

## CHAPTER 5

### An Impact Analysis Based On Micro Studies

One important question related to the problem of social forestry is whether the benefits from this institutional modification would substantially exceed the costs. The answer could be found by using the technique of social Cost-Benefit analysis. This chapter attempts to make this exercise.

#### 5.1

It has been stated in an earlier section that the Social Forestry wing of the Forest Department, Government of West Bengal (GOWB) has achieved its main objectives and generated significant positive impact. Here we shall examine these claims based on some in-depth micro level studies. We shall particularly attempt to see whether the Social Forestry schemes have been able to garner net social benefits. If so how and why. We shall also try to explore the implications of our findings for appropriate institutions for sustainable forest resources.

If distributive gains are important to society, then the society could well attach a higher importance to consumption increment of poorer individuals. This concept, as in Little-Mirrless (LM) System (Little and Mirrless, 1974) can be developed into a comprehensive system of social cost-benefit analysis<sup>1</sup>.

The specific form of the social weighting functions proposed is:

$$d = MU_1 / MU_2 = (C_1)^n / (C_2)^n = (C_1 / C_2)^n$$

where the relative weight,  $d$ , of incremental consumption at income levels  $C_1$  and  $C_2$  (represented by the ratio of marginal utility to society of a rupees's consumption increment at the respective income levels) is the relative income level  $C_1 / C_2$ , raised to some power  $n$ , which would be negative in the above formulation. Sometimes,  $n$  is considered to take a positive value and in this case the index is negative,  $d = (C_1 / C_2)^{-n}$ . The implication is that marginal utility of consumption

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1. The following discussions draws mainly from Kumar (1992)

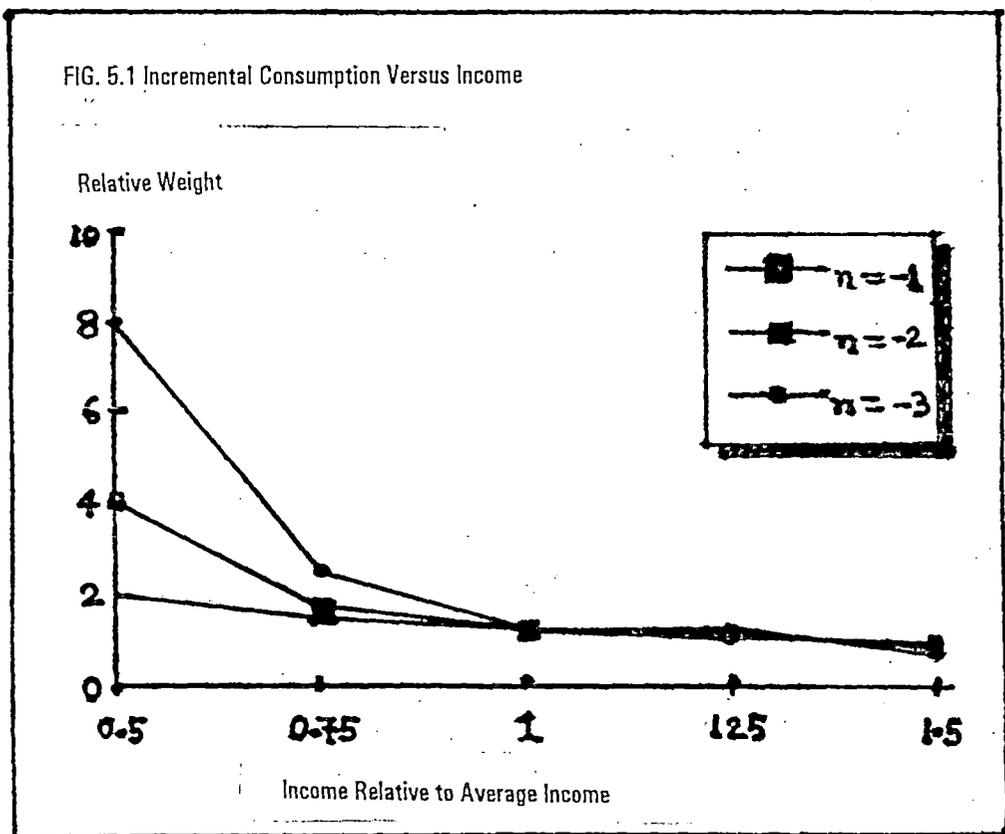
is related to income level by  $MU=C^n$ . Thus, the higher the income level, the lower is the relative social weightage attributed to consumption increments accruing to individuals at that income level, provided the absolute value of  $n$  is greater than 1. The parameter,  $n$ , is also termed the elasticity of marginal social utility of consumption:

$$\begin{aligned} & \text{Elasticity of marginal social utility of consumption} \\ & = \text{relative change in marginal utility/relative change in consumption} \\ & = \frac{dMU/MU}{dc/c} = \frac{-nc^{n-1} dc/c}{dc/c} = n \end{aligned}$$

If  $n$  is highly negative, say -3, the relative value of incremental consumption falls very steeply as income rises (shown in Fig-5.1). If  $n$  is less negative, say -1, the fall is less steep. In  $n=0$ , society values consumption increments equally whatever the income level of the consumer. A highly negative  $n$  is, therefore synonymous with high concern for redistribution. When applied to Government investment, it is expected that projects whose benefits flow directly to the poorer sections will be favoured, even if not economically efficient in the neoclassical sense. Since my study is mainly related to a target population -disadvantaged and poorer sections of village population, I opt for not bringing the issue of distributional weights in my Cost-Benefit exercise.

Principally, it is the discount rate that arbitrates between time intervals. To a private individual every use of investible funds has an opportunity costs either in the form of returns (financial) that could have been obtained from alternative uses or from simply investing them at the market rate of interest. For the society as a whole, the cost of using available investment funds in a particular project is the marginal rate of return. One needs to assume that such resources have been invested efficiently in the past. In the case of high return uses, the opportunity costs and hence the discount rate would be high. If this high rate were applied in a cost-benefit analysis (CBA) of all alternative uses, the neoclassical optimal use of investible resources would be attained. Conversely, the amount of investment and number of projects would be determined by the marginal discount rate applied.

FIG. 5.1 Incremental Consumption Versus Income



## 5.2

To make it operational, here I use the term "Social forestry" as the forestry which is undertaken "by" and "with" the people on common lands of villages or government (public) lands earmarked for the purpose. Here I hypothesise and try to prove on the basis of selected projects that social forestry is both economically and financially viable. So is also the case with the farm forestry on private holdings. To prove this I follow the traditional cost-benefit analysis which is part economics, part accounting and part good old-fashioned detective work (Nadkarni et.al., 1992)..

A social forestry project generate both direct and indirect benefits. But under the present socio-economic structure of our rural economy, indirect benefits are quite irrelevant in the sense that people do not bother much about it and they are mostly concerned about what they will be or are getting directly from the projects. Thus in the revenue side of benefits I consider only the direct benefits which they received from the projects. In this sense I under-estimate the benefits. The returns from social forestry projects may not always be in terms of direct pecuniary profits as in case of farm forestry but may also be returns in Kind, in the form of goods of local uses. I consider both cash and imputed monetary value of kind.

The direct benefits are in terms of green leaves harvested or expected to be collected for manufacturing disposable leafy plates etc., dry leaves or side branches harvested or expected to be gathered for fuel, fruits or seeds harvested or expected to be harvested, poles harvested or expected to be harvested, volume of timber expected from the mature trees etc. irrespective of whether they are sold or given free. The other questions of economic significance like optimum density, optimum life span of cutting down trees for timber etc, have been ignored here. The expenditures on preparation of soil, on manure, recurring expenditures on preparation of soil, on manure, recurring expenditure on watch and ward, opportunity cost incurred interms of grazing foregone etc. have been included. However, costs incurred on Government staffs in terms of their salaries or transport which are attributable to the projects have been excluded here. It is very difficult to

calculate the actual costs incurred on the staffs on a particular project as data are not available and as they have to look after the initiation of several projects and several works at different locations at a time. It will not under estimate the cost as I include additionally maintenance charge for watch and ward (actually incurred) even though there is no such official provision for these in actual practice.

In economic evaluation of projects, problems arise due to factors like time preference and inflation. Nadkarni et. al. (1992) resolve this problem by expressing the flows of benefits and costs in terms of constant prices, a reasonable rate of discount in real terms which is taken as the difference between average rates of interest on institutional lending and average rate of inflation in India during the last five years or so. It is claimed that this rate of discount is indicative of social time preference, netted for inflation and other factors like risk of default, social policy of discouraging investment in certain directions and so on. On the basis of such considerations I take a kind of judgemental discount rate as 4 percent and 6 percent. These are not actually derived since institutional lending rates vary widely in a given period of time. For sensitivity analysis, I evaluate benefits at variable rates of discount since future is uncertain and the risk premium for future uncertainty can increase with increasing horizon of time span even in real terms. I have used variable rates of discount, the rates being 4 percent for the first 10 years, 6 percent for the next 10 years and 9 percent for the remaining years beyond 20.

Pricing is also a great problem in economic evaluation of a social forestry project. Usually, Shadow prices are used to reflect real scarcity instead of market prices. Following Nadkarni et. al (1992) I use 1993-94 market prices prevailing in the villages concerned which the farmers either got or expected to get by selling their own timber, or other bio-mass, or where such prices are not available, I take ex-depot prices quoted by the forest department for timber or sal pole. In some instance, I take the prices which the villagers are prepared to pay to obtain such usefruct.

I undertook my field work in 1994. Not all the projects were initiated in the same year and some investments were

undertaken in earlier years. All investments here, are expressed in terms of 1993-94 prices by raising earlier figures by the same proportion as the rise in money wages paid to unskilled labours, in the region for soil work etc. I do it because social forestry projects involve mainly labour-intensive works. I use actual wage rates for labour hired in social forestry projects both at the initial and at the maintenance phases, instead of any shadow wage rate to assess economic as well as financial viability of the projects. I have estimated the opportunity cost as arising throughout the project period, for this I collected informations on the number of animals - cows, buffaloes, bullocks, sheep and goats - in standardised units (like Nadkarni et. al, 1992) from the selected villages.

In my study area of South-west Bengal there are enough barren, uncultivable up and high lands. Cultivable lands are also available for grazing for 6 to 9 months due to typical agricultural crop pattern practiced in the region. There is no boundary for grazing -cattle can move easily from one village area to another village area. So it is very difficult to calculate alternative available grazing lands for a particular village. Except during rainy season grass cover is usually very poor. For this reason opportunity cost is not treated as a very important factor. However, to calculate the opportunity cost I use a simple method which is popularly known as a woman's calculation (MEYELI HISAB) in the rural areas of Bengal. Here I take the valuation of grass on the basis of the deprivation of a standard unit of cattle due to plantation in the project. The household had to purchase this quantum from the local market if he/she so wished. This amount of grass is in addition to the agricultural crop residues (green or dry), fodder raised on the farms etc. usually given by the owner of the cattle for feed. The valuation of grass, as I get it, varies from Rs. 4 to Rs 6 per cattle per day. In the coppicing sal forests of South-West Bengal cattles are deprived of grazing facilities for only four months only in the first year of plantation (from June to September when other cultivable lands are not available for grazing). The growth of coppicing sal is very fast (in most cases it is more than 7 to 8 meters) in the initial years. Once it attains the height of 7 to 8 metres, the project is again made available for grazing purposes. For other plantations, I calculate the opportunity cost at the same rate using the same

method.

In the "farm forestry" and "river bank plantation" of North Bengal, opportunity cost does not arise as the project lands considered there have virtually no alternative uses. In the river bank, lands are sandy and some areas are covered with thatch grasses which are not consumed by cattles as food. Again, the lands used in the farm forestry, are small, scattered, and infertile and barren. They have either no other uses or have very insignificant uses. There is no provision for costs for watch and ward except for the three initial years in the new plantation (e.g. in the case of River bank plantation before handing over to the beneficiaries). However I assume it as between Rs. 500 to Rs. 700 per month per project. I think it is quite reasonable because patrolling-team required some contingency expenditure for smoking biri, battery, torchlight and for some other related appliances.

In our economic evaluation another important consideration is the time period for which the stream of benefits and costs to be calculated. In this study I consider the flows of benefits and costs over a period of 55 years for South-Bengal projects and 40 years for the North-Bengal projects<sup>1</sup>. I consider these time periods on the basis of my interview with villagers and forest officials. Most of the species available in the South-Bengal projects are sal, cashew, akashmani, kend, mahua etc<sup>2</sup>. Which may last well beyond 55 years. The species planted in the North-Bengal projects are Sisso, Akashmani, Teak, Khair, Sirish, Gamar, Mandani, Chikrashi, Ghora-Neem, Simul, Kadam, Subabul, Minjiri, Jarul etc. which may last well beyond 40 years but the Forest Department suggests and advices to cut it down within 40 years. There are some species like Subabul, Ghora Neem, Kadam etc. whose life span is much shorter than 40 years. I ignore replanting and consider the flows pertaining to plantation as existing during my field work. I collected data on benefits and costs and other informations related to projects at two levels. I collected project level data through questionairre method, visiting the project area

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1. Details of the geographical division follows.

2. Section on Glossary contains the details.

and spending several days in respective spots and interviewing participant villagers local forest officials. Apart from initial expenditure I took note of recurrent expenditure, number of trees observed or reported, type of species, leaves, sidebranches collected by villagers etc. I collected secondary data from the officials involved in the projects. I met a number of forest officials and villagers to collect the information regarding the life span, the average age at which they are expected to be cut, usufruct expected every year and their prices in the respective villages in 1993-94, the volume of timber expected from a mature tree and the prices expected from their sale etc. for different types of trees. Details of the estimate is shown in Appendix - 1. Composition of the sum of benefits and costs at present (discounted) values is shown in Appendix - 2.

To assess the economic and financial worthwhileness I use three measures (FRASER, 1977) ; net present value (NPV), benefit-cost ratio (BCR), and internal rate of return (IRR). The NPV refers to a discounted measure of future flows of net benefits in rupee terms. The stream of benefits and costs are discounted to get the present values and then NPV is obtained. As the project areas differ widely I calculate PV, NPV on per hectare basis (as are shown in the following respective tables) so that NPVs can be compared across different projects. The second measure BCR refers to the ratio between discounted benefits and the discounted costs (ie.  $BCR = \text{Discounted benefits} / \text{Discounted costs}$ ). The third measure IRR refers to that rate of discount which would make the NPV zero ie. discounted benefits = Initial costs. It has been derived by calculating discounted benefits and discounted costs with several discount rates and plotting the discount rate against NPV. Thus IRR is that rate of discount where discounted present value of benefits is equal to the initial cost of the project. It may be pointed out here that it is not known exactly what level of IRR is economically worthwhile but where it is high enough it may not create any significant problem. (Nadkarni et.al., 1992)

The social forestry projects in the state of W.B. are well established. I choose three districts - Bankura, Purulia and Midnapur from the South and three districts -Cooch Behar, Darjeeling and Jalpaiguri from the North.

## THE SOUTH

In my study presence of forest protection committees plays an important role. Forest protection committees refers to the legal committees constituted for the purpose of regeneration, maintenance and protection of moribund sal and other hardwood forests with the active participation and involvement of local people where beneficiaries acting as members of such committees shall be allowed, as a measure of incentive, 25% of the usufructs. The early experience from the pilot project at Arabari in West Bengal paves the way for formation of such committees in the state. This approach totally changed the attitude and concept of forest management and attracted attention from forest administrators and planners at national and international levels.

I choose seven forest protection committees (FPCs) arbitrarily from the three districts of south-west Bengal where the 'joint forest protection committee' programme is well established : Karapara FPC, Asnasoli patharmari-Indkuri FPC, Suribanka FPC, Bansraya FPC, Sumaidihi FPC, Birkham FPC, and Dharagram FPC. A profile regarding the FPCs are presented below in table 5.1 which shows their location, year of registration/starting, the type of species planted, population of respective villages as in 1994 and animal population in standardised unit, tree density etc. All the committees were set up for degraded forest land and organised by the Forest Department.

As observed, in the coppicing sal forests of south-West Bengal benefits start flowing from the second year of the initiation. In the 2nd and 4th year, they provide 6-7 cartload of firewood @Rs. 25 per cart-load (buffalo) per hectare or Rs. 30 per cartload (Bullock) per hectare and in the 7th year they give 10-12 stacks of firewood per hectare [one stack =  $1.5m^L \times 1m^H \times .75^B = 1.125 m^3$  where L, H & B stand for length, height and breadth] at the rate of Rs.160-170 per stack. In the coppicing year i.e. 11-12th year they provide 800-850 poles per hectare at the rate of Rs.15 per pole (ex-auction rate), 30-50 stacks of firewood per hectare at the rate of Rs. 160-70 per stack and 12-15 cartload of buckles per hectare for firewood at the rate of Rs. 25 per cartload, 15-16 cartload of brushwood per hectare at the rate of Rs. 25 per cartload. Along with these benefits, a moderate sal forest gives green leaf for sal-plate over 6-7 months (from April to October) the value of which amounts to Rs. 1000 per hectare per year; kend leaf for biri worth Rs 300 per hectare per year for two months (from february to march); mushrooms worth Rs. 1000-1500 per hectare

per year (from July to September) ; Mahua (from march to april) worth Rs. 400-500 per hectare per year; and dryleaf (from December to February) worth Rs. 200-300 per hectare per year.

TABLE 5.1 : PROFILE OF THE PROTECTION COMMITTEES AND CONCERNED VILLAGES

(Protection Committees)

Feature	Karapara	Asnasoli	Suribanka	Bansraya	Samaidihi	Birkham	Dharagram
1. Location <sup>†</sup> (District)	Bankura	Midnapur	Midnapur	Puruliya	Puriliya	Bannkur	Bankura
2. Year of Starting/ registration	1990-91	1990-91	1990-91	1990-91	1990-91	1989-90	1989-90
3. Project Area (HQ.)	40	406	101.59	100*	177.33	61.96	69.33
4. Village Population (1994)	292	822	512	640	1236	223	416
5. Animal in standardised units (1944)**	213	548	256	300	855	120	152
6. Type of plantation and main tree species	Mixed: Sal, Kend	Mixed: Sal, Mahua Kend	Commercial: Kazu, Eucaly -tus.	Mixed: Sal, Mahua Kend	Mixed: Sal, Mahua Kend	Mixed: Akashmani Eucalyptus	Mixed: Akashmani Eucalyp tus
7. Tree den- sity per Hectare***	800	800	354	800	800	1425	1425

Notes :

+ Details can be found in Appendix Fig A-1 to A-7

\* In Bansraya FPC actual forest existing at present is 100 Ha but officially it is 232.72 Ha.

\*\* One animal unit = 1 cow = 1 bullock = 1 buffalo = 5 sheep = 5 goats

\*\*\* Tree density has been calculated on the basis of the report of the forest officials and participant villagers supported by visual observation of projects and not by actual counting.

In south West Bengal sal is coppiced generally after every 10-12 years for better growth in the next period. I take 11 year rotation period of coppicing. The last rate of price available at the time of survey of a 11-years old pole was found to be worth Rs. 15 only. During the current year (1994) no auction of sal forest occurred as the GOWB banned it due to high rate of deforestation in the region. The rate of sal pole is quite low. There are only a few auctioners (in most cases two or three), as it is reported by the experienced villagers, who can easily negotiate within themselves and oligopsonistically purchase it at a very low price. However, in the absence of alternative information, in my exercise I use this rate. In this sense benefits are underestimated here since felling of Mahua and Kend has been banned by the GOWB, timber value of Mahua and Kend are not considered here.

Initial cost of coppicing sal forest is almost nil or very negligible. In the initial year i.e. coppicing year, the coppicing expenditure varies from 12-14 labour (or mandays) per hectare at the wage rate prevailing in the market (i.e. Rs. 36.19 per labour in 1993-94). In this study I do not include this cost as neither the corresponding benefits were distributed among the villagers nor the villagers did participate in the process at that point of time. It is only after coppicing that the forest came under the purview of joint committees formed with forest officials and villagers. The cost of multiple-suit cutting (M.S) in the 3rd/4th and 7th year varies from 6 to 8 mandays/labour per hectare. In the 11th year, coppicing expenditure is Rs. 8 per pole which includes felling, debarking, stacking and carriage up to depot, and final stacking for auction. Firewood i.e. branches, tops and lops, barks are sold on the spot basis by contract system for which there is no cost for the purpose.

#### **SENSITIVITY ANALYSIS OF ECONOMIC VIABILITY**

I use different sets of assumptions to try out the robustness of the results through what is known as sensitivity

analysis. First I take benefits at full value of benefits as estimated by me. Then I uniformly reduce them by 50 per cent as expected benefits may fail in some years. Against the probability of full benefits realised (1) or none (0), a probability of 0.5 of the benefits being realised, does not seem an unreasonable assumption for the sensitivity analysis. From the two different sets of benefit levels ie. full and half, I deduct two different levels of costs. One excludes the opportunity costs in terms of grazing deprived on the social forestry project area and the other includes opportunity costs. These give 12 possibilities in deriving NPV and BCRs. In the case of IRR, the rate of discount is derived and not assumed and so there are only four possibilities. TABLE 5.2 presents the absolute magnitude of benefits (gross returns) and costs separately (in thousand rupees) per hectare of project areas.

Table 5.3 presents net present values (NPV) obtained after deducting costs from gross returns. They are sums of the present (discounted) values of flows of benefits, costs and NPV respectively up to 55 years. It may be recalled that not all flows are up to 55 years and that the flows for trees like eucalyptus, cashew and acacia auriculiformis are much shorter, but no replanting and resumed flows are assumed in these cases. It may, therefore, be misleading to divide the sum of present values of benefits and costs by 55 to derive the average value per year per hectare.

It is interesting to note that the FPC at Dharagram has both the highest benefits as well as highest costs and also the highest NPV per hectare (as it is seen from Table 5.3). It may be noted from Table 5.1 that the density of trees is highest in places containing eucalyptus and akashmani. The soil of the project is red laterite and it is on the slope of the masak hill. Quick growing species like eucalyptus and akashmani are appropriate. The Project is well managed where Panchayat members and people take active interest in the project.

On the other extreme, there is Karapara FPC which has the lowest, though positive NPV per hectare. It is a coppicing sal forest and it was completely degraded before the formation of FPC. As it is far from Urban areas, it suffers heavily from the greed of external forces like contractors, auctioners etc.

Table 5.2 PRESENT VALUE OF BENEFITS AND COSTS PERHECTARE OF PROJECT AREAS

(At 1993-94 prices summed up for flows up to 55 years)

(Values in thousand Rs.)

FPCS							
Rate of Discount	Karaparā	Asnasoli-Patharmari-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Present value of benefits (gross returns) Per hectare							
1. At full value of benefits estimated							
4 per cent	75	99	571	94	102	1181	1712
6 per cent	52	69	385	66	71	838	1204
4, 6 and 9 per cent	42	58	313	36	59	862	1229
2. If estimated value of benefits were to be lower by 50 percent							
4 per cent	38	50	285	47	51	590	856
6 per cent	26	35	192	33	36	419	602
4, 6 and 9 per cent	21	29	156	28	30	431	614
B Present value of costs per hectare							
1. Excluding opportunity cost in terms of grazing deprived							
4 per cent	17	14	9	15	14	11	11
6 per cent	11	9	8	10	9	10	10
4, 6 and 9 per cent	8	7	8	7	7	10	10
2. Including opportunity cost in terms of grazing deprived							
4 per cent	24	16	14	19	21	16	17
6 per cent	17	10	13	13	15	14	16
4, 6 and 9 per cent	14	8	13	10	12	15	15

Note : 1 the flow of benefits are summed up for 55 years. Life span of sal is taken as 55 years, the highest life span assumed for a tree and I take 11 years as the rotation period ie. coppicing is considered on 11 th yr, 22nd yr., 33rd yr., 44th yr., and 55th yr. Shorter life span are considered for quite a few trees like eucalyptus, cashew, akashmani, and no replanting and resumed flows are taken into account in such cases. For this reason, it would be misleading to convert the present values of costs and benefits into flow per year (divided by 55).

2. The costs exclude the overhead administration & supervision cost incurred by the department in terms of their salaries and transport.

3. The benefits and cost are comparable accross projects because they are all at 1993-94 prices and also expressed in terms of per hectare of respective project areas.

4. In two cases the benefits and costs are discounted at a uniform rate over the entire project period-in one case at 4 per cent, in another at 6 percent. In the third case I use variable rates of discount over the project period where the first ten years are discounted at 4percent , the next ten at 6 percent and the remaining period at 9 per cent.

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Another test of economic viability considered here is a BCR. It indicates the productivity per unit of cost. It is shown in TABLE 5.4. It is the reciprocal of cost per unit of output. However, this is not a satisfactory criterion, because an enterprise can earn more profits than another in absolute terms even if the former has the lower productivity per unit of cost or higher cost per unit of output. But it is, nevertheless, important to make investment in social forestry as cost-effective as possible and from this point of view BCR is a useful indicator.

From the Table 5.4 it is seen that Dharagram has the highest BCR among the seven FPCs and Karapara has the lowest. It is interesting to note that Karapara FPC has the lowest NPV as well as the lowest BCR. Nonetheless, even this project obtains two times more benefits compared to cost incurred under the most rigorous test (Table 5.4 last row). Thus even a project, that seems to be least efficient or productive per unit of cost among the selected FPCs , is still economically worthwhile.

Table 5.5 presents the economic viability of the FPCs in terms of IRRs. Even the least IRR, applying the most rigorous test, is 32.5 per cent in the case of Karapara (as it is shown in the last row of table 5.5). This is quite high considering that the flows are at constant prices.

TABLE 5.3 : NET PRESENT VALUE OF PER HECTARE OF PROJECT AREA (1993-94 prices summed up for flows up to 55 years)

(Values in thousand Rs.)

FPCs							
Rate of Discount	Karapara	Asnasoli- Patharmari- Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Full benefits net of costs excluding opportunity cost of grazing (A.1 minus B.I in table 5.2)							
4 per cent	58	85	561	80	88	1169	1702
6 per cent	41	60	376	56	62	827	1194
4, 6 and 9 per cent	34	50	304	48	52	852	1219
B Full benefits net of costs including opportunity cost of grazing (A.I minus B.2 in Table 5.2)							
4 per cent	51	83	556	75	80	1164	1696
6 per cent	35	58	371	53	56	823	1188
4, 6 and 9 per cent	29	49	299	46	48	847	1214
C Benefits reduced by 50 percent net of costs excluding opportunity cost of grazing (A.2 minus B.I in Table 5.2)							
4 per cent	21	35	276	32	36	579	845
6 per cent	15	25	184	23	26	409	592
4, 6 and 9 per cent	13	22	148	21	22	420	604
D Benefits reduced by 50 per cent net of costs including opportunity cost of grazing (A.2 minus B.2 in Table 5.2)							
4 per cent	13	33	271	28	30	574	840
6 per cent	9	24	179	20	21	404	587
4, 6 and 9 per cent	7	20	142	17	18	416	599

Notes: 1. See notes below Table 5.2.

2. The NPVs are here calculated from original figures and then rounded off. As such they may not accurately represent differences between respective A-s and B-s in Table 5.2 as they are also rounded off to thousand rupees.

TABLE 5.4 : BENEFIT-COST RATIOS.

(Present value of benefits per unit of present value of costs in rupees)

FPCs							
Rate of Discount	Karapara	Asna-Path-Indukuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Full benefits over costs excluding opportunity cost of grazing							
4 per cent	4.5	7.0	61.6	6.4	7.2	105	154
6 per cent	4.6	7.4	45.4	6.8	7.6	83	120
4, 6 and 9 per cent	5.0	8.4	36.2	7.7	8.6	81	117
B Full benefits over costs including opportunity cost of grazing							
4 per cent	3.1	6.2	39.5	4.9	4.8	73	103
6 per cent	3.0	6.4	28.9	5.0	4.8	57	79
4, 6 and 9 per cent	3.1	7.0	22.9	5.4	5.1	56	77
C Benefits reduced by 50 percent over costs excluding opportunity cost of grazing							
4 per cent	2.3	3.5	30.8	3.2	3.6	52	77
6 per cent	2.3	3.7	22.7	3.4	3.8	41	60
4, 6 and 9 per cent	2.5	4.2	18.1	3.9	4.3	40	58
D Benefits reduced by 50 per cent over costs including opportunity cost of grazing							
4 per cent	1.5	3.0	19.7	2.5	2.4	36	51
6 per cent	1.5	3.2	14.4	2.5	2.4	28	40
4, 6 and 9 per cent	1.5	3.5	11.4	2.7	2.5	27	38

Notes : See Notes in Table 5.2

Therefore, all the three criteria- NPV, BCR and IRR - show the economic viability of the selected projects in a favourable light even under some more rigorous assumptions and they stand the test of sensitivity analysis. We now turn to financial viability.

#### FINANCIAL VIABILITY

In terms of financial viability, I try to find out whether the financial return expected from that part of the produce which is sold is commensurate with the paid out costs. The opportunity cost is not included here among the costs, since the analysis is in terms of actual cash return and cash costs.

**TABLE 5.5 ; ECONOMIC VIABILITY IN TERMS OF INTERNAL RATES OF RETURNS**  
(per cent at constant prices)

	FPCs						
Assumption	Karapara	Asna-Path- Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Full benefits, costs excluding opportunity cost of grazing	1133	8186	56.4	3858	7373	57.2	59.2
B Full benefits, costs including opportunity cost of grazing	56.4	323	50.2	141	96.6	53.2	54.7
C Benefits reduced by 50 per cent costs exclude opportunity cost of grazing	567	4095	43.6	1941	3696	46.8	48.7
D Benefits reduced by 50 per cent cost including opportunity cost of grazing	32.5	162	38.6	76	52.0	43.4	45.0

Notes : 1. Error considered for calculating IRR is  $\pm$  1 per cent.

2. The initial cost of coppicing sal is very low, that is why IRRs are exceptionally high for those projects.

In this calculation I include the full value of timber, poles, kend leaf, sal leaf and cashewnut and since almost half is used for self-consumption 50 percent of the fuelwood, 50 percent of Mushroom, 50 per cent of Mahua flower/fruits. Almost a half of all firewood, mahua and mushroom are given free to the participants. That is why one half is included in financial analysis.

As in the case of economic viability analysis, here returns are considered at two levels - full and half. That means that at the half levels - only 25 percent of the firewood, mushroom, mahua are being included since 50 percent of them is taken at full returns level. The price used in both economic and financial analysis are the same. The results of financial viability analysis are presented in tables 5.6 to 5.9.

Table 5.7 shows that NPV of financial returns is positive from all FPCs at the discount rates of 4 and 6 percent, both for full returns and for returns taken as half. It is so even when the more rigorous variable rates of discount of 4, 6 and 9 percent are applied. Thus all the FPCs can be taken to be financially viable. The ranks of different FPCs are also stable across sensitivity analysis. Similar picture is shown by Table 5.8 where the financial returns over the costs are analysed.

TABLE 5.6 : PRESENT VALUE OF FINANCIAL RETURNS OF PROJECT AREA

(1993-94 prices summed up for flows up to 55 years)

(Values in thousand Rs.)

FPCs							
Rate of Discount	Karapara	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Present value of gross returns per hectare :							
1 At full value of timber, poles cashewnut and 50 per cent of the value of fuelwood harvested at the end and 50 per cent of mashroom, mahua :							
4 per cent	58	71	547	70	75	1021	1455
6 per cent	40	49	367	50	53	717	1005
4, 6 and 9 per cent	32	41	293	42	44	733	1012
2 At 50 per cent of the value of timber, poles, cashewnut and 25 per cent of the value of fuelwood, mashroom and mahua :							
4 per cent	29	36	274	35	38	511	728
6 per cent	20	25	183	25	26	358	503
4, 6 and 9 per cent	16	21	147	21	22	367	506
B Present value of costs per hectare (paid out costs):							
(Excluding opportunity cost in terms of grazing)							
4 per cent	17	14	9	15	14	11	11
6 per cent	11	9	8	10	10	10	9
4, 6 and 9 per cent	8	7	8	7	6	10	10

Note : Mushroom and Mahua flowers have good local market. 50 percent of these are assumed to be sold in the market.

The financial viability seen in terms IRRs (as shown in table 5.9) is very much encouraging. The results range from 46.8 percent per annum in Dharagram to 5609 percent in Asna-pathar-Indkuri at full value of returns and from 39.5 percent to 2806 percent in the same FPCs respectively when gross returns are valued at half their normal level. Even the lowest rate of 39.5 per cent is satisfactory when it is considered that these are real rates for output valued at constant prices and not nominal rates. Here IRR figures for Karapara, Path-Asna-Indkuri, Bansraya and Sumaidihi are unexpectedly high because these are natural forests where initial cost i.e., coppicing cost are either very low or negligible.

TABLE 5.7 : NET PRESENT VALUE OF FINANCIAL RETURNS PER HECTARE OF PROJECT AREA

(1993-94 prices summed up for flows up to 55 years)

(Values in thousand Rs.)

FPCs							
Rate of Discount	Karapara	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Full returns from timber, poles, cashewnut and 50 percent from fwelwood, mashroom, mah net of costs:							
(A.1 minus B in Table 5.6)							
4 per cent	41	57	538	56	61	1010	1444
6 per cent	28	40	358	39	43	706	995
4, 6 and 9 per cent	24	34	284	34	37	723	1001
B Returns (A) reduced by 50 percent net of costs							
(A.2 minus B in Table 5.6)							
4 per cent	12	21	264	20	24	499	716
6 per cent	9	15	175	15	17	348	492
4, 6 and 9 per cent	7	13	138	14	15	356	495

Note : As in Table 5.6

From the above analysis of financial viability it can be said that though the main justification for social forestry is to meet the local needs of the rural economy it can yield a financial net return which is high enough to generate a surplus. Thus it may really become a way of life in future as well as a viable rural institution for sustainable greening of our country.

Now we turn to the socio-economic aspects of the participants. This we do to see whether the social forestry programme could really benefit the most disadvantaged sections of the rural community. One aspect of the success and sustainability of the programme crucially hinges on this caste-based distribution of the households presented in table 5.10 through 5.18.

**TABLE 5.8 : FINANCIAL RETURN-COST RATIOS**

(Present value of return per unit of present value of costs in repees)

FPCs							
Rate of Discount	Karapara	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Full returns from timber, poles, cashewnut and 50 percent from fuelwood, mahua mushroom over costs:							
4 per cent	3.4	5.0	59	4.8	5.3	91	131
6 per cent	3.5	5.3	43	5.0	5.6	70	101
4, 6 and 9 per cent	3.8	5.9	34	5.7	6.3	69	97
B Returns (A) reduced by 50 per cent over costs							
4 per cent	1.7	2.5	29	2.4	2.6	45	66
6 per cent	1.7	2.6	22	2.5	2.8	35	50
4, 6 and 9	1.9	2.9	17	2.8	3.1	34	48

Note : As in Table 5.6

**TABLE 5.9 : FINANCIAL VIABILITY IN TERMS OF INTERNAL RATE OF RETURN (PERCENT)**

(At constant prices)

FPCs							
Assumptions	Karapara	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dharagram
A Full returns from timber, pole cashewnut and 50 percent from fuelwood, mashroom, mahua							
	866	5609	54	2776	5313	50	46.8
B Returns (A) reduced by 50 per cent							
	432	2806	42	1400	2666	41	39.5

Note : As in Table 5.6

Table 5.10 shows that the households participating in social forestry (FPCs) belong to disadvantaged classes of the society. They represent about 63 percent (sc-12% and ST-51%). Therefore it seems that, as it has been stated in the objectives of the projects, benefits of the projects have really reached to target group.

**TABLE 5.10 : CLASSIFICATION OF SAMPLE HOUSEHOLD BY CASTE**

Name of the FPCs	S.C.	S.T.	General	Total
1. Karapara	-	12	3	15
2. Asna-Path-Indkuri	-	20	6	26
3. Suribanka	8	-	15	23
4. Bansraya	-	20	5	25
5. Sumaidihi	-	13	12	25
6. Birkham	-	12	-	12
7. Dharagram	10	-	15	25
<b>Total</b>	<b>18 (12%)</b>	<b>78 (51%)</b>	<b>56 (37%)</b>	<b>151 (100%)</b>

The data on the age of the members of FPCs show that about 78 percent are in the age interval 20-50 while there are 30 members aged less than 30. The distribution of FPC members according to age is presented in the following table 5.11.

**TABLE 5.11 : DISTRIBUTION OF SAMPLE FPC MEMBERS IN AGE-GROUPS**

Age group.	Karapara	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara-gram	Total
20-30	4	1	1	4	9	3	8	30
31-40	3	8	7	9	5	8	3	44
41-50	4	8	9	8	7	1	7	44
51-60	3	8	6	2	4	-	4	37
61-above	1	1	-	2	-	-	3	7
<b>Total</b>	<b>15</b>	<b>26</b>	<b>23</b>	<b>25</b>	<b>25</b>	<b>12</b>	<b>25</b>	<b>151</b>

The literates among the participant household constitute only 55 percent of the sample. The data on literacy among the participant members are furnished categorically in tabel 5.12.

Of the total participants 42% are engaged completely in agriculture while 16 per cent are agricultural labourer and 35 per cent have to earn their livelihood from more than one sources who have less fertile and small holdings in their possession. Table5.13 gives the break-up of the participating members according to their respective occupation.

**TABLE 5.12 : LITERACY AMONG THE MEMBERS STUDIED**

Literacy	Karapara	Asna-Path- Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara- gram	Total
Illiterate	8	12	6	15	13	3	11	68
up to								
class IV	2	6	14	4	2	1	6	35
up to								
class VIII	3	3	2	3	7	5	1	24
Above								
class VIII	2	5	1	3	3	3	7	24
<b>Total</b>	<b>15</b>	<b>26</b>	<b>23</b>	<b>25</b>	<b>25</b>	<b>12</b>	<b>25</b>	<b>151</b>

Note: Illiterate includes newly literate under the literacy programme of the state.

**TABLE 5.13 : OCCUPATIONAL DISTRIBUTION AMONG SAMPLE MEMBERS STUDIED**

Occupation	Karapara	Asna-Path- Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara- gram	Total
Service	-	3	-	-	-	1	-	4
Agriculture	6	4	10	16	14	7	6	63
Agricultural								
Labourer	1	6	5	1	-	4	8	25
Mixed	7	13	7	8	11	1	6	53
Traders	-	-	-	-	-	-	2	2
Others	1	-	1	-	-	-	2	4
<b>Total</b>	<b>15</b>	<b>26</b>	<b>23</b>	<b>25</b>	<b>25</b>	<b>12</b>	<b>25</b>	<b>151</b>

Note : 1. Mixed occupation refers to the combination of more than one of the following agriculture, agricultural labour, grossery, owner of tea or sweet shops, minor forest products, forest related activities, blacksmith, carpenter, hair-cutter, helper of contractor etc.

2. Others refers to the people who are in the single occupation like haircutter, black smith, carpenter, washman etc.

**TABLE 5.14 : DISTRIBUTION OF FAMILY SIZE IN THE FPCs STUDIED**

Family size	Number of households							Total
	Karapara	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara-gram	
1-3	2	2	1	4	1	1	2	13
4-5	7	8	6	8	11	5	10	55
6-8	4	16	9	9	11	5	6	60
9-10	-	-	2	-	-	1	3	6
10 and above	2	-	5	4	2	-	4	17
<b>Total</b>	<b>15</b>	<b>26</b>	<b>23</b>	<b>25</b>	<b>25</b>	<b>12</b>	<b>25</b>	<b>151</b>

The survey data collected on the size of the families of participant households indicate that about 45 per cent household have less than 6 members and 85 percent have less than 9 members. The table 5.14 given below provide the distribution pattern of households according to the size.

The value of household assets reflect the economic status of the participating households. About 27 percent of the households have assets valued less than Rs. 15000 and 56 percent households have assets worth Rs. 25000 and above. A glance at the following tabel 5.15 will indicate the distribution of household assets:

**TABLE 5.15 : DISTRIBUTION OF HOUSEHOLD ASSETS AMONG MEMBERS STUDIED**

Value (Rs)	Number of households							Total
	Kara-para	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara-gram	
0-5000	1	3	4	-	-	-	7	15
5000-10000	-	4	3	2	-	-	1	10
10000-15000	2	6	-	2	1	1	4	16
15000-20000	3	4	-	-	4	-	-	11
20000-25000	2	3	3	-	3	1	2	14
25000-99999	4	5	9	18	13	9	6	64
Above 99999	3	1	4	3	4	1	5	21
<b>Total</b>	<b>15</b>	<b>26</b>	<b>23</b>	<b>25</b>	<b>25</b>	<b>12</b>	<b>25</b>	<b>151</b>

TABLE 5.16 : DISTRIBUTION OF MONTHLY INCOME AMONG THE MEMBERS STUDIED

Income Group (Rs)	Kara-para	Asna-Path-Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara-gram	Total
0-250	-	-	-	1	3	-	-	4
250-500	7	10	6	13	14	1	3	54
500-750	3	7	6	7	2	4	11	40
750-1000	1	1	3	3	3	3	2	16
1000-1250	-	4	2	-	1	2	4	13
1250-1500	1	-	-	1	1	-	2	5
1500-1750	1	1	3	-	-	1	-	6
1750-2000	1	1	1	-	1	-	-	4
2000-9999	1	2	2	-	-	1	3	9
Total	15	26	23	25	25	12	25	151

The social forestry programme, as observed earlier benefits the target group (basically disadvantaged) to a large extent and is also supported by the data on monthly income of the households. For example, 65 percent of the sample households are in the income level of Rs. 750 and below per month. This is very much pronounced in all the seven FPCs and could be seen in the following table 5.16.

Data on distribution of land-holding also corroborate the observation that FPCs have been successful in reaching its target groups. The sample data on distribution of land holding shows that about 84 percent of the household have less than 3 acres of land, 43 percent have less than one acre and 11 percent are landless. Table 5.17 providing the distribution of land owned, shows that majority of the households participating in the programme belong to small farmers group.

Data on indebtedness of households show that 52 percent of the sample households are having debt, out of which a sizeable proportion of them have borrowed for agricultural purposes (36 percent), followed by cattle loan (23 percent) and domestic needs (19 percent). Table 5.18 gives the details of the amount borrowed, purpose of the loan and sources of loans. The amount borrowed is less than Rs. 1000 in the case of 19 percent of the indebted households and at the same time 72 percent of them have borrowed more than Rs. 1500. The main institutions provid-

ing credit facilities are agricultural cooperatives -38 per

TABLE 5.17 : DISTRIBUTION OF LANDHOLDINGS AMONG THE MEMBERS STUDIED

Land Hold- ing size (acre)	Kara- para	Asna-Path- Indkuri	Suribanka	Bansraya	Sumaidihi	Birkham	Dhara- gram	Total
Landless	2	2	4	2	-	1	6	17
.01-.99	5	15	7	2	6	4	9	48
1-1.99	3	4	3	10	9	4	3	36
2-2.99	2	5	5	4	6	2	2	26
3-3.99	-	-	3	4	-	-	1	8
4-4.99	1	-	-	-	4	1	1	7
5-5.99	2	-	1	3	-	-	-	6
6-6.99	-	-	-	-	-	-	2	2
7-7.99	-	-	-	-	-	-	-	0
8-8.99	-	-	-	-	-	-	-	0
9-9.99	-	-	-	-	-	-	1	1
10 and above	-	-	-	-	-	-	-	0
Total	15	26	23	25	25	12	25	151

cent, followed by panchayat (DRDA, IRDP. etc)- 28 percent, Banks - 14 percent and Tribal Development schemes (like TSP, LAMP)- 13 per cent. These data show that there is only one FPC (ie. Bansraya) where tribal development board is well functioning and in other tribal areas it is either absent or is non-functioning.

Table 5.19 shows the demand for fuelwood per household per month with their respective sources before and after the formation of FPCs. Fuelwood demand in Suribanka is seen to be exceptionally higher than that of any other project area because most of the villagers here are engaged in the business of curd (milk-products) which required more fuelwood for its preparation. Before the formation of FPCs all the members of FPCs used to collect their required fuel through illegal felling from the traditional forests.

**TABLE 5.18 INDEBTEDNESS POSITION OF THE SAMPLE HOUSEHOLDS STUDIED**

Name of FPCs	NO. of Households		Amount of loans			Purpose of loans					Sources of loans			Total		
	Having loans	Having no loans	Less than 1000	1000-1500	1500and above	Agricultural needs	Domestic needs	Business Inputs	Cattle loan	Cooperatives	Banks Money Lenders,	Tribal D. B. T.S.P. Lamp etc	Panchayat (IRDP DRDA etc.)			
1. Karapara	5	10	5	-	-	1	1	-	-	3	2	2	-	-	1	5
2. Asna-Path-14	12	1	2	11	10	2	-	1	1	6	2	1	-	5	14	
3. Suribanka	21	2	3	2	16	12	7	1	1	-	12	1	1	-	3	21
4. Bansraya	10	15	0	2	8	-	-	5	3	2	-	-	-	10	-	10
5. Sumaidihi	4	21	4	-	-	-	-	1	-	3	2	1	-	-	1	4
6. Birkhan	9	3	1	-	8	-	-	4	-	5	3	-	-	-	6	9
7. Dharagram	16	9	1	1	14	5	5	3	-	3	5	5	-	-	6	16
<b>Total</b>	<b>79</b>	<b>72</b>	<b>15</b>	<b>7</b>	<b>57</b>	<b>28</b>	<b>15</b>	<b>14</b>	<b>5</b>	<b>17</b>	<b>30</b>	<b>10</b>	<b>2</b>	<b>10</b>	<b>22</b>	<b>79</b>

Note : In Suribanka FPC there are four persons who have taken loans from relatives.

**TABLE 5.19 : DEMAND FOR FUELWOOD PER MONTH PER FAMILY**

Name of FPCs	Averagedemand for fuelwood per family per months (K.g.)	Source	
		Before FPCs	After FPCs
1. Karapara	294	Illegal Felling	FPC
2. Asna-Path-Indk.	249	Illegal Felling Collection through departmental permit in Dec-Jan.	FPC
3. Suribanka	347	Market plus illegal felling	FPC and Market
4. Bansraya	250	Illegal Felling & Collection	FPC
5. Sumaidihi	246	Illegal Felling	FPC
6. Bihrkham	224	Illegal Felling	FPC
7. Dharagram	263	Market	FPC and Market

Since the inception of joint forest management programme in the state they have been collecting these from the FPCs. Only in two cases, Suribanka and Dharagram, a part of the total demand comes from outside FPCs and some people of these two villages also use coal and kerosene as fuel.

**TABLE 5.20 : Average time spent by female members for collection of fuelwood\* in the FPCs.**

Name of FPCs	Avarage time spent by female members per day per month to collect fuelwood (in hours)
1. Karapara	1-2
2. Asna-Path-Ind	2-3
3. Suribanka	3-4
4. Bansraya	2-3
5. Sumaidihi	3-4
6. Birkham	less than 1
7. Dharagram	2-3

Note : \*Fuelwood includes collection of Akashmani Seeds

**THE NORTH**

I choose three 'river bank' plantation and three social

forestry beat<sup>1</sup> for 'farm forestry' arbitrarily from the three districts of North Bengal where social forestry schemes have been taken up. These are Binnaguri in Jalpaiguri district and Bara Atharakotha and Harinchawra in Cooch Behar district for river bank plantation and Phansidewa and Naxalbari beat in Darjeeling district and Tufanganj beat in Cooch Behar district in the extreme north of northern part of West Bengal for farm forestry. A profile of the projects are presented in Table 5.21 which refers to their location, year of plantation, type of plantation main species and tree composition, tree density per hectare etc. River bank projects are initiated and initially implemented by forest department (F.D). The F.D plant trees and protect them for the first three years and then hand over the project to the beneficiaries selected by the Panchayats (GP). Forestry under 'farm forestry' is undertaken by individual farmers who are scattered over a large zone. In order to compare across the projects I convert them into a single unit (ie. on per hectare basis).

In the case of river bank projects for stump planting flow of returns start from the 2nd year and for other cases from the 4-5th year. All these flows are usually in terms of thinning or pruning or both. I assume that thinning takes place at the rate of 25 per cent in every alternate five years. Actually forest officials try to impress upon the beneficiaries this method and procedure. Life span of trees is assumed to be 40 years. Details about the estimation of different quantities and flows of costs and benefits are given in appendix - 3. Appendix 4 shows the composition of the sum of benefits and costs at present (discounted) values.

#### **SENSITIVITY ANALYSIS OF ECONOMIC VIABILITY**

Here I follow more or less the same procedure as I have done previously for the projects of South-West Bengal. Economic viability test of the social forestry projects in North Bengal is presented in Table 5.22 through 5.25.

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1. Beat is consist of one or more than one existing general administrative blocks where plantation has been raised.

TABLE 5.21 PROFILE OF THE SOCIAL FORESTRY PROJECTS OF NORTH BENGAL

Features	Projects under Riverbank Plantation			Projects under Farm Forestry Plantation		
	Binnaguri	Bara Athara Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj
1. Location (District)	Jalpaiguri	Cooch Behar	Cooch Behar	Darjeeling	Darjeeling	Cooch Behar
2. Year of Plantation	1986-87	1989-94	1988-89			
3. Project area (Ha)	45	10	10	-	-	-
4. No. of Participants	45	20	20	-	-	-
5. Type of Plantation	commercial	commercial	commercial	commercial	commercial	commercial
6. Tree density per Ha in project area	1600	1430	1425	3000	4000	2500
7. Main species and Tree composition	sisso 20% Sirish 15% Akashmani 15% Chikrashi 15% Teak 10% Ghora Neem 10%	sisso 70% Khair 10% Sirish 10% Simul 10%	sisso 45% Sirish 14% Khair 17% Simul 17%	sisso 75% Teak 10% Gamar 10% Others 5%	sisso 55% Teak 20% Chikrashi 10% Gamar 10% Others 5%	Gamar 50% Sisso 25% Ghoraneem 10% Teak 6% Sirish 6% Others 3%

Note: Tree Density has been arrived at by deducting the trees reported to have died up and flooded over upto 1994 from the number of trees reported to have been planted and supported by visual observation of plantation, not by actually counting all the trees.

TABLE 5.22 PRESENT VALUE OF BENEFITS AND COSTS PER HECTARE OF PROJECT AREA

(1993-94 prices summed up for flows upto 40 years)

(Values in thousand Rs.)

Rate of Discount	River banks		Projects		Farm Forestry	
	Binnaguri	Bara Athara	Harinchawra	Phansidewa	Naxalbari	Tufanganj
A Present value of benefits (gross returns)						
per hectare						
1 At Full value of benefits estimated						
4 percent	547	965	874	1012	820	2047
6 percent	333	500	453	564	493	1220
4, 6 and 9%	237	253	228	330	331	836
2 If estimated benefits were to be lower						
by 50 percent						
4 percent	273	482	437	506	410	1023
6 percent	166	250	226	282	246	610
4, 6 and 9%	119	126	114	162	166	418
B Present value of costs per hectare						
4 percent	70	34	32	70	105	50
6 percent	46	24	23	45	67	35
4, 6 and 9%	36	21	20	33	48	31

Notes: 1. See notes to table 5.2

2. The flows of benefits are summed up to 40 years.

Here the period involved in considering the stream of benefits and costs is 40 years from the start of the project. I believe, based on my interviews with farmers and local officials, this to be a reasonable period.

TABLE 5.23 NET PERSENT VALUE OF PER HECTARE OF PROJECT AREA

(1993-94 prices summed up for flows upto 40 years)

(Values in thousand Rs.)

Rate of	River banks			Projects		
	Binnaguri	Bara Athara	Katha	Harinchawra	Phansidewa	Naxalbari
A Full benefits net of costs						
(A 1 minus B, in Table 5.22)						
4 percent	477	931	842	942	715	1997
6 percent	287	476	430	519	426	1185
4,6 and 9%	201	231	208	296	283	805
B Benefits reduced by 50 percent net of costs						
(A. 2 minus B in Table 5.22)						
4 percent	203	448	404	436	304	973
6 percent	120	225	203	237	179	575
4,6 and 9%	82	105	94	131	117	386

Notes : 1. See notes to Table 5.3

**TABLE 5.24 : BENEFIT-COST RATIOS**

(Present value of benefits per unit of present value of costs in rupees)

Rate of Discount	Riverbanks			Projects		Farm Forestry	
	Binnaguri	Bara Athara Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj	
A Full benefits over costs							
4 percent	8	28	26	14	8	40	
6 percent	7	20	19	12	7	34	
4, 6 and 9%	6	12	11	9	6	26	
B Benefits reduced by 50 percent over costs							
4 percent	4	14	13	7	4	20	
6 percent	3	10	9	6	3	17	
4, 6 and 9%	3	6	5	5	3	13	

Note : See notes to Table 5.2.

**TABLE 5.25 : ECONOMIC VIABILITY IN TERMS OF INTERNAL RATES OF RETURNS**

(Percent at constant prices)

Assumption	Riverbanks			Projects		Farm Forestry	
	Binnaguri	Bara Athara Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj	
A Full benefits	33.4	59.6	58.8	40.6	41.7	65.2	
B Benefits reduced by							
50 percent	26.9	42.0	41.3	32.3	33.6	52.4	

**FINANCIAL VIABILITY OF SOCIAL FORESTRY PROJECTS**

For financial viability, I include full benefits of timber, poles and 50 per cent of the fuelwood since about half of the available fuelwood be distributed to the beneficiaries free. As in the case of economic viability analysis, returns are considered at two levels - full and half. This implies that here in financial viability analysis, only 25 per cent value

of firewood is included at a half level. Financial viability analysis is presented in Table 5.26 through 5.29.

**TABLE 5.26 : PRESENT VALUE OF FINANCIAL RETURNS OF PROJECT AREA**

(1993-94 prices summed up for flows up to 40 years)

(Values in thousand Rs.)

	Riverbanks			Projects	Farm Forestry	
	Binnaguri	Bara Athara Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj
A Present value of gross returns per hectare :						
1 At full value of timber, poles and 50 percent of the value of fuelwood harvested at the end.						
4 percent	535	878	793	993	804	2012
6 percent	324	442	399	550	401	1193
4, 6 and 9%	229	204	183	316	319	811
2 At 50 percent of the Value of timber, poles and 25 percent value of fuelwood						
4 percent	267	439	396	496	402	1006
6 percent	162	221	199	275	240	596
4, 6 and 9%	114	102	92	158	159	405
B Present value of costs per hectare (paid out costs)						
4 percent	70	34	32	69	105	50
6 percent	46	24	23	45	67	35
4, 6 and 9%	36	21	20	31	48	31

From table 5.27 it is seen that NPV of financial returns are positive from all the projects at the discount rates of 4, 6 and 9 per cent, both for full returns and for half returns as well. Thus conclusions similar to projects of South of West Bengal follow.

**TABLE 5.27 : NET PRESENT VALUE OF FINANCIAL RETURNS PER HECTARE OF PROJECT AREA**

(1993-94 prices summed up for flows upto 40 years)

(Values in thousand Rs.)

Rate of	Bara Athara					
Discount	Binnaguri	Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj
A Full returns from timber, poles and 50 percent from fuelwood net of costs						
(A 1 minus B in Table 5.26)						
4 percent	465	844	760	923	699	1961
6 percent	278	410	378	505	414	1158
4, 6 and 9%	193	182	163	205	270	779
B Returns (A) reduced by 50 percent net of costs						
(A.2 minus B in Table 5.26)						
4 percent	197	405	363	427	296	996
6 percent	116	196	176	230	173	561
4, 6 and 9%	78	80	71	127	111	374

**TABLE 5.28 : FINANCIAL RETURN-COST RATIOS**

(Present value of return per unit present value of costs in rupees)

Rate of	Bara Athara					
Discount	Binnaguri	Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj
A Full returns from timber, poles and 50 percent from fuelwood over costs						
4 percent	7.6	26	24	14	7.6	40
6 percent	7.0	19	17	12	7.1	34
4, 6, and 9%	6.3	9	9	10	6.6	26
B Returns (A) reduced by 50 percent over costs						
4 percent	3.8	13	12	7	3.7	20
6 percent	3.5	9	8	6	3.5	16
4, 6 and 9%	3.1	5	4	5	3.3	13

Again, as we did in the case of South Bengal, we try to explore the possible impacts of Social forestry on the target population of the programmes.

**TABLE 5.29 : FINANCIAL VIABILITY IN TERMS OF INTERNAL RATE OF RETURN (PERCENT)**  
(At Constant Prices)

Assumptions	Bara Athara					
	Binnaguri	Katha	Harinchawra	Phansidewa	Naxalbari	Tufanganj
A Full returns from timber, poles and 50 percent from fuelwood	31.6	45.1	43.5	37.1	38.6	57.5
B Returns (A) reduced by 50 percent	25.8	31.1	30.1	30.2	31.7	40.0

**TABLE 5.30 : CLASSIFICATION OF HOUSEHOLDS BY CASTE**

	Name of the project	S.C.	S.T.	General	Total
Riverbank	1. Binnaguri	15	1	9	25
	2. Bara Athara Kotha	-	-	15	15
	3. Harinchawra	-	-	14	14
	Total	15	1	38	54
Farm Forestry	4. Phansidewa	13	1	6	20
	5. Naxalbari	12	3	1	16
	6. Tufanganj	8	-	12	20
	Total	33	4	19	56

The households by caste participating in the riverbank projects belong mainly to general (70 per cent) caste and 28 percent belongs to S. C. Where as in farm forestry about 59 per cent belongs to S.C and 34 percent belongs to General caste. Classification of households by caste is furnished in Table 5.30.

**TABLE 5.31 : Distribution of Participating Households in Age-Group**

Age group	Riverbank			Total	Projects		Farm Forestry		Total
	Binnaguri	Bara Athara	Harinchawra		Phansidewa	Naxalbari	Tufanganj		
			Katha						
20-30	3	4	1	8	3	1	-	4	
31-40	7	6	3	16	3	10	7	20	
41-50	12	3	8	23	9	3	7	19	
51-60	3	1	2	6	2	1	4	7	
61-above-	-	1	-	1	3	1	2	6	
Total	25	15	14	54	20	16	20	56	

The data on the age of the members of riverbank plantations show that about 87 percent are in the age group of 20-50 while there are only 8 members (15%) aged less than 30. The data on farm forestry show that about 77 per cent belongs to the age interval 20-50 while there are only 4 members aged less than 30. The distribution of riverbank plantation and farm forestry members according to the age is presented in the table 5.31.

**TABLE 5.32 LITERACY AMONG THE MEMBERS STUDIED**

Literacy	River banks			Projects	Farm Forestry			
	Binnaguri	Bara Athara	Harinchawra		Total	Phansidew	Naxalbari	
		Katha						
	Tufanganj	Total						
Illiterate	12	9	10	31	3	3	-	6
Up to class IV	10	1	4	15	8	3	6	17
Up to Class VIII	3	5	-	8	3	4	3	10
Above class VIII	-	-	-	-	6	6	11	23
Total	25	15	14	54	20	16	20	56

The illiterates among the participant households in riverbank plantation constitute about 57 per cent whereas in farm forestry it is about 8 per cent only. The percentage of literate above class VIII is about 41 but in river bank plantation it is nil. The data on literacy among the participant members are furnished categorically in Table 5.32.

TABLE 5.33 OCCUPATIONAL DISTRIBUTION AMONG SAMPLE PARTICIPANTS STUDIED

Occupation	River banks			Projects	Farm Forestry			
	Binnaguri	Kath	Harinchawra	Total	Phansidewa	Naxalbari	Tufanganj	Total
Service	-	-	-	-	4	2	5	11
Agriculture	8	5	-	13	7	9	7	23
Agril. Labour	1	-	-	1	1	-	1	2
Mixed.*	16	3	-	19	5	3	2	10
Traders	-	-	-	-	2	2	5	9
Others**	-	7	14	21	1	-	-	1
Total	25	15	14	54	20	16	20	56

Notes : \*\* Others - including non-agricultural labourers, Rickshaw puller, cleaner, Kamla, Helper, Talioringetc.

\* Mixed refers to more than one occupation at a time like small business, Agriculture, Service etc.

Of the total participants 24 percent are engaged in agriculture in riverbank project and 41 per cent are engaged in agriculture in farm forestry. Percentage of agricultural labour is almost nil in both the types in North Bengal. Table 5.33 gives the occupational distribution among the sample members studied.

The survey data collected on the size of the families of participant households indicate that about 39 percent in river bank projects and 48 per cent in farm forestry have less than 6 members.

Table 5.35 shows the distribution of household assets among the participant members under farm forestry and river bank plantation. It shows a quite interesting picture. Data on farm forestry show that about 72 percent fall in the slab of above Rs. 99999 where as in riverbank plantation scheme it is nil. This is because in case of river bank plantations the Gram Panchayats (local administrative body) select the beneficiaries (participants) who belongs to the targeted group i.e., landless labourer, poor artisans or agriculturists etc.

**TABLE 5.34 DISTRIBUTION OF FAMILY SIZE IN THE PROJECTS STUDIED**

Family Size	River banks			Projects		Farm Forestry		
	Binnaguri	Katha	Harinchawra	Total	Phansidewa	Naxalbari	Tufanganj	Total
1-3	3	2	5	10	6	2	1	9
4-5	4	2	5	11	8	4	6	18
6-8	13	9	4	26	6	7	9	22
9-10	3	-	-	3	-	2	1	3
10-above	2	2	-	4	-	1	3	4
<b>Total</b>	<b>25</b>	<b>15</b>	<b>14</b>	<b>54</b>	<b>20</b>	<b>16</b>	<b>20</b>	<b>56</b>

**TABLE 5.35 DISTRIBUTION OF HOUSE HOLD ASSETS AMONG THE MEMBERS STUDIED**

Value (Rs.)	River banks			Projects		Farm Forestry		
	Binnaguri	Katha	Harinchawra	Total	Phansidewa	Naxalbari	Tufanganj	Total
0-5,000	-	4	8	12	-	-	-	-
5,000-10000	-	5	5	10	-	-	-	-
10000-15000	-	6	1	7	-	-	-	-
15000-20000	2	-	-	2	-	-	1	1
20000-25000	2	-	-	2	-	-	-	-
25000-99999	21	-	-	21	9	4	2	15
above 99999	-	-	-	-	11	12	17	40
<b>Total</b>	<b>25</b>	<b>15</b>	<b>14</b>	<b>54</b>	<b>20</b>	<b>16</b>	<b>20</b>	<b>56</b>

TABLE 5.36 shows that in case of river bank projects about 50 percent participant are in the income level of Rs. 750 and below per month whereas in farm forestry about 50 per cent are in the income level of Rs. 1500 and above per month.

Table 5.37 represent that about 84 per cent of household have less than 3 acres of land (as it is in case FPCs), 34 percent have less than one acre and 26 percent are landless in river bank projects. In case of farm forestry the picture is quite different- 45 percent have less than 3 acres of land and 18 percent have more than 10 acres.

**TABLE 5.36 DISTRIBUTION OF MONTHLY INCOME AMONG THE PARTICIPANT HOUSEHOLDS STUDIED**

Family Size	River banks			Projects		Farm Forestry			Total
	Binnaguri	Katha	Harinchawra	Total	Phansidewa	Naxalbari	Tufanganj		
0-250	-	-	-	-	-	-	-	-	-
250-500	-	2	2	4	4	1	2	7	
500-750	6	10	7	23	1	5	3	9	
750-1000	8	3	3	14	1	2	-	3	
000-1250	11	-	1	12	2	3	4	9	
1250-1500	-	-	1	1	1	-	-	1	
1500-1750	-	-	-	-	2	2	2	6	
1750-2000	-	-	-	-	-	1	1	2	
2000-9999	-	-	-	-	9	2	8	19	
<b>Total</b>	<b>25</b>	<b>15</b>	<b>14</b>	<b>54</b>	<b>20</b>	<b>16</b>	<b>20</b>	<b>56</b>	

**TABLE 5.37 DISTRIBUTION OF LANDHOLDINGS AMONG THE PARTICIPANT HOUSEHOLDS STUDIED**

Family Size	River banks			Projects		Farm Forestry			Total
	Binnaguri	Katha	Harinchawra	Total	Phansidewa	Naxalbari	Tufanganj		
Landless	-	1	13	14	-	-	-	-	
0-.99	-	3	1	4	1	2	2	5	
1-1.99	9	4	-	13	5	-	6	11	
2-2.99	10	4	-	14	2	3	4	9	
3-3.99	5	2	-	7	4	3	3	10	
4-4.99	1	1	-	2	1	-	-	1	
5-5.99	-	-	-	-	-	1	-	1	
6-6.99	-	-	-	-	1	3	1	5	
7-7.99	-	-	-	-	-	1	1	2	
8-8.99	-	-	-	-	-	-	-	-	
9-9.99	-	-	-	-	1	1	-	2	
10-ABOVE	-	-	-	-	5	2	3	10	
<b>Total</b>	<b>25</b>	<b>15</b>	<b>14</b>	<b>54</b>	<b>20</b>	<b>16</b>	<b>20</b>	<b>56</b>	

**TABLE 5.38 : INDEBTENESS POSITION OF THE SAMPLE HOUSEHOLDS STUDIED**

Name of the Projects	No. of households		Amount of loans				Purpose of loans					Sources of loans			Total
	Having loans	Having no loans	Less than 1000	1000-1500	1500 & above	Agriculture/ forestry	Domestic needs	Business	Input	Cattle	Cooperatives	Banks	Panchayat IRDP, DRDA etc	Money lender	
Binnaguri	17	8	-	-	17	17	-	-	-	-	-	-	17	-	
BaraAtharaKotha	2	13	-	-	2	-	2	-	-	-	-	-	2	-	
Harinchawra	3	11	2	-	1	-	-	1	-	2	-	-	3	-	
<b>Total</b>	<b>22</b>	<b>32</b>	<b>2</b>	<b>-</b>	<b>20</b>	<b>17</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>22</b>	<b>-</b>	<b>22</b>
Phansidewa	2	18	-	2	-	1	1	-	-	-	-	-	2	-	
Naxalbari	2	14	2	-	-	2	-	-	-	-	1	-	1	-	
Tufanganj	11	9	4	4	3	3	5	2	-	-	2	-	7	2	
<b>Total</b>	<b>15</b>	<b>41</b>	<b>6</b>	<b>6</b>	<b>3</b>	<b>6</b>	<b>6</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>-</b>	<b>10</b>	<b>2</b>	<b>15</b>

TABLE 5.38 represent the indebtedness position with amount of loans, purposes and sources of loans in details of the sample households. 41 percent of the sample households are having debts, out of which a sizeable proportion of them have borrowed for either agriculture or forestry (77%), and the major source of that loan is Panchayat ie. in the form of DRDA or IRDP etc in case of riverbank projects. The forest officials helps to get the loan for forestry purpose to motivate people in social forestry projects. In case of farm forestry only 27 per cent have taken loan and that is also mainly for business or domestic purposes. However, in both the cases Panchayat is the main credit supplier in the rural areas.

TABLE 5.39 DEMAND FOR FUELWOOD PER HOUSEHOLDS STUDIED

Name of the Project	Averaged demand for fuelwood	Source	
		Before Project	After Project
Binnaguri	237	Illegal Felling	Project
Bara Athara Kotha	82	Market	Project
Harinchawra	146	Market	Project
Phanshidewa	304	Market	Project market.
Naxalbari	262	Market	Project market.
Tufanganj	323	Market	Project Market

TABLE 5.40 AVERAGE TIME (HOUR) SPENT BY FEMALE MEMBERS

Name of the Project	Averaged time spent by female members to collect fuel wood ( in hour)
Binnaguri	2-3
Bara Athara Kotha	Less than 1
Harinchawra	1-2
Phanshidewa	nil
Naxalbari	1-1 <sup>1</sup> / <sub>2</sub>
Tufanganj	Nil

Note : Fuelwood collected by hired labour is not included.

Fuelwood collection by female members is related to caste, economic status of family.

## APPENDIX

TABLE A-1 NORMS ADOPTED\* IN ESTIMATING BENEFITS IN SOUTH WEST BENGAL

A Items	Months	Average benefit in quantity available per Ha per annum**	Rate (Rs.)
1. Dry leaf cartload	Dec-Feb	220-250 cartload	Rs. 3/
2. Green leaf (Thali)	April-Sept.	65000-70000	Rs. 15/1000
3. Kedu <sup>++</sup> leaf (Biri)	Feb-March	40000-50000	Rs. 7.50/1000
4. Mahua <sup>++</sup> flower/seed	Mar-Apr/ July-Aug	80-100 kg	Rs. 12/kg
5. Mushroom	July-Sept.	25-30 kg	Rs. 40/kg

B Species	Lifespan	Average yield	Rate(Rs.)	Yield of	Rate(Rs)***	Timber/ Pole
	Assumed of usufruct/ Tree/Annum**			of fuelwood/ Tree when Tree is felled		
1. Eucalyptus <sup>+</sup>	20 years	3-10kg	.60	150 kg.	.60	2 pole 200/ pole
2. Akashmani	20 years	6-40 KG	.60	500 KG	.60	15cft 150/cft
3. Cashew	40 years	5-20 kg (raw fruit)	70/kg.	250 kg.	.60	-

\*Based on norms given by different forest officials as well as the village level data obtained at the time of survey.

\*\*Variations in the yield of usufruct has been considered as it varies according to the age of the tree.

\*\*\*Fuelwood rate, as I get at the time of survey at different projects, varies from .60-1.00 but I consider the least ie. .60 to under estimate the benefit.

+ In case of eucalyptus, I assumed output will be harvested two times during its life span ie, 1st harvest when trees become 10 years old and 2nd and final when coppices became old of 10 years again.

++ Mahua and Kend are banned by Government from felling so Timber value or usufruct for fuelwood has not been considered here.

## APPENDIX

**TABLE A-3 NORMS ADOPTED\* IN ESTIMATING DIFFERENT TYPES OF BENEFITS IN  
NORTH BENGAL**

Species	Life span	Average yield of usufruct/ Tree/Annum**	Rate(Rs.)	Average <sup>+</sup> Yield of fuelwood per tree when tree is felled	Rate(Rs.)	Average <sup>++</sup> Timber/ Yield/ Tree	Rate <sup>+++</sup> (Rs.)
1. Sisso	40 years	5-8 kg.	.60-80	500-700kg.	.80-1	40-60 ft	150-250/ cft
2. Teak	40 years	-	-	350-500 kg.	.80-1	50-60cft	200-300/ cft
3. Gamar	40 years	5-10kg	.60-80	300-400kg	.80-1	35-55cft	250-300/ cft
4. Akashmani	20 years	5-10kg	.60-80	200-250kg	.80-1	15-20cft	100-150/ cft
5. Kadam	15 years	2-5kg	.60-80	100-150kg.	.80-1	30-40cft	40-50/ cft
6. Khair	40years	-	-	-	-	30-35cft	100-150/ cft
7. Chikrashi	40years	3-8kg.	.60-80	400-500kg	.80-1	60-75cft	100-150/ cft
8. Ghoraneem	15 years	4-8kg	.60-80	100-150kg	.80-1	30-40cft	60-80/ cft
9. Minjiri	15years	5-20kg	.60-80	800-1000kg	.80-1	-	-
10. Sirish	40years	4-8kg	.60-80	300-400kg	.80-1	50-60cft	200-250/ cft
11. Simul	40years	-	-	500-700kg.	.80-1	150-200cft	50-60/ cft
12. Eucalyptus	20years	3-5kg	.60-80	100-150kg.	.80-1	2poles	200/ poles

Note: \*Based on norms given by the forest officials as well as our own figures recorded as per the projects level data obtained at the time of our survey.

\*\*I have assumed variations in the yield of usufruct (mainly dryleaf, side branches and seeds in case of Akashmani), since it varies according to age of the tree.

\*I have assumed variations in the yield of fuelwood per tree when tree is felled since it varies according to soil, space, maintenance, tending, thinning etc.

\*\*I have assumed variations in the yield of timber per tree since it varies according to soil, space maintenance, tending, thinning etc. from project to project.

\*\*\*I consider the minimum rate to outweigh the extraction cost but market rate is much higher.

TABLE A-2 COMPOSITION OF COST AND BENEFITS (PER CENT)  
(Based on Discounted Present Values)

Items	FPCs																					
	Karapara			Asna-Path-Indkuri			Suribank			Bansraya			Sumaidihi			Birkham			Dharagram			
Discount rates (Percent)	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	
A. Costs																						
1. Initial	0.70	0.8	1.0	0.2	0.3	0.4	2	6.6	28.3	27.8	0.3	0.4	0.6	0.1	0.2	0.3	24.0	25.9	25.2	23.3	25.9	24.4
2. Recurring cost with-																						
out opportunity cost	67.6	63.8	60.5	87.5	85.4	83.2	37.4	35.1	34.5	76.8	73.4	70.1	67.0	62.9	58.9	45.3	42.7	43.5	43.2	40.7	41.5	
3. Opportunity cost	31.7	35.4	38.5	12.3	14.3	16.4	36.0	35.6	37.7	22.9	26.2	29.3	32.9	36.9	40.8	30.7	31.4	31.3	33.5	34.3	34.1	
4. Total Cost	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	
B. Benefits																						
1. Fruits/Flower	-	-	-	8.9	9.2	9.8	77.5	75.0	66.6	9.3	9.6	10.0	8.6	9.0	9.5				-	-	-	
2. Firewood	28.3	27.9	27.4	25.3	24.7	23.9	8.1	9.3	12.4	17.9	17.8	17.7	21.8	21.1	20.2				21.1	22.4	22.9	
3. Salleaf (Thali)	17.6	18.4	19.8	22.3	23.1	24.4	-	-	-	22.9	23.4	24.4	21.4	22.1	23.3				-	-	-	
4. Kend leaf	8.8	9.2	9.8	-	-	-	-	-	-	7.0	7.2	7.5	6.5	6.7	7.1				-	-	-	
5. Mashroom	17.6	18.4	19.8	22.3	23.1	24.4	-	-	-	22.9	23.4	24.4	21.4	22.1	23.3				-	-	-	
6. Poles	27.7	26.1	23.2	21.2	19.9	17.5	14.4	15.7	21.0	20.0	18.6	16.0	20.3	19.0	16.6				10.6	11.2	12.1	
7. Timber	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				68.3	66.4	65.0	
8. Total benefits	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)				(100)	(100)	(100)	

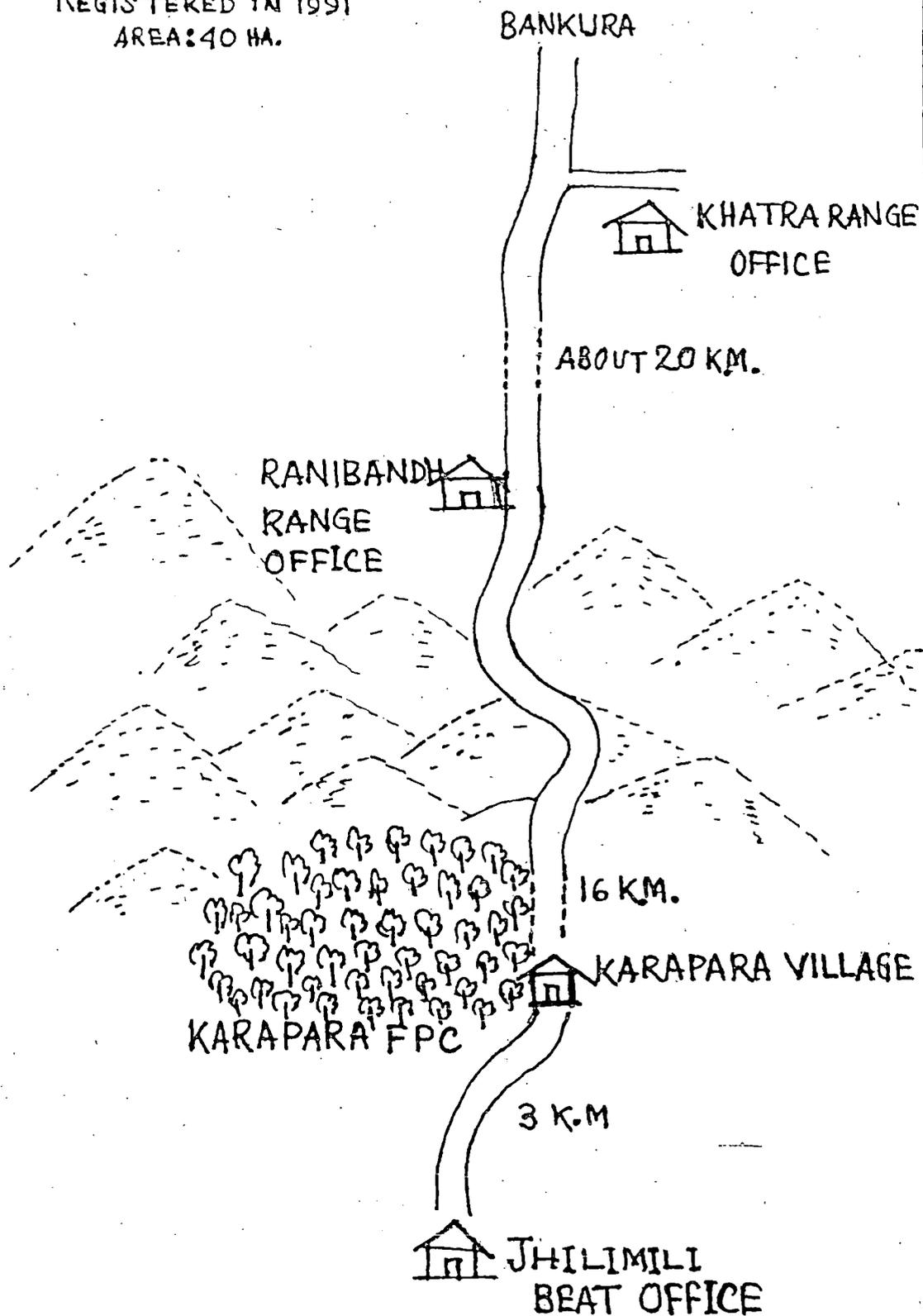
TABLE A-4 : COMPOSITION OF COSTS AND BENEFITS (PER CENT)

(Based on Discounted Present Values)

Items	Riverbanks Projects									Farm Forestry									
	Binnaguri			BaraAtharaKotha			Harinchawra			Phansidewa			Naxalbari			Turanganj			
Discount rates (Percent)	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	4	6	4,6,9	
A. Costs																			
1. Initial	7.6	11.2	14.6	16.9	22.9	26.5	16.1	22.1	25.9	6.0	9.2	12.6	3.7	5.6	8.0	5.8	8.0	9.1	
2. Recurring cost	92.4	88.8	85.4	83.1	77.1	73.5	83.9	77.9	74.1	94.0	90.8	87.4	96.3	94.4	92.0	94.2	92.0	90.9	
3. Total cost	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	
B. Benefits																			
1. Firewood	4.5	5.3	7.0	18.0	23.2	39.1	18.7	23.7	38.9	3.7	5.0	8.5	4.3	5.3	7.7	3.4	4.4	6.2	
2. Pole	2.6	2.9	3.9	4.8	7.3	16.0	4.9	7.4	16.3	0.8	1.1	2.3	0.9	1.3	2.3	0.3	0.4	0.7	
3. Timber	92.9	91.8	89.1	77.2	69.5	44.9	76.4	68.9	44.8	95.5	93.9	89.2	94.8	93.4	90.0	96.3	95.2	93.1	
4. Total benefits	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	

# FIG. A.1 : MAP OF KARAPARA FPC UNDER JHILIMILI BEAT, RANIBANDH RANGE.

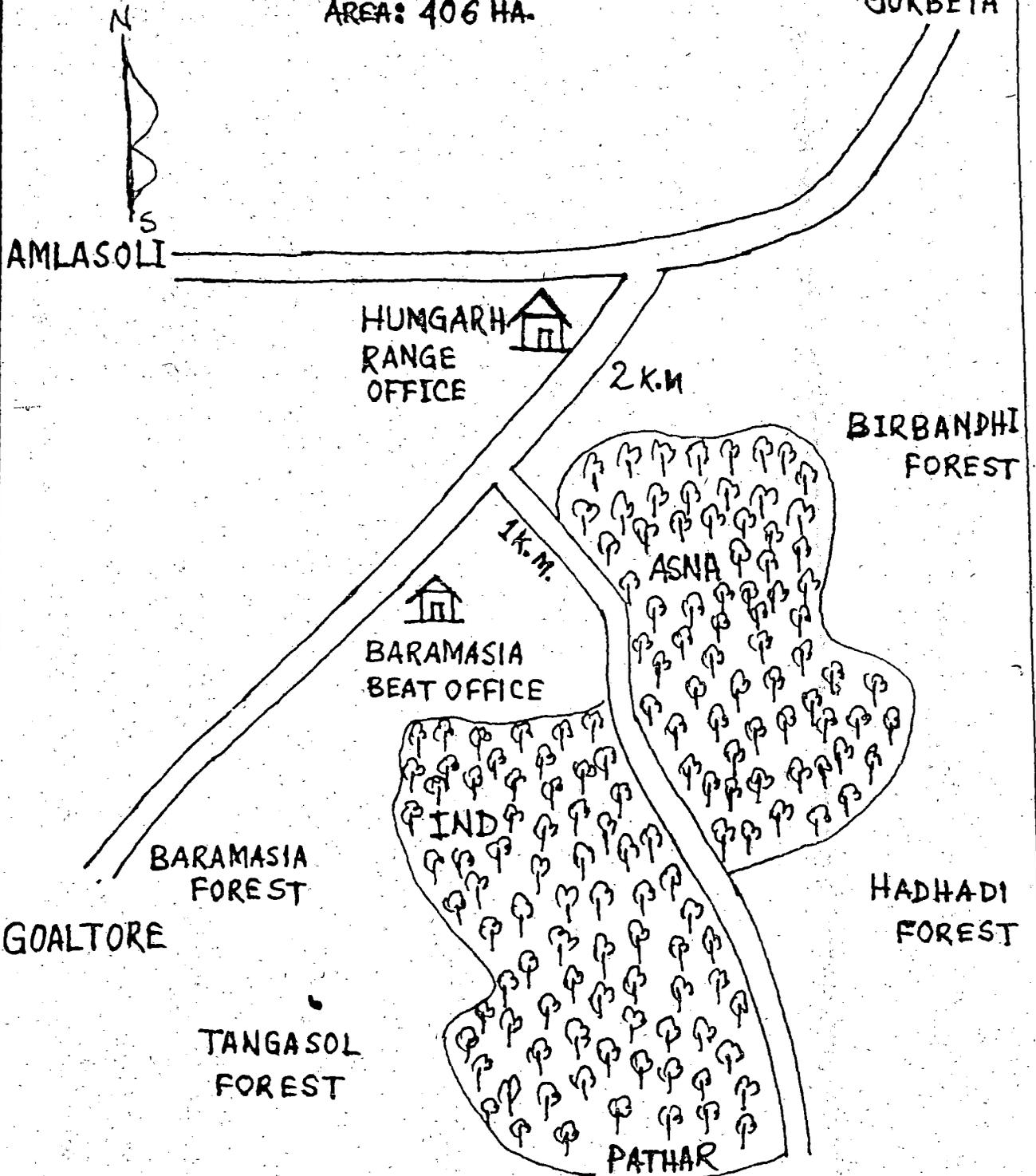
REGISTERED IN 1991  
AREA: 40 HA.



# FIGA-2 LOCATION OF ASNASOLI-PATHARMARI-INDKURI FPC

REGISTERED IN 1991  
AREA: 406 HA.

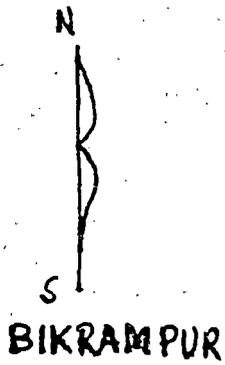
GORBETA



FIGA-3 MAP OF SURIBANKA FPC UNDER AMLASOLI BEAT, HUNGARH RANGE

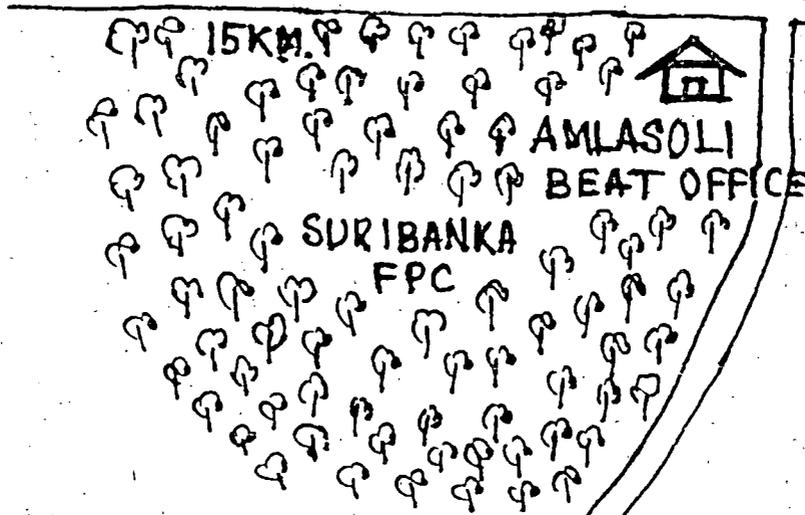
REGISTERED IN 1991

AREA : 101.59 HA.



SURIBANKA VILLAGE

HUNGARH



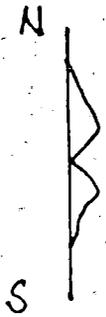
AMLASOLI FOREST

AMLASOLI-KANTI MAKLI ROAD  
15KM.

TESKONA

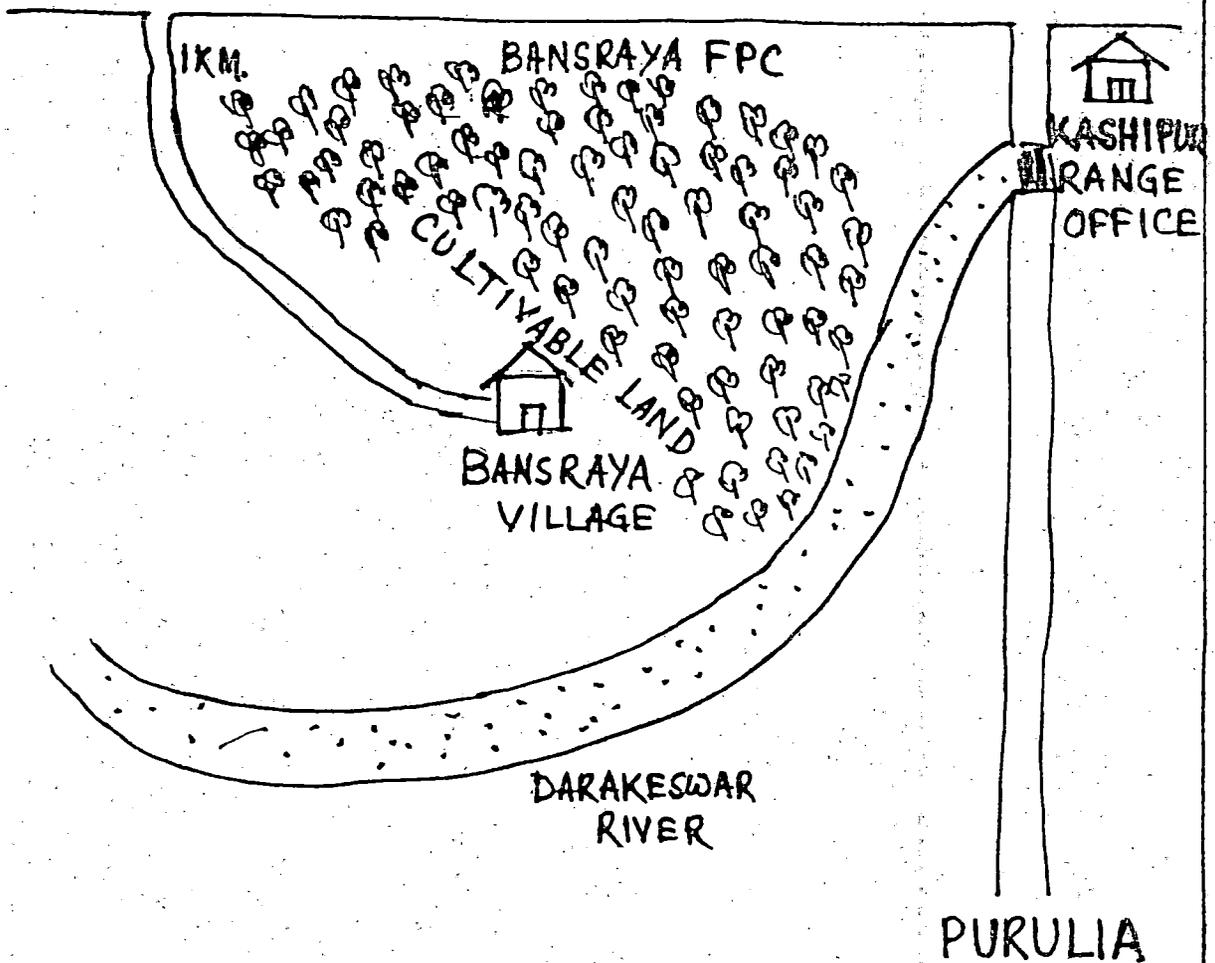
# FIG A-4 LOCATION MAP OF BANSRAYA FPC UNDER KASHIPUR BEAT & RANGE

REGISTERED IN 1991  
AREA: 232.72 HA.



5 KM

ADRA

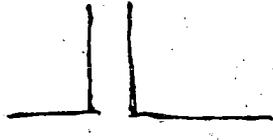


# FIG A-5 SUMAIDIHI FPC UNDER KASHIPUR RANGE & BEAT

REGISTERED IN 1991  
AREA: 177.33 HA.



ADRA



KASHIPUR  
RANGE OFFICE

6 K.M.



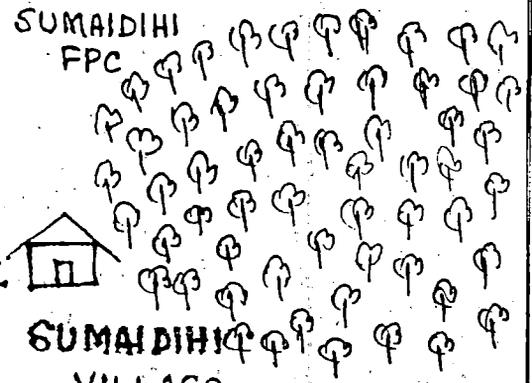
GAMARKURI  
VILLAGE

TUSHARDIHI

2 KM



SUMAIDIHI  
VILLAGE



BARADIHA

PURULIA

HURA

FIG A-6 LOCATION MAP OF BIRKHAM FPC UNDER  
KHATRA RANGE & BEAT (BANKURA SOUTH)  
REGISTERED IN 1990  
AREA : 61.96 HA

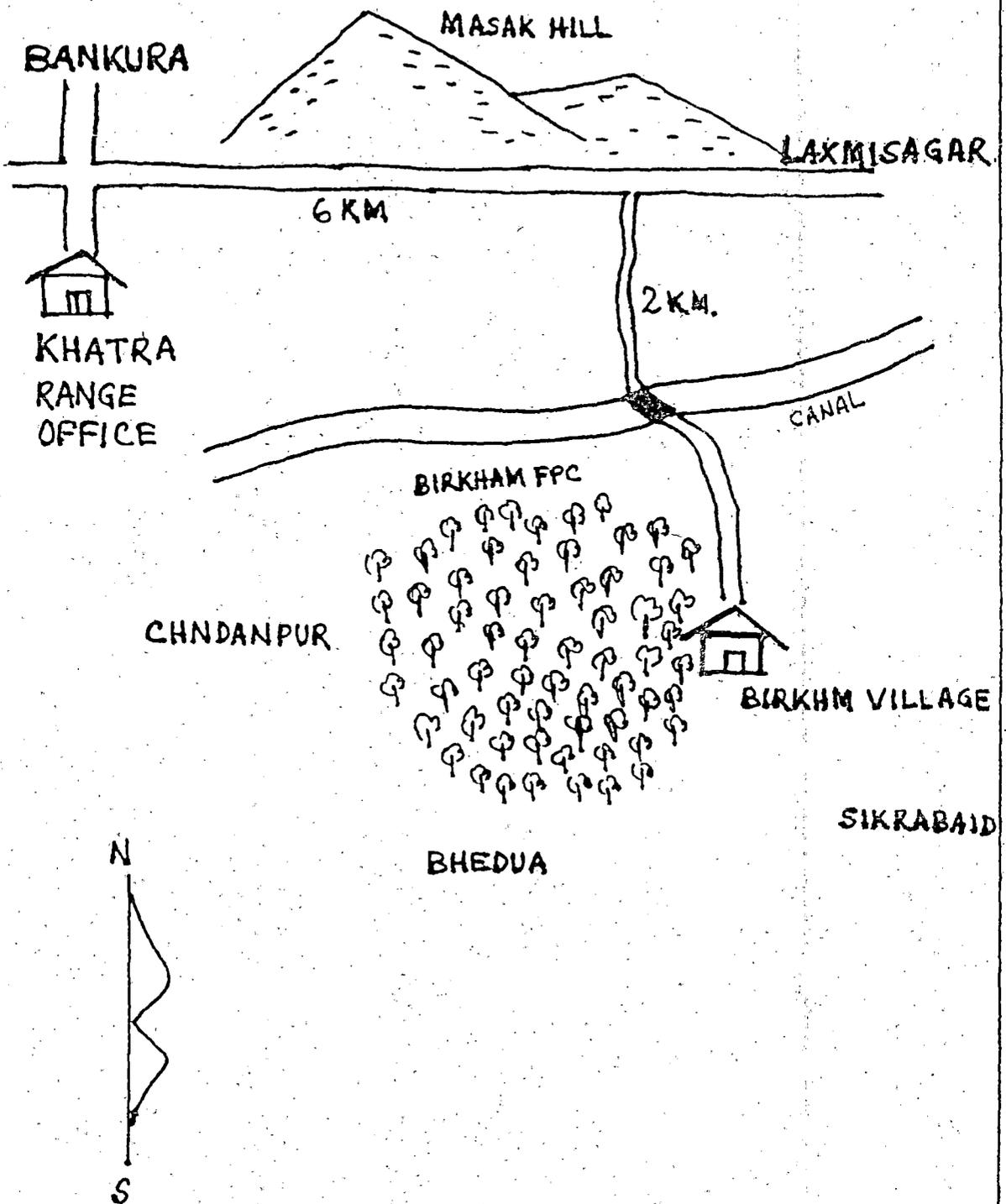
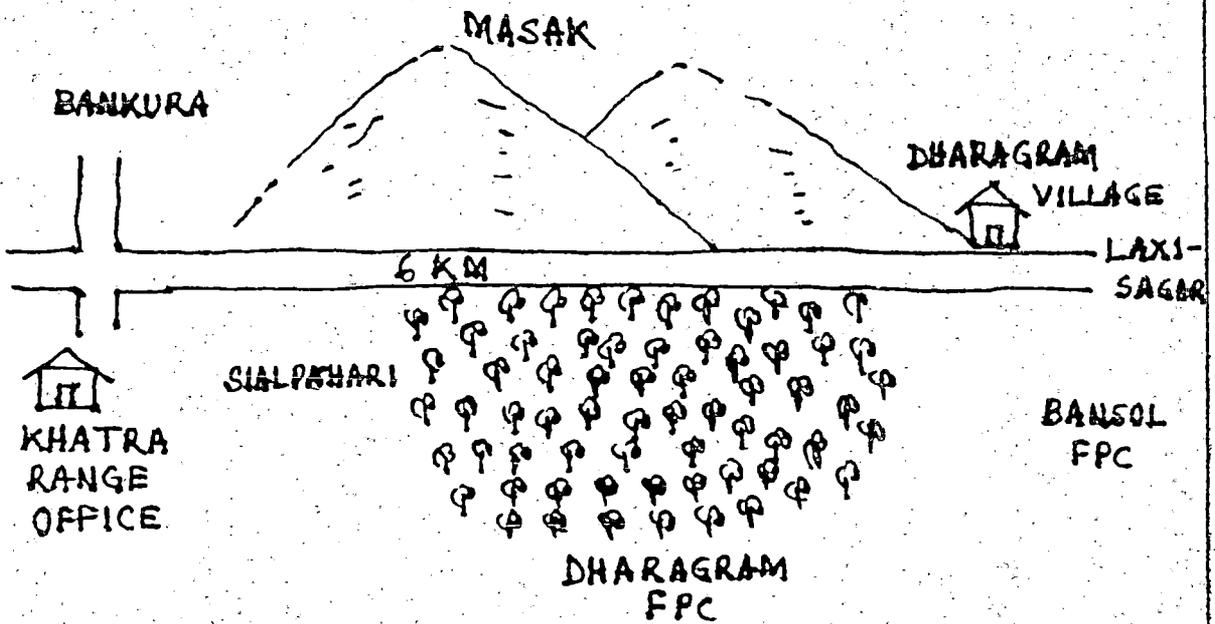


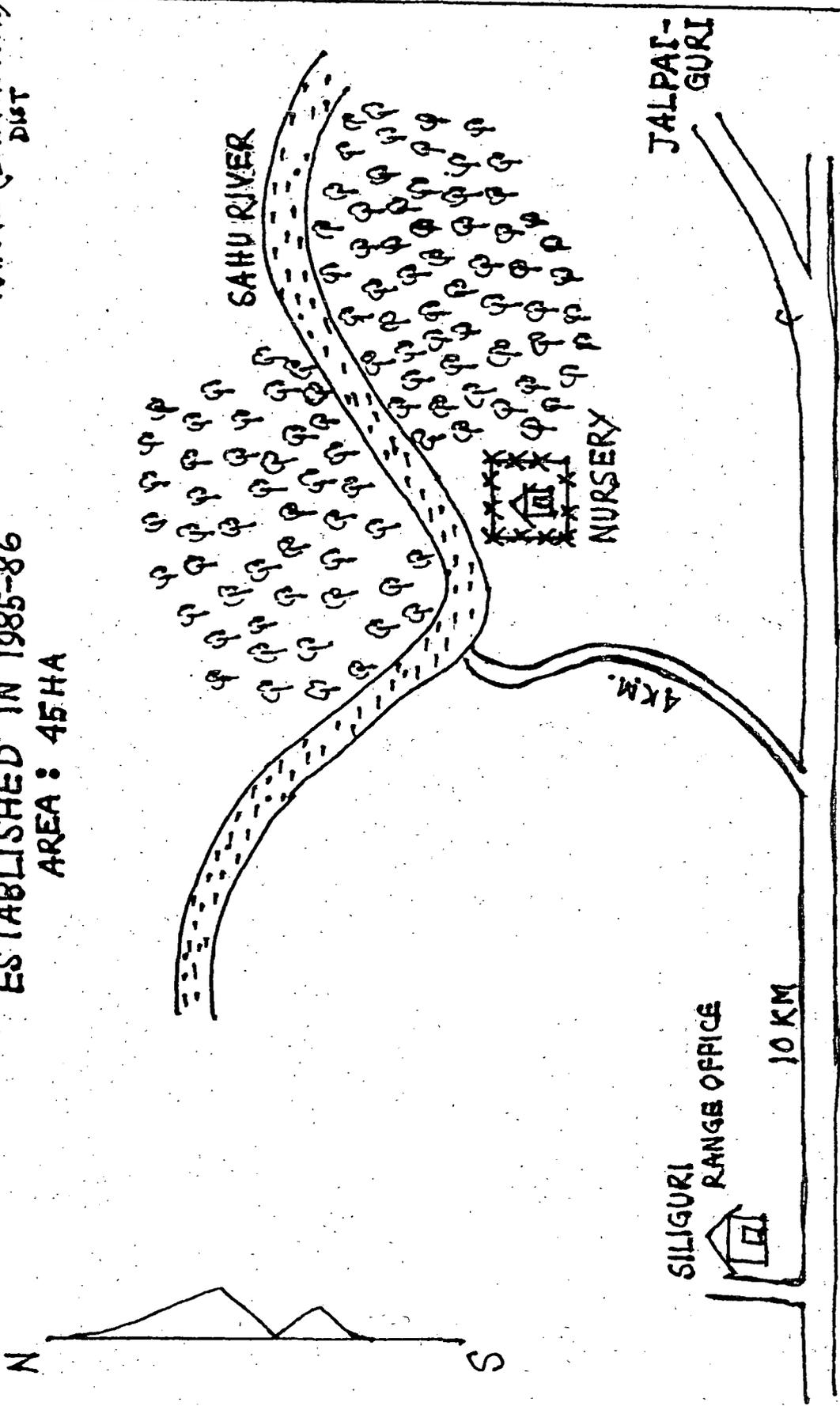
FIG. A-7 LOCATION OF DHARAGRAM FPC UNDER KHATRA BEAT & RANGE (BANKURA SOUTH)

REGISTERED IN 1990  
AREA : 63.33 HA.



**FIG. A-8 LOCATION OF BINNAGURI RIVERBANK PROJECT UNDER SILIGURI RANGE (JALPAIGURI) DIST**

**ESTABLISHED IN 1985-86  
AREA : 45 HA**



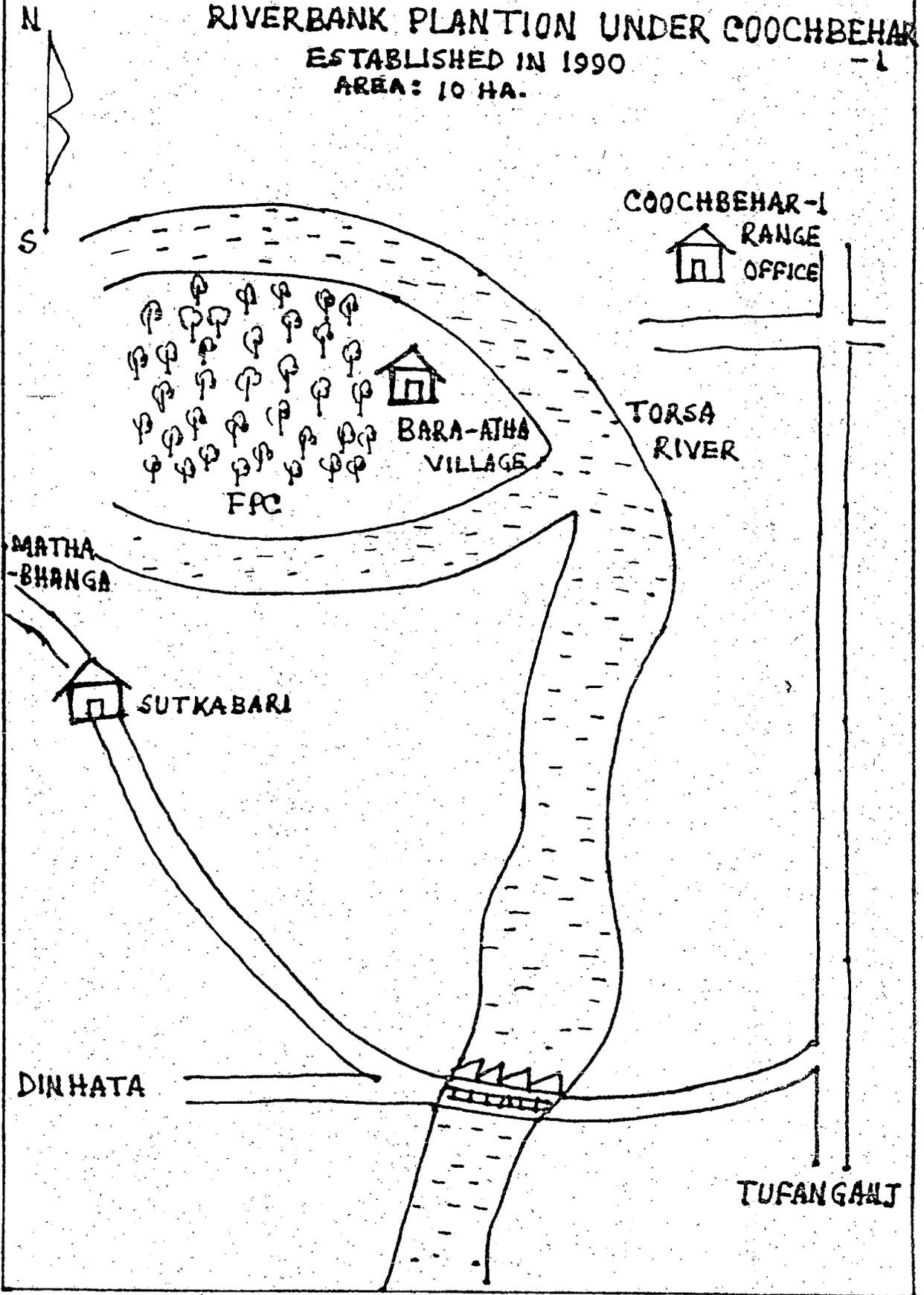
# FIG.A-9 LOCATION MAP OF BARA-ATHARKOTHA

RIVERBANK PLANTION UNDER COOCHBEHAR

ESTABLISHED IN 1990

AREA: 10 HA.

- 1



# FIG.A-10 LOCATION MAP OF HARINCHAWRA RIVER-BANK PLANTATION UNDER COOCHBEHAR

ESTABLISHED IN 1989

AREA: 10 HA.

