fully adopted that was followed by the farmers (16 %) with adoption partially and 12 % with not adoption at all the training message given.

Table – 14: Adoption scale of training messages to the fishery village farmers

Village	Adoption category	Adoption scale of training messages											
		Embankment preparation	Removal of weed	Removal of predatory fish	Liming	Pre-stocking fertilizer	Species selection	Density of species	Post-stocking fertilization	Supplementary feeding	Partial harvest	Re-stocking	Hazards management.
Manikchaper	Fully Adopt	17	18	16	20	18	15	19	17	21	16	17	14
	Partially Adopt	6	4	6	3	4	5	3	5	3	4	3	6
	Do not Adopt	2	3	3	2	3	5	3	3	1	5	5	5
Washin	Fully Adopt	15	13	16	21	14	17	18	20	18	18	16	19
	Partially Adopt	5	7	4	3	6	6	4	3	4	4	6	3
	Do not Adopt	5	5	5	1	5	2	3	2	3	3	3	3
Shorafpur (north)	Fully Adopt	19	17	15	22	20	18	15	19	15	19	17	15
	Partially Adopt	3	5	3	1	3	4	5	3	5	3	5	3
	Do not Adopt	3	3	7	2	2	3	5	3	5	3	3	7
Shorafpur (west)	Fully Adopt	20	18	14	20	18	15	20	18	15	19	17	17
	Partially Adopt	3	4	7	3	4	5	3	4	5	3	5	6
	Do not Adopt	2	3	4	2	3	5	2	3	5	3	3	2
Chandpur	Fully Adopt	16	17	14	18	15	19	17	17	15	20	18	15
	Partially Adopt	4	3	6	4	5	3	5	5	3	3	4	5
	Do not Adopt	5	5	5	3	5	3	3	3	7	2	3	5
Goalgram	Fully Adopt	20	18	17	20	18	20	18	18	19	20	18	18
	Partially Adopt	2	4	3	3	4	3	4	5	3	3	4	4
	Do not Adopt	3	3	5	2	3	2	3	2	3	2	3	3

4.3 Adoption, partial adoption and not adoption percentage (average on the basis of entire adoption scale of training message) according to village

Among the selected fish farmers of Manikchaper village, 69.33 percent farmers fully adopted that was followed by the 17.33 % farmers adopted partially whereas only 13.33 percent fish farmers with not adoption on an overall adoption parameter message basis. In case of Washin village, the highest (68.33 %) farmers were fully adopted, 18.33 percent were partially adopted whereas only 13.33 percent with not adoption. On the other hand, 70.33 percent the fish farmers of Shorafpur (north) village with fully adopted that is followed by the 14.33 % with partial adoption whereas, 15.33 percent never responded. In case of farmers of Shorafpur village, highest (70.33 %) adopted fully whereas 17.33 % and 12.33 % with partial adoption and not adoption respectively. 67 percent of the farmers of Chandpur village adopted fully of the adption parameters whereas 16.67 % and 16.33 % with partial adoption and not adoption respectively. The highest adoption percentage of the study area (among six villages) was 74.67 % done by the farmers of the Goalgram village whereas 14 % and only 11.33 % with partial adoption and not adoption respectively.

Table – 15: Adoption, partial adoption and not adoption percentage according to village

Village	Adoption (%)	Partial adoption (%)	Not adoption (%)	Total (%)
Manikchaper	69.33	17.33	13.33	100
Washin	68.33	18.33	13.33	100
Shorafpur (north)	70.33	14.33	15.33	100
Shorafpur (west)	70.33	17.33	12.33	100
Chandpur	67.00	16.67	16.33	100
Goalgram	74.67	14.00	11.33	100

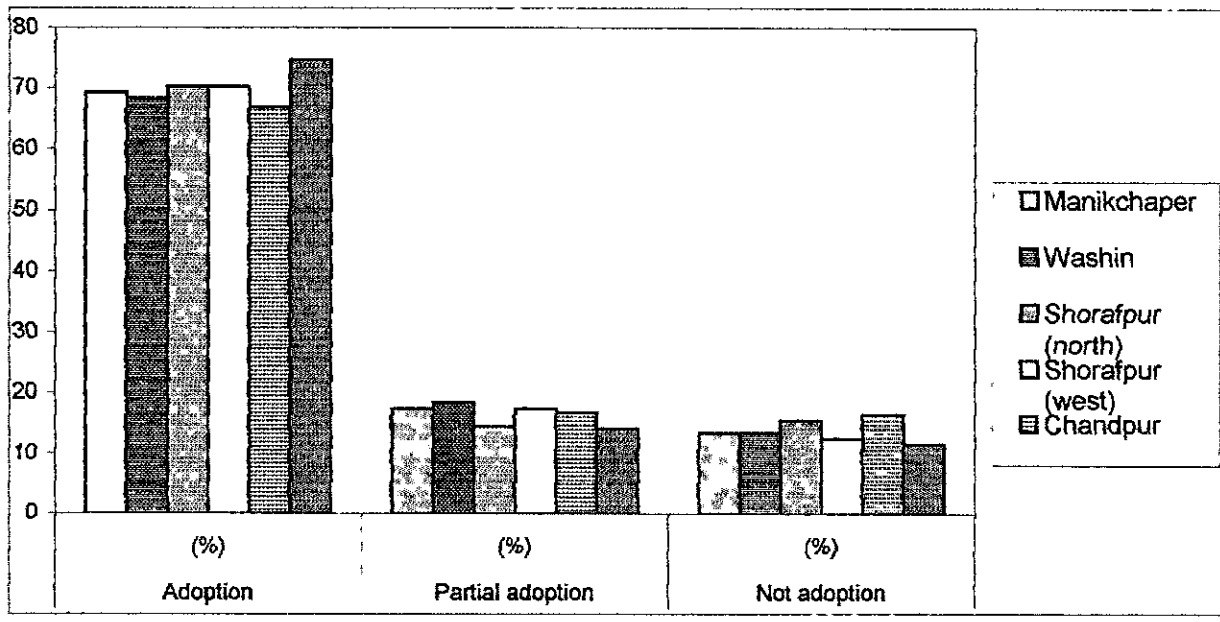

Figure – 07: Adoption, partial adoption and not adoption percentage according to village

4.4 Adoption index

Adoption index between selected training perform indicators (training messages) is shown in the table 16. It was found that adoption indicators such as embankment preparation, liming, fertilization, supplementary feeding were depends on the economic conditions of the fish farmers. On the other hand, species selection, removal of weed, removal of predatory fish, density of species measurement, hazard management was depended on aquaculture knowledge of farmers.

The adoption index of Manikchaper village varies from 136 to 180 and here the farmers responded supplementary feeding highly. In case of Washin village, liming responded farmers were highest in number which adoption index is 180. Adoption index of liming was highest (180) of Shorafpur (north) village whereas adoption index removal of predatory fish and hazard management was lowest (132). The highest adoption index of Shorafpur (south) varies from 140 (species selection and supplementary feeding) to 172 (embankment preparation). In case of chandpur village, the adoption index varies from 132 (supplementary feeding) to 172 (partial harvest). The highest adoption index of Goalgram village varies from 148 (removal of predatory species) to 172 (liming, species selection and partial harvest). Among the all fishery villages, the average adoption index of Goalgram was highest whereas that was lowest in the village of Chandpur village.

Table – 16: Adoption index of training messages

Village	Adoption index of training messages												
	Embankment preparation	Removal of weed	Removal of predatory fish	Liming	Pre-stocking fertilizer	Species selection	Density of species	Post-stocking fertilization	Supplementary feeding	Partial harvest	Re-stocking	Hazards management	**Average adoption index.**
Manikchaper	160	160	152	172	160	140	164	156	180	140	148	136	**155.6**
Washin	140	132	144	180	136	160	160	172	160	160	152	164	**155.0**
Shor afpur (north)	164	156	132	180	172	160	140	164	140	164	156	132	**155.0**
Shorafpur (west)	172	160	140	172	160	140	172	160	140	164	156	160	**158.0**
Chandpur	144	148	136	160	140	164	156	156	132	172	160	140	**150.6**
Goalgram	168	160	148	172	160	172	160	164	164	172	160	160	**163.3**

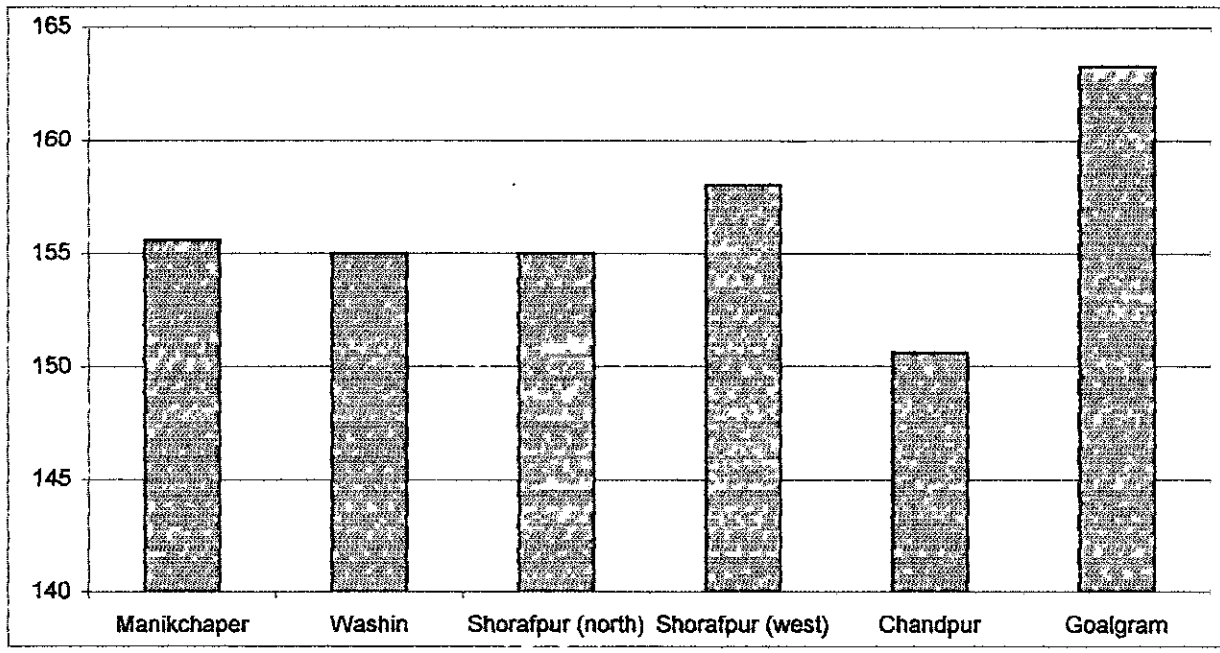

Figure – 08: Average adoption index of training messages

4.5 Fish production rate after Training

The production rate of fish was recorded from selected farmers after the adoption of training messages. Among the selected fish farmers, the highest (ranges varies from 20 to 23) farmers fish production was greater than 8 kg per decimal that is followed by the fish production after training varies from greater than 5 to 8 kg per decimal was ranges from 0 to 3 fish farmers.

Table – 17: Fish production rate after training of the fish farmers

Village	Fish production rate after Training (Kg per decimal)				
	≤ 3	>3-5	>5-8	>8	Total
Manikchaper	1	4	0	20	25
Washin	0	3	0	22	25
Shorafpur (north)	0	0	3	22	25
Shorafpur (west)	0	0	3	22	25
Chandpur	0	3	0	22	25
Goalgram	0	2	0	23	25

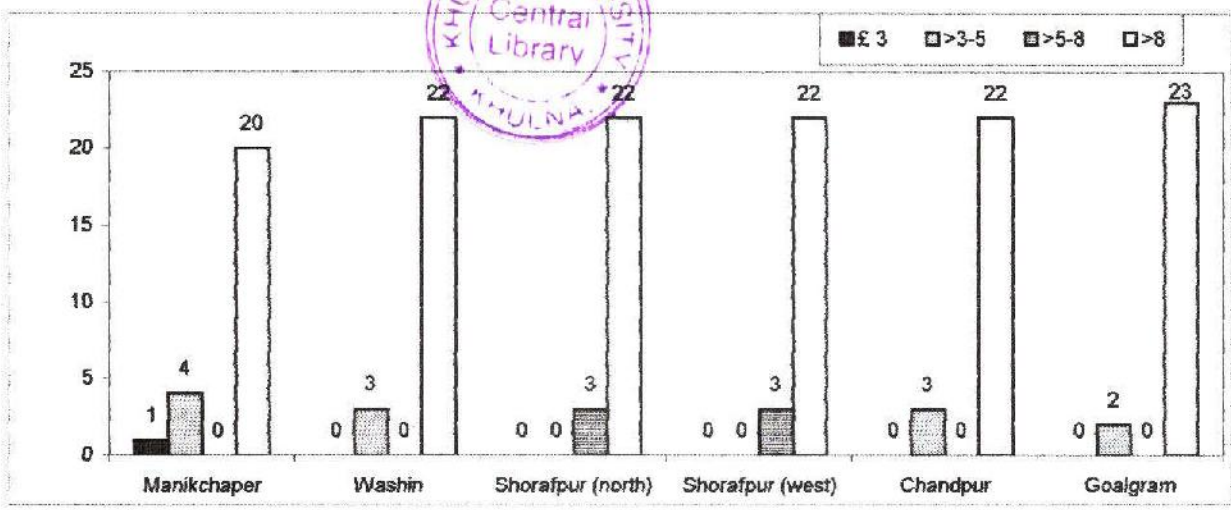

Figure – 09: Fish production rate after training

4.6 Differences between pre-training and post-training fish production rate

There are significant differences of fish production between before training and after training of the farmers. Before adoption of training messages the production rate of Minikchaper, Washin, Shorafpur (north), Shorafpur (west), Chandpur and Goalgram were 4.09, 5.55, 4.65, 5.44, 5.07 and 4.96 kg per decimal respectively but after adoption of training messages, production rate significantly increased and production rate after training reached at the rate of 10.19, 10,52, 9.98, 11.07, 10.09 and 11.51 kg per decimal respectively. Production was low because either ponds were not stopped at all appropriately or where stocked high densities of small fry were released into unprepared ponds. There after fertilization and feeding were either not practiced or at best were only done irregularly and species combinations were not maintained. As a result, intra species competition for food and habit reducing growth rates and increasing mortality. Yashouv(1969) stated that in a polyculture system, interaction between fish species and within fish species could hinder or stimulate fish growth. After adoption of training messages, production rate significantly increased and production rate after training reached at the rate of 10.19 kg per decimal, 10.52 kg per decimal, 9.98 kg per decimal, 11.07 kg per decimal, 10.09 kg per decimal and 11.51 kg per decimal respectively. Pond production after extension and training in fishery village program has increased because ponds were stocked at all, stocked in sizable and actual combination of species of fish were released into prepared ponds there after fertilization

and feeding were practiced by some farmers fully and some farmers partially. The production in ponds has also increase due the inclusion of the seven fish species, thai silver barb which prefer to feed on duckweed and soft leafy vegetation. The efficient use of different natural food organisms by fish species that have different spatial and tropic feeding riches, is the essence of a sound poly culture system and results in higher production (Reich, 1975). The total yields obtained from the six fishery villages ranged from 9.98 kg per decimal to 11.51 kg per decimal were of the same range as those obtained by NFEP demonstration farmers between from 1992 to 1995 (Morrice, 1996). Other researchers have produced similar results. Mozumdar (1993) obtained production rates ranging from 6.2 to 7.1 kg per decimal (1560 – 1770 kg per ha) for a six months polyculture trial. Akhtaruzzaman, (1994) obtained yields of 6.0 to 8.0 kg per decimal six months 1500 – 2000 kg per hactare per six months for monoculture of silver barb. Differences of before and after training of fishery villages were 6.10, 4.97 kg per decimal, 5.33 kg per decimal, 5.63 kg per decimal, 5.02 kg per decimal, 6.55 kg per decimal. These differences indicate a strongly positive relationship between production rate and adoption of training messages. The observed phenomenon can be explained in this way, adoption of training messages helps the farmers to achieve higher production of fish. The incremental rate of the fishery villages were 149.14%, 89.55%, 114.62%, 103.49%, 99.01%, 132.06% percent.

Table –18: Difference between pre training and post training production rate

Village	Fish production rate before training (Kg/decimal)	Fish production rate after training (Kg/decimal)	Differences (Kg/decimal)	Increment rate (%)
Manikchaper	4.09	10.19	6.10	149.14
Washin	5.55	10.52	4.97	89.55
Shorafpur (north)	4.65	9.98	5.33	114.62
Shorafpur (west)	5.44	11.07	5.63	103.49
Chandpur	5.07	10.09	5.02	99.01
Goalgram	4.96	11.51	6.55	132.06

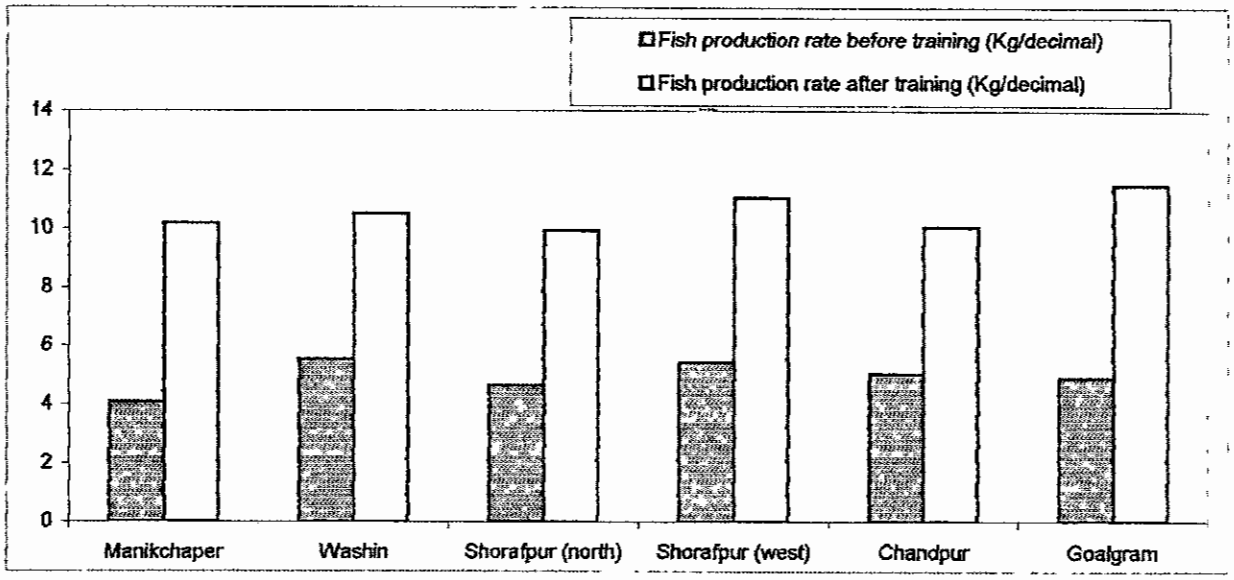

Figure – 10: Fish production rate before and after training

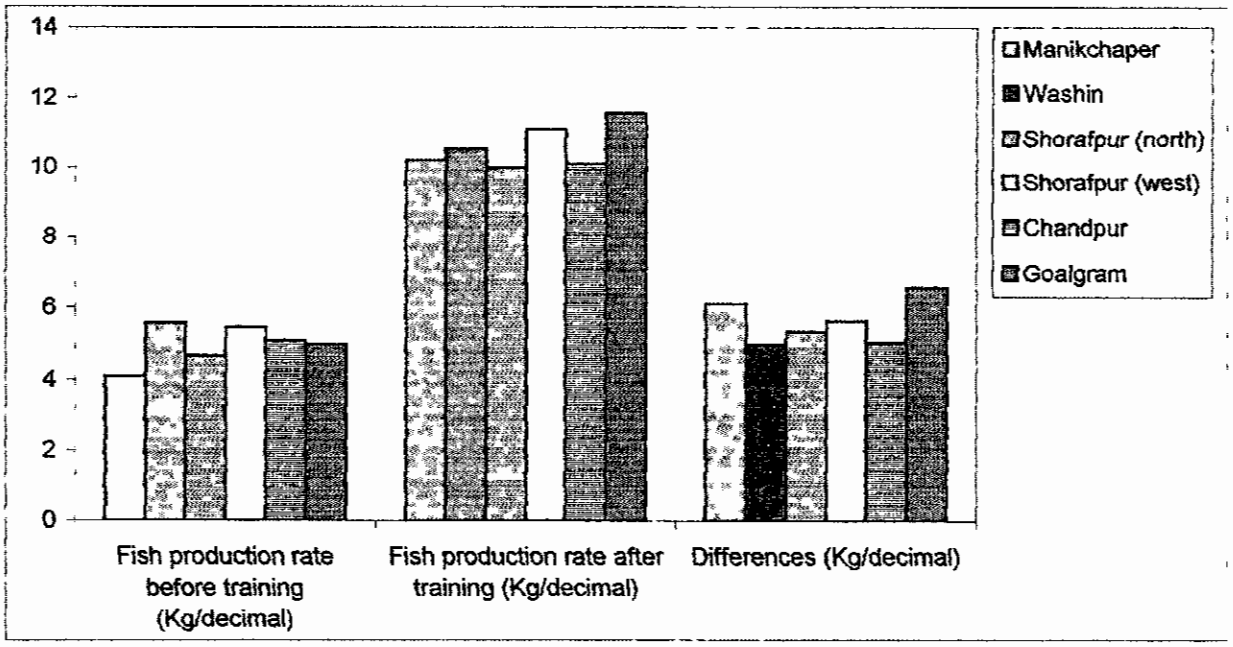

Figure – 11: Differences with pre training and post training production rate

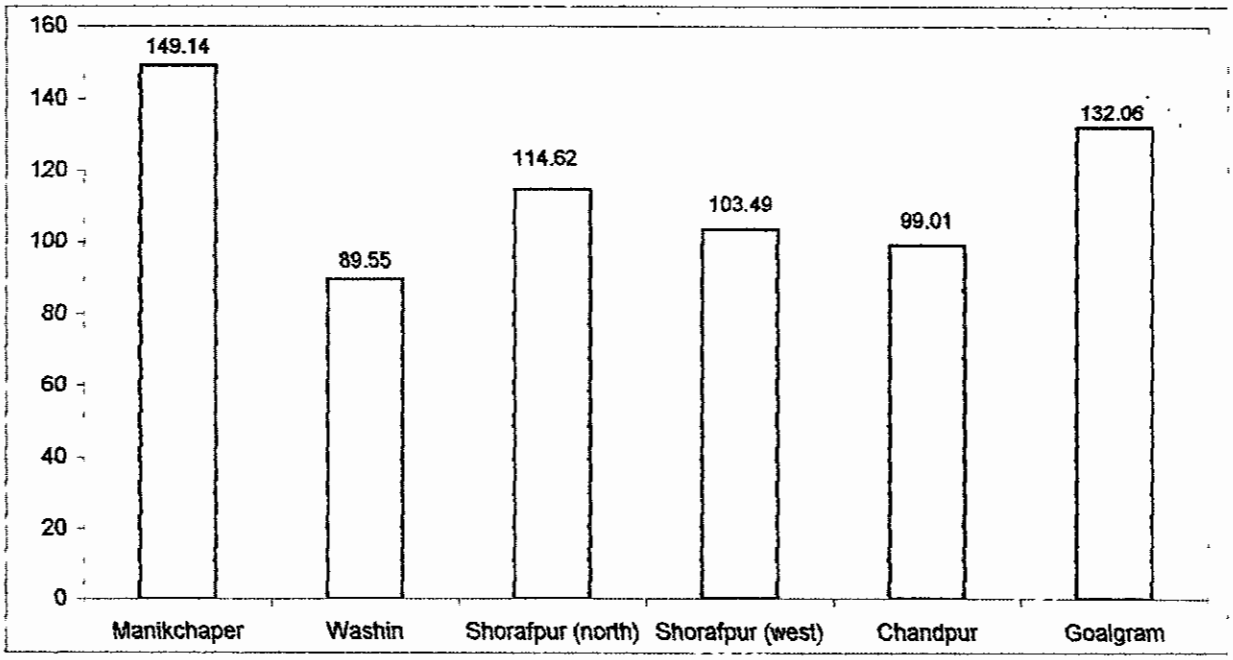

Figure – 12: Increment rate of the fish production

Chapter 5

SUMMARY AND CONCLUSION

5.0 SUMMARY AND CONCLUSION

Fishery village program (FVP) extension approach has made a significant improvement on pond culture techniques in fishery villages of Manikchaper, Washin, Shorafpur (north), Shorafpur (west), Chandpur and Goalgram. The fishery village program targets 25 interested pond owners in a village and all receiving training and technical support whether rich or poor pond owners currently involve in the fishery village program of Tarash Upazilla under Serajgonj ditrict and benefiting directly from the project. The study was cariie4d out for the period of 16 months from March'2001 to June'2002.

An investigation on the socio-economic profile, the degree of adoption of training messages, assessment of fish production after receiving training in small scale aquaculture were conducted. Socio-economic profiles of the selected farmers were presented in terms of age structure, household size, educational level, annual household cash income and status of previous training on management of small-scale aquaculture. Among the fishery villages, the age group of less than or equal to 25 years found to be the highest. The largest household size was found to vary between 5 to 7 persons. The principal occupation of the most farmers was agriculture. Farmers of fishery village had the maximum size of greater than 20 to 50 decimal aquaculture resource (pond). Annual household cash income of farmers were observed to vary between taka15, 001 to 20,000. Before training and extension program the base line production of fishery villages of Manikchaper, Washin, Shorafpur (north), Shorafpur (west), Chandpur and Goalgram were 4.09 Kg/decimal, 5.55 Kg/decimal, 4.65 Kg/decimal, 5.44 Kg/decimal, 5.07 Kg/decimal and 4.96 Kg/decimal respectively. After extension and training program the production has increased to 10.19 Kg/decimal, 10.52 Kg/decimal, 9.98 Kg/decimal, 11.07 Kg/decimal, 10.09 Kg/decimal and 11.51 Kg/decimal respectively. The highest fish production has increased to 149.14% in the fishery village of Manikchaper.

The maximum portions of fish farmers were available whose annual cash income was 10,001 to 30,000 taka in case of every village. The maximum number of fish farmers of every villages had the pond covering greater than 20 to 50 decimal followed by the pond size of greater than 10 to 20 decimals.

Among the selected fish farmers of Manikchaper village, 69.33 percent farmers fully adopted that was followed by the 17.33 % farmers adopted partially whereas only 13.33 percent fish farmers with not adoption on an overall adoption parameter message basis. In case of Washin village, the highest (68.33 %) farmers were fully adopted, 18.33 percent were partially adopted whereas only 13.33 percent with not adoption. On the other hand, 70.33 percent the fish farmers of Shorafpur (north) village with fully adopted that is followed by the 14.33 % with partial adoption whereas, 15.33 percent never responded. In case of farmers of Shorafpur village, highest (70.33 %) adopted fully whereas 17.33 % and 12.33 % with partial adoption and not adoption respectively. 67 percent of the farmers of Chandpur village adopted fully of the adoption parameters whereas 16.67 % and 16.33 % with partial adoption and not adoption respectively. The highest adoption percentage of the study area (among six villages) was 74.67 % done by the farmers of the Goalgram village whereas 14 % and only 11.33 % with partial adoption and not adoption respectively.

Adoption index between selected training perform indicators (training messages) is shown in the table 14. It was found that adoption indicators such as embankment preparation, liming, fertilization, supplementary feeding were depends on the economic conditions of the fish farmers. On the other hand, species selection, removal of weed, removal of predatory fish, density of species measurement, hazard management was depended on aquaculture knowledge of farmers.

The highest group of farmers (92 %) of Goalgram village had the fish production rate before training was greater than 8 kg per decimal.

The production rate of fish was recorded from selected farmers after the adoption of training messages. Among the selected fish farmers, the highest (ranges varies from 20 to 23) farmers fish production was greater than 8 kg per decimal that is followed by the fish production after training varies from greater than 5 to 8 kg per decimal was ranges from 0 to 3 fish farmers.

The fishery village program (FVP) of fourth fisheries project (FFP) community based approach to aquaculture training and extension has the following district advantages.

- It maximizes utilization of local resources and knowledge by limited numbers of extension staff in a short project of time.
- It enables farmers to formulate programs and eventually to assist in the implantation among the farmers.
- It creates an air of friendly competition among the farmers.
- The community approach provides moral support and gives farmer the confidence to try out new ideas.
- This method allows a high degree of flexibility and can be modified as required if difficulties arise.
- Sharing can reduce the cost and labor for some activities including netting and draining ponds and transportation of fingerlings.
- It creates a strong sense of community spirit, self help and empathy among neighbors and loss of fish by poaching is reduced.
- The pond owners club can influence local market prices and has more bargaining power when buying greater amounts of inputs, than as individuals.

Based on the findings of the study, the following steps may be undertaken to increase fish production in small-scale aquaculture:

- Special institutional credit system can be provided with convenient terms.
- Social awareness should be created in the respective community for changing the social norms that are prejudiced against women.
- Training should be given in appropriate time of the year.
- Inputs support should be supplied to the selected fish farmers in the fishery villages.
- Training should be provided with earning members through group approach.

Chapter 6

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APPENDIX

Appendix – 1

Socio-economic profile collection format
Division _____ District _____ Upazila_____ Village _____

Farmer no.	Farm-ers Name	Father/ husbands name	Sex M/ F	Age (Yr)	HH size (No.)	Occupation (Code)	Education (Code)	Annual cash income (Tk.) Code	Crop land Code	Total pond nos.	Water area of pond (decimal)	Previous training (Y/N)

Appendix –2

Assessment format of message adoption

Technologies/ Training messages	Fully apply training message (Nos.)	Partially Apply training message (Nos.)	Not Apply training message (Nos.)	Not applicable (Nos.)
1. Dyke repairing				
2. Removal of weed				
3. Removal of predatory fish				
4. Liming				
5. Pre stocking fertilization				
6. Species selection				
7. Density of species				
8. Post stocking fertilization				
9. Supplementary feeding				
10 Partial harvesting				
11. Restocking				
12. Hazards management				

Appendix – 3

Production rate assessment format

Sl. No.	Farmer's name	Father/husband name	Sex (M/F)	Pond area (decimal)	Production after training (Kg/decimal)
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					