Financial Viability of Agroforestry under Participatory Approach in Bangladesh : The Case of Forest Department's First Logged Over Plots of Dinajpur *

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Abstract

The Community Forestry Project, undertaken in 1981 was the first government-initiated and large-scale participatory forestry management programme in Bangladesh. Under this project the participants were promised 50 percent share from the sales proceeds of final tree harvest in addition to 100 percent of all other benefits generated from agricultural crops, thinning materials and pruning. In 1993 five agroforestry plots, each having an area of 1.21 hectares of land were harvested at Madhyapara, Dinajpur. Although rotation was planned for a period of seven years trees were actually felled one year later. It has been the country's first logged-over area under participatory approach. Half of the sales proceeds was distributed to the participants. This example inspired both the participants and the Forest Department.

Financial viability of the system has been explained in terms of internal rate of return, benefit-cost ratio and present net worth under three situations, *viz.* a) financial viability of the whole system, b) financial gain of the participants, and c) financial gain of the Forest Department. While the system as a whole is found to be highly prospective, the results also show that the benefits generated to both the participants and the Forest Department are also much encouraging. A sensitivity analysis allowing probable variations in cost and benefits reveals no financial risk of the system under any criteria. Social impacts of the project and some problems have been pointed out.

সারসংক্ষেপ

১৯৮১ সালে গৃহীত 'কমিউনিটি ফরেষ্ট্রি প্রজেক্ট' ছিল বাংলাদেশে সরকার সূচিত প্রথম বড় আকারের সামাজিক বনায়ণ কর্মসূচী। এ প্রকল্পের আওতায় বনায়ণ কর্মে অংশগ্রহণকারীদেরকে প্রকল্প এলাকায় উৎপাদিত বিভিন্ন ফসল সম্পূর্ণভাবে ভোগ করার অধিকার প্রদান করা হয়েছিল এবং উৎপাদিত কাঠের বিক্রয়মূল্যেরও একটি নির্ধারিত অংশ (৫০%) দেয়ার অঙ্গীকার করা হয়েছিল। ১৯৯৩ সালে ৮ বৎসর আবর্তকাল শেষে মধ্যপাড়ায় ১.২১ হেক্টর আকারের পাঁচটি বরাদ্দকৃত কৃষিবন প্লট থেকে বৃক্ষ কর্তন করা হয়। সামাজিক বনায়ণের আওতায় এটাই

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ছিল দেশের সর্বপ্রথম বৃক্ষ আহরণের ঘটনা। কাঠ বিক্রয়লব্ধ টাকার অর্ধেকাংশ অংশগ্রহণকারীদেরকে বিতরণ করা হয়েছিল। এ উদাহরণ অংশগ্রহণকারী ও বন বিভাগ উভয়কেই দারুণভাবে অনুপ্রাণিত করেছে।

এ প্রবন্ধে তিনটি অর্থনৈতিক মানদণ্ডের ভিত্তিতে উপরোক্ত কর্মকাণ্ডের লাভালাভ বিশ্লেষণ করা হয়েছে। মানদণ্ডগুলো হল ঃ ক) 'ইন্টারনাল রেট অব রিটার্ণ' খ) বেনেফিট-কষ্ট অনুপাত ও গ) প্রেজেন্ট নেট ওয়ার্থ। বিশ্লেষণে যে তিনটি পরিস্থিতি বিবেচনা করা হয় সেগুলো হচ্ছে ঃ ক) অনুসৃত কৃষিবন পদ্ধতির সামগ্রিক লাভালাভ খ) অংশগ্রহণকারীদের লাভালাভ ও গ) বন বিভাগের লাভালাভ। দেখা যায় যে সম্পূর্ণ কৃষিবন পদ্ধতিটি এককভাবে শুধু লাভজনক নয়, তা আলাদাভাবে অংশগ্রহণকারী ও বন বিভাগ উভয়ের জন্যও লাভজনক। আয়-ব্যয়ের সম্ভাব্য পরিবর্তন বিশ্লেষণে সন্নিবেশিত করেও কোন পক্ষের অর্থনৈতিক ক্ষতির কোন ঝুঁকি পরিলক্ষিত হয় না। প্রবন্ধে প্রকল্পের অন্যান্য সামাজিক ফলাফল ও সমস্যা উল্লেখ করা হয়েছে।

Key words: Agrisilvicultural system, community forestry project, intercrop, internal rate of return, participatory approach

Introduction

Social forestry has recently emerged not only as an effective approach to afforestation in the denuded areas but also as a promising strategy of rural development in most of the South East Asian countries (Magno 1994). The Betagi-Pomra Community Forestry Project initiated in 1979-80 was the first systematic effort in this field in Bangladesh (Ministry of Agriculture 1987, Alim 1988, Rahman 1991). The Forest Department (FD), however, started massive social forestry programmes since 1982 under the Community Forestry Project financed by the Asian Development Bank (Chowdhury and Hossain 1988, Bhuiyan 1994). This Project (1982-87) covered seven greater districts of north-western Bangladesh and functioned within the framework of three distinct components *viz.*, agroforestry, woodlot plantation and strip plantation. The encroachers/landless/poor farmers were organized under various programmes through extending short-term tenurial provision, input assistance and technical supports. Under agroforestry component the participants were promised 50% share from the final tree harvest and 100% of all other benefits generated from agricultural crops, thinning materials and other products.

In Dinajpur Forest Division agroforestry plantation started since 1984-85 and during this year 6.05 hectares of such plantation were established at Madhyapara Sadar Beat involving five participants (Forest Department 1985). Initially the rotation was prescribed for seven years. But trees of this patch of plantation were sold through auction by the FD in 1993 because of delay made in the process of decision making. It has been the country's first logged over social forestry plantation area. Half of the sales proceeds was distributed to the participants as promised. The Madhyapara case has been a glaring example which has inspired the participants of Dinajpur and other districts. Previously the participants of various regions were in serious hesitation as to whether the FD would allow them the promised share from the final tree harvest. The volume of wood

produced in a small piece of land and handsome revenue generated has also inspired the FD officials. It has been an exemplary case which clearly shows that the participatory approach is better than the conventional approach.

The objective of this paper is mainly to analyze :

(a) Financial benefit enjoyed by the participants involved (Participant viewpoint),

(b) Rate of return earned by the FD from its investment (FD viewpoint), and

(c) Financial viability of the agroforestry module practiced (Social viewpoint).

Other impacts concerned with the above situations have been discussed. Some major problem are pointed out.

Methodology

A socio-economic survey was conducted, and data were collected from five participants (covering 100 percent population) as per designed questionnaire. The data were compiled and analyzed. Financial viability was expressed in terms of net present worth (NPW), benefit-cost ratio (B/C ratio) and internal rate of return (IRR). Official information was collected from the office records available at the Divisional Forest Office, Dinajpur and Madhyapara Forest Range Office. A discussion was held with the Range Officer in order to gather relevant qualitative information. A group discussion was also held involving three participants.

Agroforestry system practised

In the study area agrisilvicultural system was followed where rows of trees were planted in two lines leaving 9 meter alleys in between tree rows for growing agricultural crops. Tree spacing was 1.5m x 1.5 m. Mainly *Eucalyptus camaldulensis* and *Acacia mangium* were planted for a rotation of 7 years. Rice, sugercane, maiz, pulse, vegetables and sesame were mainly grown as intercrops. It was learnt from interview that crop production was hampered due to shade effect and root interventions from the third year. The size of each allotted plot was 1.21 hectares.

Input costs and benefits generated

The FD invested Tk. 3,000 (43 Tk.= 1US$) and Tk. 1,800 in each plot in the first and second year respectively for raising plantation. This amounts included costs of nursery, fertilizer and wages. In one of the five plots the FD planted pineapple in the alleys on experimental basis. The Department gave Tk. 600 to each of the remaining four participants in the first year to procure inputs for growing agricultural crops. For pineapple the FD invested Tk. 4,675 in the first year. In the third year this pineapple plot was auctioned to the allottee at Tk. 1,500. All other farm costs were incurred by the farmers themselves. Thus the total invesment made by the FD in the first year was Tk. 23,000 in the second year Tk. 9,000 and in the 9th year Tk. 5,000 (various unrecorded costs not realized through cash recovery of service payment) for all plots together. The financial returns accruing to the FD were Tk. 1,500 in the third year (pineapple auction) and Tk. 1,38,090 in the 9th year.

The farmers incurred required input costs in addition to FD assistance for growing intercrops in the first year. From the second year onward the farmers had to bear all the costs fully for growing agricultural crops. The total cost in the 1st, 2nd, 3rd, 4th, 5th, 6th and 9th year were Tk. 14,400,

Tk. 13,890, Tk. 23,800, Tk. 6,610, Tk. 690, Tk. 360 and Tk. 11,950 respectively. Labour contributed by the farmers themselves was priced at Tk. 30 per day.

Participants' benefits came from agricultural crops (100%), cyclone damaged trees (100%), wages paid by the FD in the 1st and 2nd year and sales proceeds of trees in the 9th year (50%). The total stream of participants' benefits from all the five plots together stood at Tk. 16,150, Tk. 12,750, Tk. 28,100, Tk. 24,500, Tk. 8,400, Tk. 2,225 and Tk. 1,44,690 in the 1st, 2nd, 3rd, 4th, 5th, 6th and 9th year respectively. Year-wise break-up of costs and benefits is presented in Annex. 1.

The total costs pertaining to whole agroforestry system practiced were obtained by adding the costs incurred by both the participants and the FD. The total benefits generated by the system were also estimated similarly.

Results and discussion

Financial analysis

A. Financial viability

All the benefits generated and costs incurred up to 9th year under 'only FD situation', 'only participants situation' and 'whole agroforestry system situation' have been presented in Table 1. The estimated NPW, B/C ratio and IRR have also been shown under each situation.

Table 1. Financial analysis of Madhyapara logged over agroforestry plots under participatory approach.

Year	Only FD situation		Only participants situation		Whole agroforestry system situation	
	Benefit	Cost	Benefit	Cost	Benefit	Cost
1		23000	16150	14400	16150	37400
2		9000	12750	13890	12750	22890
3	1500		28100	23800	29600	23800
4			24500	6610	24500	6610
5			8400	690	8400	690
6			2225	360	2225	360
7						
8						
9	138090	5000	144690	11950	291960	16950
Present worth at 15% rate of interest (PW)	42850	28227	102437	46348	145286	74575
NPW	14623		56089		70711	
B/ C ratio	1.43		2.21		1.95	
IRR	0.22		2.50		0.42	

The results show that even at 15% rate of interest NPW is positive under all the situations considered. This rate of interest is much high in case of an agroforestry project where land use efficiency, employment generation and environmental impacts are very significant. The B/C ratios under 'only FD situation', 'only participants situation' and 'whole agroforestry system situation' stand at 1.43, 2.21 and 1.95 respectively. All the three estimated B/C ratios are greater than 1. It implies that the agroforestry system applied is viable not only for the FD and the participants but the whole participatory module is also financially feasible. The IRR under the above three situations are 21%, 250% and 42% respectively. These rates of return are significant and much high compared to many agricultural projects. It is observed that the whole agroforestry system stands to be financially viable and this participatory system is also promising for both the FD and the participants under all financial criteria.

The sensitivity of the results was tested allowing a 10 percent increase in cost while keeping the benefits same and again allowing a 10 percent decrease in benefit while keeping the cost same. It is observed that the system still remains to be viable under all financial criteria and to both the participants and the FD. The results of sensitivity analysis is shown in Table 2.

Table 2. The sensitivity of financial indicators in respect of Forest Department's Madhyapara agroforestry farms.

Financial indicators	Only FD situation		Only participants situation		Whole agroforestry system situation	
	Benefit	Cost	Benefit	Cost	Benefit	Cost
a) Cost increase by 10%, benefits remaining same						
PW (at 15%)	40240	31049	102437	50983	145286	82032
NPW	9191		51454		63254	
B/C ratio	1.29		2.01		1.77	
IRR	0.19		1.80		0.36	
b) Reduction of benefit by 10%, costs remaining same						
PW (at 15%)	36216	28227	92193	46348	130758	74575
NPW	7989		45845		56183	
B/C ratio	1.28		1.99		1.75	
IRR	0.19		1.50		0.36	

Cashew plantations established at central Tamil Nadu, India under agroforestry conditions also showed comparable financial results giving B/C ratio of 1.65 and IRR of 40.83% (Sekar and Karunacharan 1994). At Pomra Community Forestry Project the IRR was 90% (Rahman 1987).

B. Other impacts

The participatory approach, apart from financial considerations, encompasses some other impacts as discussed below.

(a) Impact on the FD

i. The FD recovered the encroached forest lands and established its legal rights.

ii. The FD emerged as a development partner.

iii. The management costs of the FD reduced substantially, and there was no risk involved. The FD simply supervised the activities. Well stocked plantation was developed in the area where the FD could not be successful in raising plantation under the conventional approach. The FD did not require to employ its limited resource for protecting the plantation. The participants protected their own plantations. Given the meagre number of staff in the Forest Beat offices, the participatory approach appeared to be easier and successful.

(b) Impact on the participants

i. The participants got legal authority to use the FD land peacefully. Their income increased substantially with the receipt of 50 percent share of timber sales proceeds.

ii. The participants emerged as a dynamic social group.

iii. Employment opportunity was generated.

(c) Social impact

i. The participatory approach accelerated land use efficiency. Previously these lands were barren. The encroachers were unorganized and grew agricultural crops haphazardly. In Bangladesh there is population pressure on the one hand and scarcity of land resource on the other. Under this situation land should be intensively utilized for sustaining national development. The participatory approach rehabilitated both man and land together.

ii. The participatory system contributed towards environmental stability.

iii. Socially required agricultural crops were produced. It enhanced the supply situations in the local markets. Thus the system contributed towards price stability. Local people could consume more agricultural products leading to improvement in their quality of life. It is one of the major national development goals.

iv. The system also contributed towards social equity.

v. Successful resource management system was introduced and tested. The information would be useful to the planners and policy makers.

C. Problems

It was found that the extension service was not very strong. There was lack of credit facilities. The participants reported that the alleys were rather narrow and from the third year crop production was meagre due to shade effect and root intervention. The system was not fully participatory as in cases of nursery management, choice of species and other forestry related matters the FD

took decisions without discussing with the participants. Participants' decision making power was limited to agricultural crop production.

Conclusion

It is found that agroforestry under participatory approach is financially viable for both the FD and the participants. The system as a whole also stands to be feasible under all financial criteria. A sensitivity analysis allowing probable variations in costs and benefits reveals no financial risk of the system. The participatory approach contributes significantly towards land use efficiency, employment generation, environmental stability and social equity. Both man and land are rehabilitated together leading to a positive impact on the quality of rural life. The FD has established legal right to encroached land and emerged as a development partner. The participants turn up to be a dynamic social group. The Madhyapara case has been inspiring to both the participants and the FD. The participants have been distributed 50% share of sales proceeds realized from final tree harvest, while the FD also has earned handsome revenue from a small patch of plantation without involving itself in the tidious job of its protection. Agroforestry module has been tested and data generated will be useful to the planners and policy makers. The system was, however, confronted with centralized decision making process, poor extension service, lack of credit facility and shade effect. A more organized approach will need to be evolved in integration with the overall rural development process. With the provision of long-term tenurial security to the participants intensive land use can be ensured to generate sustainable flow of agroforestry products.

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Annex. 1. Cost-benefit trend of Forest Department's participatory agroforestry farms established in 1984 - 85 at Madhyapara.

Sl. No.	Name of the farmers	Cost Benefit (Tk.)	Year 1	2	3*	4+	5+	6+	7	8	9
1.	Osman Gani	Cost	5400	3850	1600	450	-	-	-	-	1800
		Benefit	6850	3200	-	3500	-	-	-	-	28655
2.	Samir Ali	Cost	6050	6450	5950	600	450	-	-	-	1800
		Benefit	6200	5750	8000	7000	4400	-	-	-	24320
3.	Nuru Mia	Cost	1800	2050	2050	1700	-	-	-	-	1800
		Benefit	1400	3300	4600	4000	-	-	-	-	26505
4.	A. Majid Kabir	Cost	1150	1540	1600	360	240	-	-	-	4750
		Benefit	1700	500	5500	6000	4000	-	-	-	31440
5.	Md. Mansur Ali	Cost	-	-	12600	3500	-	260	-	-	1800
		Benefit	-	-	10000	4000	-	2225	-	-	33770
Total		Cost	14400	13890	23800	6610	690	360	-	-	11950
		Benefit	16150	12750	28100	24500	8400	2225	-	-	144690

* Thinning took place in the third year. Participants mentioned against Sl. Nos.2, 3, 4 earned Tk. 3,500, Tk. 2,500 & Tk. 5,500 respectively from thinning. There was no thinning in the first & 5th plot.

\+ Agricultural crops could not be grown after the third year. The benefits of the 4th year were generated from the sale of hurricane-broken trees, while those of the 5th and 6th year came from pruning.

Note : Own labour was priced at the rate of Tk. 30 per day