

Women in Carp Pond Cultivation

A case of BRAC¹

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1. ¹ *The paper presented in 'Women Farmers Conference' organized by Centre for Development Research (ZEF, Bonn, Germany), in collaboration with Tufts University (Boston, USA) and the University of Hohenheim (Stuttgart, Germany during 26-27th August 1999.*

ABSTRACT

This is a case study on 106 female fishermen who made success in increasing their household income with the help of BRAC provided services. Fish cultivation was found to be highly correlated with many factors such as types of soil in the ponds, ownership of ponds, their size and position, farmers' occupation, education, marital status, their skill on fish cultivation and the intensity of labour to be employed in the activities. In majority cases their involvement in the given activity increased household income which helped further expansion of the business, in reducing their dependency on their male income earners, and finally it helped increase household's fish consumption. The cost of BRAC provided services was Tk. 335.75 against Tk. 201.45 charged by BRAC. The net income earned by each member-farmer was 56.6 times higher than those of the additional amount spent by BRAC per member-farmer. To make the programme cost-effective it should involve the marginal farmers and give them training on the use of advanced technology. The existing loan repayment system may be changed. A major amount may be collected at the time of harvesting. It will help reduce the pressure on farmers. Thus, they will be able to spend higher proportion of loan for fish cultivation. Demonstration ponds may be introduced. The number of field staff may be increased for better service delivery and to reduce existing workload.

- although soil type does not always matter for mixed fish cultivation, the sandy loam, clay-loam and loam soil are considered to be better suited for it.

Carp polyculture is also done in derelict ponds. BRAC leases in derelict ponds from their owners for a maximum period of 10 years, re-excavates them and then, leases it out to its VO members. Lease value per decimal of pond depends on the cost of re-excavation. Money charged for leasing out the ponds is deposited in the VO account of those members who lease in the ponds and use them for the maintenance of ponds. BRAC selects those members for fish cultivation who are very keen to do it, own ponds or can lease them, preferably have previous experiences and willing to participate in BRAC fisheries training session. Farmers and ponds selection are done in February-March. Selected farmers are given training any time during March-May. The preparation of ponds and stocking of fingerlings are done in April-June. Fish is harvested during August-June.

In each decimal of pond around 34 fingerlings of different carp species are released consisting of 10-12 silver carp, 4-6 katla, 6-7 rui, 5-7 mrigal, 2 mirror carp and 2-3 grass carp. A member-farmer receives Tk 175-200 as loan per decimal of water body from BRAC which covers all the cost of production including the lease value (RDP Operation Manual, 1995).

OBJECTIVES AND METHODOLOGY

The objective of this study was to measure the cost-effectiveness of carp pond cultivation from the farmers as well as BRAC's point of view.

The specific objectives were

to find out factors contributing to the profitability of the given enterprise;

to know farmers' perception on the types of services received from BRAC and their usefulness; and

to show the non monetary benefits if any gained through their involvement.

For this study Jessore, Jhinaidah and Kushtia regions, less affected by flood '98 were initially selected. Three RDP area offices (AO) from each region and twelve programme participants (member-farmers) from each AO were randomly selected for interview. In June-July 1998 a household survey were conducted on a total of 106 member-farmers.

FINDINGS

Household and individual characteristics of farmers: Average household size of member-farmers involved in carp polyculture was found to be 5.5, of them 2.3 persons were income earners. Number of dependents per working member was 1.9. Among farmers 3.8% did not own any land, 37.7% had up to 50 decimals, 28.3% owned above 50 decimals but less than 1.5 acres, 30.2% were with more than 1.5 acres. Distribution of member-farmers by their household land size indicates that more marginal farmers were involved in carp polyculture. Mean age of females involved in fish polyculture was 36 years (Table 1.1).

Types of enterprises: Among member-farmers 57.5% were involved in fish cultivation independently and 32.2% of members cultivated in partnership with another BRAC member. The rest joined with two and more BRAC members. Maximum number of partners in a pond was found to be seven (Table 1). Among member-farmers 70.8% used their own pond, the rest leased it in.

Table 1. Household characteristics of farmers

Indicators	Mean	Median	Std Dev.	Min.	Max.
Average hh size (No)	5.5	5.0	2.2	2	14
No of income earner	2.3	2.0	1.4	1	9
Hh homestead land (dec.)	21	15	18	0	100
Total hh land (dec.)	148	76	198	0	1,021
No of RDP members involved per pond	1.7	1.0	1.1	1	7

Extent of employment: Average length of members' involvement in this activity was 5.8 years. It varies from 2 to 30 years. Twenty eight percent of the members were involved in fish cultivation previously but did it in a traditional way. After becoming members of BRAC they received formal training on fish cultivation and got monetary and other technical supports from BRAC which helped them in increasing their income level. Number of involvement of member-farmers in household and other activities increased after starting fish cultivation. All the work related to fish cultivation were found to be done by 8.5% of members themselves. In 51% cases the member with the help of another household member did those. In addition to member-farmers themselves involvement of other two or more household members were found in 40.5% cases. Seventy three percent of members stated that their husbands were also involved in the process of fish cultivation. In 33% cases children also participated in it. On an average 7.4 persons were found to be involved in the process of fish cultivation per acre of pond. Since this activity does not require full time involvement of a person except care taking they can carry out this function without affecting other activities. Usually full time care taking is done only if the pond is big in size and far from the place of residence (Table 2).

Table 2. Individual characteristics of members involved in fish polyculture

Indicators	Mean	Median	Std Dev.	Min.	Max.
Age of members (years)	36	35	9	20	70
Length of fish rearing (yr.)	5.8	4.0	5.2	2	30
No of activities carried out before started rearing	1.8	2.0	0.9	1	4
Average pond size (dec.)	68.5	49	85.8	10	500
No of activities carried out after rearing started	2	2.0	0.8	1	4

Profitability of carp polyculture: Table 3 describes the average costs and returns on the carp enterprises used during the last year preceding the date of interview. Average recurrent cost of fish cultivation in 68.5 decimals of pond was found to be Tk 13,763 which included price of fingerlings, lease value of pond if it is leased out, cost of pond

preparation and hired labour, cost of feed, service charge paid to BRAC (Tk 5 per decimal) and other miscellaneous costs. Price of fingerlings constituted about 39% of the total cost. Cost of feed and lease value of ponds were the next important cost items which with price of fingerlings comprised 82% of the total costs.

Gross income included income from sale of big and small fish, value of fish consumed in the household, value of fish given to others as gift and sale of fruits and vegetables cultivated at the bank of ponds. Around 89% of the total income came from sale of fish. It is also important to note that a significant proportion of fish consumed at home (7.7%) helps the grower to meet their own household needs which might not have been possible if they had to purchase it from the market. The mean gross income was found as Tk 25,589. It was higher for enterprises which started before BRAC's programme due to their larger pond size (Table 4). Although cost per decimal of pond is higher for the newly started enterprises, return per decimal in terms of revenue and profit was also significantly higher for them. The rate of return on investment was also higher for the newly started enterprises which influenced their total profit margin (Tk 9,633 and Tk 12,690 respectively for that enterprises started before and after BRAC programme intervention). The per member profit margin would be Tk 5,666 and Tk 7,738 respectively for enterprises that started before and after BRAC programme intervention if considered the number of members involved per pond.

In spite of a relatively high income earned by each enterprise it is also important to mention that the enterprises which started before BRAC programme had increased their gross income by Tk 5,738 from Tk 17,073 to Tk 23,073 with BRAC support although their pond size reduced from 160 to 100 decimals. Average net changes in income due to BRAC for the pre-BRAC enterprises was Tk 5,731 which is calculated by subtracting 65.8% as cost of production from both pre-BRAC and post-BRAC mean income. This 65.8% is taken on the basis of cost-revenue ratio of the last year's production. For the newly started enterprises it was Tk. 8,316. This amount is

calculated by deducting 48% from the average income of Tk 15,992 since joining BRAC programme. The 48% was taken as cost of production and estimated on the basis of their cost of production for the year preceding the interview. The average changes in income for all enterprises irrespective of their length of involvement due to BRAC intervention was found to be Tk 7,584, i.e. 4,569 per member-farmer.

Table 3. Cost benefit analysis of carp polyculture

Cost items	Value (Tk)	% to total	Revenue items	Value (Tk)	% to total
Price of fingerlings	5,332	38.7	Sale of big fish	16,481	64.4
Pond preparation	1,502	10.9	Sale of fingerlings	6,254	24.4
Feed	3,106	22.6	Household internal consumption	1,975	7.7
Lease value	2,894	21.0	Sale of other products*	571	2.2
Labour	363	2.6	Others	308	1.2
Service charge	342	2.5			
Others	224	1.6			
Total cost	13,763	100	Gross revenue	25,589	100

* Include fruits and vegetables grown on pond bank

Among sample enterprises only 7.5% did not make any profit. But 82% of the respondents including all farmers who incurred loss stated that they might get more income than they had received. Among reasons insufficient feeding due to shortage of liquid money in hand was stated by 29% of the respondents. Among other responses improper care due to lack of knowledge (10.3%), death of fish for overdose of chemical fertilizer used (9.1%), theft of fish (6.9%), improper selection of harvesting time when market price was low (10.3%) and 'others' including low water level, water overflow due to continuous raining, small size of the pond, small size of fish, lower price in the market and higher lease value were mentioned (Table 5).

Table 4. Mean differences of major indicators of farmers with and without pre-BRAC experiences

Indicators	Farmers with pre-BRAC experiences n = 30	New farmers n = 76	Total n = 106
Age of member-farmers (years)	35.3	36.0	35.8
Household land (decimals)	204	125	147
Number of VO members involved per pond	1.70	1.64	1.66
Average length of involvement (months)	11.1	3.7	5.8
Average loan size (Tk)	5,333	6,831	6,411
Total accounting cost of rearing (Tk)	18,512	11,890	13,764
Gross revenue (Tk)	28,145	24,580	25,589
Profit (Tk)	9,633	12,690	11,825
Profit per decimal pond (Tk)	236	298	280
Profit per RDP VO member involved (Tk)	5,666	7,738	7,123
Pond size (decimals)	100	56	68
Cost per decimal (Tk)	162	188	180
Revenue per decimal (Tk)	398	485	460
Revenue-capital ratio (Tk)	2.85	3.05	2.99
Profit-capital ratio (Tk)	1.85	2.05	1.99
Mean income before joining BRAC (Tk)	17,335	-	4,906
Mean income after joining BRAC (Tk)	23,073	15,992	17,996
Changes in gross income due to BRAC (Tk)	5,738	15,992	13,090
Changes in net income due to BRAC* (Tk)	5731	8,316	7,584
Changes in net income per member due to BRAC (Tk)	3,371	5,071	4,569

* it is calculated by using the following formula:

$$\Delta Y = \frac{\bar{Y}_t - \bar{C}_t}{\bar{Y}_{t-1} - \bar{C}_t}$$

Where,

ΔY - net changes in income

\bar{Y}_t - Mean income after joining BRAC

\bar{Y}_{t-1} - Mean income before joining BRAC

\bar{C}_t - Cost ratio of last year income

Among those who reported that insufficient feeding due to shortage of liquid money in hand, farmers with pre-BRAC experiences were proportionately higher. Although farmers with pre-BRAC experiences were relatively better-off in owning more land, they also received significantly lower amount of BRAC loan considering the water body used for carp polyculture. It is likely that the newer farmers who borrowed two times more amount per decimal of water body than the older farmers with previous experiences were able to spend more for feeding and other purposes. The older farmers had also taken relatively less care than the new farmers on fish cultivation. All of these together with relatively higher proportion of responses on low water level of their ponds used for fish cultivation influenced their net return.

Table 5. Reasons for low income

Sl N o	Reasons	Farmers with previous experiences n = 23	New farmers 64	Total n = 87
1	Feed shortage	52.2	20.3	28.7
2	Improper care	4.3	12.5	10.3
3	Death of fish	4.3	9.4	8.0
4	Theft of fish	4.3	7.8	6.9
5	Low water level	13.0	6.3	8.0
6	Improper time of harvesting	8.7	10.9	10.3
7	Others	13.0	32.8	27.6
	Total	100	100	100

Note: Others include water overflow due to continuous raining, small size of pond, small size of fish, lower price in the market, higher lease value, etc.

Factors contributing to the profitability: Results of bivariate analysis of major factors which were responsible in the variation of profit earned per decimal of pond are presented in Tables 1.6 and 1.7. According to the tables types of soil, ownership of ponds,

Table 6. Factors contributing to the profitability of carp polyculture

Variables	% to total n = 106	Profit per decimal
Type of soil		
sandy	4.7	451
sandy loam	31.1	227
loam	29.2	209
clay	9.4	256
clay loam	25.5	404
Sun light transmitted		
yes	95.3	285
No	4.7	188
Ownership of ponds		
Self	70.8	317
Leased	29.2	190
Pond size (dec.)		
1-20	21.7	598
21-30	16.0	258
31-50	34.0	197
> 50	28.3	149
Pr-BRAC experiences		
yes	28.3	236
no	71.7	297
No of present activities carried out was		
more than previous	23.6	230
equal to previous	71.7	289
less than previous	4.7	393
Educational status of members		
Illiterate	42.5	250
1-5 class	31.1	308
> 5 class	26.4	295
Marital status of members		
Married	91.5	273
Unmarried/divorced/separated	8.5	353
Members' main occupation		
Fish cultivation	23.6	375
Household work	59.4	235
Agriculture	3.8	167
Others	13.2	345
Decisions were made by the influence of		
BRAC	66.0	293
Husband	24.5	261
Others	9.4	242

their size and position, farmers' occupation, education, marital status, farmers' skill on fish cultivation and household workload of member-farmers - all of these made significant contribution to the profitability. Those who used their own ponds made more profit because they did not have to pay the extra amount for its lease. Although

the total amount of profit was higher for ponds with bigger size the rate was higher for the smallest ones. It might be because feed shortage, which was found as the major reason for lower income, was proportionately less in the smaller size ponds compared to the bigger ones. The unmarried, divorced or separated women farmers earned more profit than the currently married ones. Results also show literacy but not qualification might have some influence on the output. Members with fish farming occupation gained more than others. Those members who concentrated mainly on fish cultivation by reducing their total number of involvement also gained more. Positive results regarding BRAC influences also show higher profit of member-farmers who decided to be involved in the activity after joining BRAC and did it with the help of BRAC. Results of multivariate analysis support findings of bivariate ones in terms of pond size and its ownership, marital status of member-farmers, their education level and skill on fish farming. Households with higher dependency had to spend more on household consumption, which could not permit them to invest more on fish farming. The household dependency negatively influenced in the output of fish cultivation. For those who received proportionately higher amount of BRAC credit per decimal results were found significantly positive. Results of standardized beta coefficient indicate that the probable contribution of loan amount in the profit earned per decimal of pond is 50%.

Non monetary benefits: On the question about the benefits they gained from this project 88% of the member-farmers mentioned that first of all their involvement in fish polyculture increased their household income although 97% of the respondents reported that it contributed positively to increase their household income. Seventy two percent also gained better knowledge about fish cultivation. It brings some sort of security in their future life as stated by 43.4% of them. Among other responses, exposure to outside world, direct interaction with market, purchase of household assets, generation of new employment, increase in savings, increase in household fish

consumption, resulting in raising protein intake and contribution to children education were mentionable (Table 8).

Table 7. Factors contributing to the profitability of carp polyculture: results of OLS analysis

Independent variables	Beta coefficient	Standardized beta	t value
Constant	52.09		0.45
Household dependency	-25.41	-0.12	-1.22
Educational level of members	9.34	0.09	1.07
Marital status of members (unmarried/divorced/separated = 1, else = 0)	33.81	0.03	0.33
Number of BRAC members cultivated jointly	-15.06	-0.07	-0.56
Pond size	-0.42	-0.02	-0.91
Ownership of ponds (self = 1, else = 0)	25.83	0.05	0.35
Members' main occupation (fish cultivation = 1, else = 0)	220.76	0.23	2.96
Amount of loan received per decimal	0.83	0.50	5.23
Multiple R	.60		
R Square	.36		
Adjusted R square	.31		
F statistics	6.13		

Table 8. Benefits gained by the farmers (perception of the growers)

Benefits	Responses of the participants						% responded
	1st	2nd	3rd	4th	5th	6th	
Increase hh income	86.8	8.5	1.9	-	-	-	97.2
Secured future life	0.9	17.9	15.1	8.5	0.9	-	43.4
Better knowledge about fish cultivation	4.7	36.8	22.6	6.6	0.9	-	71.7
Exposure to outside world	1.9	-	1.9	2.8	2.8	7.5	17.0
Direct interaction with market	-	9.4	13.2	4.7	7.5	1.9	36.8
Others	4.7	20.8	13.2	3.8	2.8	-	45.3

Note: others include asset increase, children education, generation of new employment

Use of income: Twenty six percent of the farmers first of all reinvested the amount they received in fish cultivation for the next production cycle, another 25% had given

second priority to this sector. On the whole in 71% cases part of this income went to the next year's fish cultivation. Eighty eight percent spent part of their income to meet the household consumption expenditure. Forty three percent used this money to satisfy members' own needs. It also contributed to satisfy needs of the children according to 40% respondents. Among other responses construction of living houses, purchase of land and other assets, debt servicing, health care and savings accumulation were important (Table 9).

Services provided by BRAC and members' perception: At the initiation of the programme in each area a pond survey is conducted by BRAC field staff to determine the scope and potentiality of the programme. Then it arranges training on fish cultivation for their members already selected. Other types of services offered by BRAC are: i) to help in pond and feed preparation and netting in the ponds, ii) to give orientation on feeding procedure, iii) to calculate the number of fingerlings of different size and variety suitable for the specific pond, iv) to help in receiving fingerlings and maintaining book keeping, v) to provide all kinds of technical support, vi) regular monitoring follow-up and vii) to provide suggestions on fish marketing.

Table 9. Use of income for different purposes on the priority needs

Purpose of use	Priority based use of income (%)						% responded
	1st	2nd	3rd	4th	5th	6th	
Reinvest in fish cultivation	25.5	24.5	13.2	6.6	0.9	-	70.8
Household consumption expenditure	30.2	35.8	11.3	5.7	2.8	-	85.8
Construction of living house	2.8	2.8	3.8	3.8	0.9	-	14.2
Purchase of land	7.5	1.9	-	0.9	-	-	10.4
Purchase of other assets	2.8	3.8	3.8	4.7	-	-	15.1
Satisfy own needs	3.8	3.8	14.2	15.1	3.8	1.6	42.5
Satisfy children needs	0.9	6.6	14.2	7.5	6.6	3.8	39.6
Supply of protein in the hh consumption	0.9	1.9	5.7	0.9	2.8	18.4	22.6
Others	23.6	14.2	11.3	2.8	1.9	1.9	55.7

Note: Others include debt servicing, health care, savings accumulation, etc.

Perceptions of member-farmers on the type of services received from BRAC and their usefulness are presented in Table 10. Although 28% of farmers had pre-BRAC experiences on carp cultivation, 90% of the respondents participated in BRAC organized formal training on carp polyculture. Ninety two percent also received technical advises. BRAC helped a significant proportion of farmers with supply of fingerlings, feed, medicine and in selling of fish. Ninety seven percent received credit from BRAC. Almost all the respondents mentioned that the amount they had received covered less than half of their total recurrent costs. Moreover, they could not spend the total borrowed amount to this activity. Part of it went for payment of weekly instalment since this activity requires some gestation period for receiving income. In addition to services related to fish cultivation, 82% also stated that they participated in BRAC organized awareness raising training. The new farmers received relatively more services than the older ones. Almost all the respondents who received any kind of services mentioned earlier stated that those were useful in the rearing process and in gaining additional knowledge.

Table 10. Types of BRAC provided services received by the member-farmers and their usefulness

Sl No	Types of services	% received			Usefulness of services n = 106
		Older farmers n=30	New farmers n=76	Total	
1	Fish cultivation training	73.6	96.1	89.6	100.0
2	Awareness raising training	73.3	85.5	82.1	100.0
3	Technical advice for fish cultivation	83.3	96.1	92.1	99.0
4	Inputs supply (fingerlings, feed, medicine)	13.3	26.3	22.6	100.0
5	Help in selling fish	20.0	35.5	31.1	100.0
6	Collection of fingerlings	13.3	35.5	29.2	100.0
7	Loan	93.3	97.4	96.4	84.3

Cost of BRAC and its effectiveness: In the process of implementation of the programme BRAC has to incur costs for member selection, skill training of selected members and their follow-up. For selection of one member one working day of a Programme Assistant (PA²) is spent. It means that one day's salary of PA including his/her transport and other allowance i.e. Tk 185 is spent for selection of a member for training. A member is given two-day orientation training after being selected. It is estimated that for one day orientation training Tk 50 is spent per member which includes salary of the PA trainer, cost of food and stationeries provided for training and rent value of venue used for training. The initial investment cost of BRAC for the development of a member as an entrepreneur is, therefore, Tk 285 including cost for member selection and two day orientation training. Since there is no provision for refreshers, this amount (Tk 285) is spent by BRAC for each of the member-farmers for his/her development as an entrepreneur. Training is a life long investment. If it is assumed that a member-farmer will use the knowledge gained through training for 20 years then the yearly cost of this training will be Tk 14.25. During the period of fish cultivation BRAC incurs other services costs against which farmers pay annually Tk 5 per decimal of water body to BRAC for the services they receive from BRAC. On an average each member cultivated 40.29 decimals of water body. Thus the total amount paid by a member in the last year was Tk 201.45. According to BRAC estimates this amount covers 60% of the total annual cost of the organization. This implies that for member selection, training and follow-up services BRAC spends Tk 8.33 per decimal water body or Tk 335.75 per member-farmer i.e. Tk 3.33 extra per decimal. The additional cost of BRAC over service charges received from each farmer was thus Tk 134.30 (Table 11). The net gain for a member-farmer due to BRAC was estimated at Tk 7,584 for the last year. This amount exceeds those additional costs of BRAC by 56.6 times. This result gives an indication that even if BRAC charges the total amount spent per member, the programme will be cost-effective and the member-farmers will continue their involvement in the activity.

²Recently re-designated as Programme Organizer (PO)

Table 11. Cost benefit analysis of BRAC provided services per member-farmer

Types of services	Total	Per year
Member selection	185.00	9.25
Training	100.00	5.00
Follow up services		321.50
Total cost		335.75
Service charges received	Tk 5 per decimal	201.45
Net gain/loss for BRAC		-134.30

Conclusions

Fish cultivation programme helps in increasing the income of participating households and, therefore, contributes positively to the gross national product of the country. Through re-excavation of derelict ponds and use of uncultivated water bodies for commercial fish cultivation the programme generates additional employment opportunities for the landless mainly women. This programme is very prospective in the sense that a vast area of water body is not yet used for commercial fish cultivation. Proper utilization of this water body will further increase country's GNP, increase protein intake of the people and, therefore, will reduce their nutritional deficiency. Involvement of the landless poor female will generate additional income and employment for them and reduce their dependency on their male counterparts. In this activity risk in the loss of capital invested is very low unless any natural calamities, mainly flood, hit the water body. That is why massive expansion of this programme is possible by which BRAC can receive a substantive amount through service charge. To make fish cultivation sustainable the following suggestions have been made by the field staff:

- involving marginal farmers who are not members of RDP VO to this activity. They will pay BRAC for the services BRAC will be providing them;
- providing training to VO members using advanced technology which will increase productivity;
- since there is some gestation gap between investment and income received it will be less burdensome for the member-farmers if the existing repayment system can be changed by collecting a major amount at harvest time which will reduce the

pressure for farmers and help them to spend a higher proportion of the loan amount for fish cultivation;

- introducing demonstration ponds which will make other farmers in the village interested to be involved in this activity;
- increasing the number of field staff in each AO for better service delivery which will reduce the existing workload per worker.

References

BRAC, Rural Development Programme (RDP), Phase III Report (1993-1995)

BRAC, RDP Operation Manual, January 1995, undated (*in Bangla*)