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Bengal, India**

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March 2009

Online at <https://mpra.ub.uni-muenchen.de/33447/>

MPRA Paper No. 33447, posted 16 Sep 2011 10:16 UTC

# **Sustainable Rural Livelihoods under Joint Forest Management (JFM) Programme: An Evidence from West Bengal, India**

Published in *Artha Vijnana*, Gokhale Institute of Politics and Economics, Poona, Vol LI, No .1, March 2009, pp.59-84.

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*The objectives of this article are to assess linkages and impact of participatory JFM Programme on Sustainable Rural Livelihoods (SRL) across socio-economic group of forest fringe communities. The study is based four sample FPCs – one female FPC and three joint FPCs - under Midnapore and Bankura districts in West Bengal. The results from this study suggest that the JFM Programme under the sample FPCs/Villages in West Bengal is participatory. With regard to the SRL framework, strong sustainability criteria meet for very poor and poor households, which live below poverty line and are dependent on forest resource for their livelihood security. The study suggests that force or law cannot effectively control illegal collection of TFPs for the households living below poverty line, until a considerable increase in the collection of legal forest products – NTFPs, fuelwood etc. – and wage income from forest provide for their minimum livelihood security.*

## **Introduction**

In order to protect natural forests from further degradation owing to mere commercial exploitation of forest resources, participatory programme in forest management is fundamentally a decentralized grassroots movement initiated by forest communities. Decentralized community participation between the state and local communities has been globally accepted as a concept and essential tool for the sustainability of natural resources. In keeping with this, a consensus has also emerged in both academic and policy-making bodies about the desirability of decentralized participatory model for the management of forest resources. Concerning decentralized planning and participatory programme in JFM (Joint Forest Management), it is said that forestry can play a significant role for the well being of the people living in and around the forest areas and, conversely, these people can play a major part in making the forests around them more productive under local management partnership between the state and local communities. The World Bank Learning Group on Participatory Development defined participation as process through which stakeholders' influence and share control over development initiatives, and the decisions and resources that affect them (World Bank, 1995:3). The new policy lays emphasis on meeting the local needs in particular of the tribal and the rural poor living near the forest and in safeguarding their traditional rights and concessions subject to the carrying

capacity of the forests. To pave the way for this programme, the concept of participatory forest management programme closely tied with sustainable livelihood (SL) framework of forest fringe communities is increasingly being accepted as a viable tool of decentralized participatory forest management programme because the SL framework emphasizes livelihood assets, or capital, as the basis for the sustainable improvement of people's livelihoods without undermining the forest resource base. SL framework refers to 'a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base' (Carney, 1998:4, cited in Reddy *et al.* 2004:299). The participatory programme of forest management with SL framework has been treated as the best alternative among the multiple criteria of forestry programme because it seems to serve the two main pillars of sustainability – equity and efficiency/productivity: this programme is entitled to the livelihood sustenance issue of the forest fringe communities by giving them the right on timber forest products and non-timber forest products on forest resources on the one hand, the need for plantation and afforestation concentrated on ecological sustainability has been given emphasis on the other.

In most of the developing countries during the last one and a half decade, there has been a shift from revenue oriented forest management to conservation and that is related to participatory community based approaches (Bhattacharya, 2001: 107). The main trends of the forest policies in the developing countries include replacement of uncontrolled exploitation, selected areas with conservation of forest, more plantations and community and social forestry, sharing of benefits with the forest dependent communities, involving communities and the management of forests, and encouraging communities to participate to some extent in decision-making (*ibid*: 107). However, some countries such as Thailand, Nepal and India recognize effective participation by local people in the forest consistent with government policies.

In India, evidence of earliest forest management by the state is found in Kautilya's Arthashastra (BC 321) which refers to 'forests' being managed as 'state reserves for revenue' and for 'public use' (Sarmah and Rai, 2000: 209). But, indeed, no rulers in India did execute these policies in the management of forest resources before 1988. Rather, the forest policy of India before the year 1988 was oriented with commercial need either of the government or of the rulers of India without safeguarding the traditional rights and concessions of the forest fringe communities on forestland. Although the first Act of forestry in India was enacted in 1865, the major laws governing forestry have formulated by the Indian Forest Act of 1878, Indian Forest Act of 1927 and the Forest Conservation Act of 1980 (World Bank, 2006: xvi). The Forest Conservation Act of 1878 and that of 1927 emphasized commercial timber production. The Forest Conservation Act of 1980 and the 1988 National Forest Policy shifted the

pendulum strongly towards forest conservation and joint forest management (ibid: 16-18). The revision of the National Forest Policy in 1988 marks a major departure from the earlier policies which emphasize on production of commercial wood and disregard for local need (Poffenberger, 1995; Sarmah and Rai, 2000: 213), because Government of India, then, could understand that until and unless the benefit of forest fringe communities is secured, neither forest resources nor forest management can be sustainable.

However, against the custodian forest management system (commercial need either of the government or of the rulers of India), in keeping with the other parts of India, the local forest fringe communities of West Bengal have also mobilized repeatedly from long past to protect their traditional right on forestland (Poffenberger, 1995). With regard to the south West Bengal (Midnapore, Bankura, Purulia, Burdwan and Birbhum), including our study area, is concerned, *Santal*, *Bhumij* and *Mahato* tribal, with some low cast Hindus, mobilized repeatedly against *Mughal* and *British* rulers to protect their traditional rights on forestland from long past. *Chur Rebellion* (from 1767 to 1805), *Naik Revolt* (1806-16), *Hul Rebellion* (1855) are the glaring examples of the history in south West Bengal where forest fringe communities organized resistance against rulers of India to protect their own right in forestland. It is said that during *Hul Rebellion* (on July 16, 1855) some ten thousand tribal, under the messianic leadership of four Santal brothers stood their ground firmly and fought with bows and a kind of battle-axe in a battle near *Pirpaiti* (Dutta, 1940: 26). The revolt collapsed eventually after half their members were reportedly killed. Despite their defeat, the *Hul Rebellion* (as it is known among the Santal) profoundly influenced the ideological development of many Santal communities (Duyker, 1987: 35), and lives on in the songs and oral traditions of the tribal people of this area.

The JFM movement gathered momentum in West Bengal when in 1989 a programme of resuscitation and reestablishment of *moribund sal* and other hardwood forests in the districts of Midnapore, Bankura, Purulia, Burdwan and Birbhum in south West Bengal was initiated by the government with the active participation and involvement of the local people. Simultaneously, a Government resolution was also issued in 1989 declaring the principles of sharing of duties, responsibilities as well as the usufructs from the forests, with the participant local people living in the fringe of the forests. West Bengal Government' JFM resolution in June 1989 for the first time specifies the rights of the protecting communities with the help of establishing Forest Protection Committees/Village Forest Committees over forest lands through their active participation in the protection and development of forest lands. The foundation of an innovative forest protection system and the participatory forest management was thus laid for the forests of south West Bengal which cover approximately 38 per cent of the total forest area of the State. While mentioning the success of JFM programme in West Bengal, State Forest Report (2000) clearly mentions: "As a result of participatory and joint forest management activities in south West

Bengal the vast tract of scattered, over-exploited and degraded forests containing mainly the sal were resuscitated and restored to productivity with great improvement in quality and density” (SFR, 2000: 47). These participatory activities are now progressing in other areas of the state as well.

In this perspective, the main objectives of this article are to assess the linkages and impact of participatory initiative of JFM Programme on Sustainable Rural Livelihoods (SRL) across socio-economic group of forest fringe communities in four sample FPCs (Forest Protection Committees) – one female FPC and three joint FPCs - under Midnapore and Bankura districts in the state of West Bengal of India. This empirical study is important in that it might help us examine whether, unlike earlier forest policies which emphasize on production of commercial wood and disregard for local need, the 1988 Forest Policy of India and West Bengal has been effective in meeting the local needs in particular of the tribal and the poor living near the forests and in safeguarding their traditional right and concession subject to the carrying capacity of forests. The article is organised as follows: Introduction is followed by the conceptual framework and approach (Section 2). The data set, the profile of the sample villages and an analysis of the impact of the JFM programme on rural households in terms of five capital assets based on findings of this study appear in Section 3. Policy model appears in Section IV. The conclusions are contained in the final section (Section IV).

### **Conceptual Framework and Approach**

Participation is a dynamic process through which stakeholders influence and share control over development initiatives and the decisions and resources that affect their livelihood (Banki, 1981, World Bank, 1996). The Sustainable Rural Livelihoods (SLR) model looks at the basic dynamics of livelihoods and people draw on a set of capital assets as a basis for their livelihoods. Davies (1996) presents a detailed understanding of the dynamics of the livelihoods of the poor in relation to food, because they respond to highly viable conditions (natural and human) that confront them. Davies’ conceptual framework is based on five key ideas – livelihood systems and security, Entitlement, Vulnerability, Resilience and sensitivity, Livelihood system diversity – which can be expanded to broader issues of sustainable livelihoods, depending on the different ways people acquire access to food (p.15). SRL framework of JFM programme allows us examine and assess the impact from many angles when compared to the earlier approaches to assessing costs (expenditure per unit etc.) and benefits (income to landed and employment to landless) not in a wider sense (Reddy, 2000; Rao, 2000; Farrington et al., 1999). But SRL framework indicates the sustainability of the programme in the long run, which is not possible in the earlier approaches (Reddy and Soussan, 2004:331). Without following the traditional methods of employment generation and target group programmes, SL framework provides new ways to address poverty issues which are examined in relation to five capital

assets – physical, financial, natural, human and social. The understanding of these concepts can be gained by looking at them in relation to entitlement theory (Sen, 1982, 1985 cited in Reddy et al., 2004:299-300). The livelihood assets, with their perspective, can be seen as a capability or a potential that can be deployed to undertaking or ‘invested’ livelihood activities. They are not uniform in character; but they influence the viability of livelihood activities.

Although five capital assets are assumed complementary to each other, especially, natural capital has a pivotal role in the livelihoods of rural people: predominantly the poor in the world depend directly on natural resources through cultivation, herding, collecting or hunting for their livelihoods. Therefore, the natural resources must be sustained for the livelihoods to be sustained (Rennie and Singh, 1996:16; Reddy et al, 2004:300). SLR can be termed as strong SLR – improvement in all the five capitals and less dependence on other activities – and weak SLR – improvement in some of the capitals and high dependency on other activities (for example, activities that are highly related to transitory or casual income). But improvement on each of these capitals is in turn dependent on various indicators.

The following indicators of capital assets are used for SRL framework in the present context. Physical capital is measured in terms of households’ possession of durable assets (excluding land) such as house, machinery, livestock, and so on. Forest related structures reflect the physical capital (for example, non-timber forest product based production enterprises) created at the household and village level under the JFM programme. Increases in natural capital are measured in terms of changes in access to or improvement in land, water, and other common pool resources, (CPRs) - for example, use of fodder from CPRs and time spent in fetching it from forest is taken as a measure of improvement in CPRs. Natural capital is essentially a flow – the availability of productive potentials as inputs into livelihood activities that appears from the dynamics of ecosystem functioning (Reddy et al, 2004:201). Education, health and skills are the main elements of human capital. As regards direct measurement of human capital is concerned, changes in education and medical expenditure can capture variation within households/communities. Social capital is ‘the institutions, relationships, attitudes, and values that governs interactions among people and contribute to economic and social development’ (World Bank, 2002:2). Social capital is represented by collective action, institutional strength, equity, information, education, economic status and demographic characteristics (Krishna and Uphoff, 1999 ; Reddy et al., 2004 ; World Bank, 2002). These measures are ones that can be more easily asserted and more, pertinently, linked directly to JFM as a part of the process (such as decision made by all in JFM, women’s participation in decision making) or as a factor that JFM seeks to influence (such as equity in benefit flows). All the indicators of social capital that have direct influence on JFM can be assessed and the changes of these have a long-term nature. It also helps in assessing the nature of participation of the people in the JFM Programme. Financial capital is measured in terms of savings (that part of cash

income that is not used for consumption) and/or social payments. Improvements to financial capital are usually assessed in terms of sustainable increase in income potentials, given the difficulties in obtaining accurate information on savings (something that people are understandably reluctant to talk about).

Improvement in all the five capitals could be termed 'strong SRL (Sustainable Rural Livelihood), while improvement in some of the capitals that at least compensate for any decline in other capitals could be termed weak SRL (Reddy et al., 2004:300). As mentioned earlier, although these five capitals are complementary to one another, natural capital, especially, has a pivotal role in the livelihoods of rural people. Improvements in each of these capitals are in turn dependent on various indicators. The following functional form expresses these linkages:

$$SRL=f(\delta PC, \delta NC, \delta SC, \delta HC, \delta FC, \delta Y_{oth})$$

Where SRL=Sustainable Rural Livelihoods;  $\delta PC$ =Change in physical capital;  $\delta NC$ =Change in natural capital;  $\delta HC$ =Change in human capital;  $\delta FC$ =Change in financial capital;  $\delta Y_{oth}$ =Change in income from other activities.

SRL is defined as strong if change of each type of capital is greater than zero (i.e.,  $\delta PC > 0$ ,  $\delta NC > 0$ ,  $\delta SC > 0$ ,  $\delta HC > 0$ ,  $\delta FC > 0$ ) and the change of income from other sources is less than or equal to zero ( $Y_{oth} \leq 0$ ), SRL is defined as weak SRL if  $(\delta PC + \delta NC + \delta SC + \delta HC + \delta FC) > 0$  and  $\delta Y_{oth} > 0$ .

This study considers the following factors affecting five types of capital related to forest resource.

$$PC = f(A)$$

$$NC = f(CPR)$$

$$SC = f(Ca, Ins, Eq, Oth.)$$

$$HC = f(H, Ed)$$

$$FC = f(S)$$

Physical capital (PC) depends on various assets (A) of household possession such as house, machinery, livestock and so on. Our study considers non-timber forest product (NTFP) based production enterprises' assets of households that mainly depend on forest for their livelihood (L). Natural capital related to JFM programme under our study is measured in terms of changes in access to or improvements in forest as common pool resources (CPR). The improved quality and quantity of common lands is reflected in the availability of fodder (f) fuelwood (Fu), NTFPs (Non timber Forest Products), TFPs (Timber Forest Products). So, CPR depends on f, Fu, NTFPs and TFPs. Social capital is dependent on collective action (Ca), Institutional strength (Ins), Equity (Eq) and Others (Oth.). Oth. includes number of sources of information, education, economic status and demographic characteristics. Human capital is related to Health (H) and educational expenditures of households (Ed). Improvements of financial capital are a function of saving (S). But because of the difficulties in

obtaining accurate information on saving for the reluctance of the members of households to talk about it, improvement of financial capital are assessed in terms of sustainable increase of income (Y) of households (Ibid: 301). Then, S depends on Y. All these activities are expected to play the key roles for sustainable rural livelihoods (SRL) through participatory initiative of JFM Programme.

The major problems in measuring these indicators are the level of measurement (household/village/community/group), types of statistical information (variable/attribute), difficulties in ascribing the changes to a particular programme (like JFM Programme) from other variables (Programmes) influencing these changes, unit of measurement (for example kilograms/days/standard cattle). To some extent, these problems or limitations can be dealt with through the adoption of appropriate techniques of data generation and estimation procedures. An appropriate baseline survey of the households would contribute to capture the changes better. But such baseline data set are often not available; the problem in such cases is that we cannot observe the participating households without observing the programme at the same time. This is the major loophole of this study. One way of handling this problem is to have a control group, which is similar to the participating group in all respects except the programme in order that the control group may act as the counterfactual of the participating group. But it is difficult to find such a matching group because there is hardly any forest area, which is functioning without JFM programme in the area we surveyed. Even the recent JFM programmes that are operating in this area originated before the year 2002. In this regard a second best solution is reflexive comparison where 'before' and 'after' scenarios are compared for the participating households. This would be helpful to provide reasonable estimates of the impact on the condition that there is no serious memory lapse problem among the respondents (Ravallion, 2001). But memory lapse is directly related to the time, which passes away after initiating the programme. By using the 'double difference' method where 'before' and 'after' situations are examined for both control and participating groups, these biases can be further minimized. Due to non-availability of data of matching control group for the causes mentioned earlier, we had to depend on 'reflexive comparison' where 'before' and 'after' situations are examined for participating groups only. 'Before' and 'after' estimation is analysed for all households involved in the JFM programme under our study. Indicators are measured in actual monetary terms and presented as after and before situations. It is relevant to mention that no households of forest fringe communities were outside the JFM committee we studied and the share of timber sell received by each JFM committee from the forest department was equally distributed among all households irrespective of the economic status of households.

Although the aggregation of five capitals is a great challenge to us for two different periods - before JFM and after JFM, because the units of measurement are different for different types of capital and also for intra-capital assets,

however, the aggregation is made in monetary units (in Rs.) for both the periods. Market price is taken into consideration for measurement for forest products, which is used for consumption by the FPC (Forest Protection Committee) member households; collector's price is taken into account for forest products, which is used for marketing by them. The expenditures related to health and education was available from households in monetary units (in Rs.). But with regard to social capital is concerned, the direct monetary value of social capital was not taken into account, because as social capital is an attribute of an individual in a social context, it is difficult in the measurement (Solow, 2000: 7; Sobel, 2002:139). Although social capital contributes to economic and social development (World Bank, 2002: 2), these attributes come into being by the nature of participation, type of participation and the process of participation of the local communities in the management of natural resources and common activities by the forest fringe communities and depends, mainly, on the growth of other capital assets<sup>1</sup>. But Reddy and Soussan (2004) and Reddy et al.(2004) measures social capital in terms of changes in income from migratory labour, while they attempt to assess five capital assets of watershed development programmes on rural livelihood in their studies. In spite of some limitations for measuring social capital we, however, follow Reddy and Soussan (2004) and Reddy et al. (2004) in view of measuring social capital on rural livelihood in our studies.

### **The Data Set**

In order to examine our stated objectives based on both female and joint FPCs, we mainly depend on field survey in Midnapore and Bankura districts of West Bengal. The inclusion of Midnapore district under our field survey is due to the fact that the key precursor to JFM in India from the managerial perspective was a local level initiative, which was started from the Arabari hills under Midnapore district of West Bengal during the early 1970s. Moreover, as we attempt to examine the stated objectives in both the female and joint FPCs, some female FPCs are also in operation along with joint FPCs in Midnapore district. The main argument behind the inclusion of Bankura district under our study may be judged by the fact that female FPCs were first established in Bankura districts in West Bengal during early 1990's and the majority of female FPCs are now running in Bankura district. As per the official records (State Forest Report, Government of West Bengal 2000), 17 female FPCs are in operation in Bankura district – 4 in Bankura North, 9 in Bankura South and 4 in Panchet forest divisions (Sarker and Das, 2002:4410). However, during the first year of my UGC Minor Research Project entitled "How to execute the Joint Forest Management Programme with Sustainability? a study of Joint FPC and Female FPC in four divisions under Midnapore and Bankura districts in West Bengal" (Sarker, 2007), we conducted our field survey in four FPCs based on stratified random sampling method from

different forest ranges under two forest divisions – one in West Midnapore (Midnapore district) and the other in North Bankura (Bankura district).

We selected our sample (four FPCs) based on stratified random sampling method in the following lines. First, forest divisions and then forest ranges- the subdivision of population into several parts, called “strata”- were selected by purposive sampling method. Two forest divisions – one in the West Mednapore (Mednapore district) and the other in North Bankura (Bankura District)- are selected by purposive method. Next, within these two forest divisions(West Mednapore and North Bankura), two forest ranges – Gidni range and Hatibari range- were purposively selected from West Mednapore divisions, and one forest range – Gangajalghati range- is purposively selected from North Bankura division. As regards the justification of the purposive selection of specific forest divisions and then forest ranges within forest divisions related to the subdivision of the population into several parts (called “strata”) is concerned, the specific forest divisions and forest ranges were considered because those places are the regions of the research during the first year of the UGC project proposal on the basis of which the project was granted by UGC.

Second, the selection of sub-samples (four sample FPCs) within each selected “strata”- three forest ranges (Gangajalghati, Gidni and Hatibari) - depends purely on chance (Simple Random Sampling without Replacement). As regards Gangajalghati forest range under North Bankura forest division is concerned, one joint FPC was randomly selected from all existing total joint FPCs (fifty six in number). Female FPC could not be selected from this range because there was no female FPC within this range. Similarly, two FPCs- one female FPC and one joint FPC- were randomly selected from the respective total FPCs of the Gidini Range under West Midnapore district- one joint FPC (Khatgeria) was selected from total joint FPCs of the said range, and one female FPC was randomly selected from total female FPCs of the said range. Worthwhile to mention that two Female FPCs were in operation in Gidini Range under West Midnapore district – Kherajhore Female FPC and Depudanga Female FPC. Kherajhore Female FPC was randomly selected from them for our field study. Likewise, one joint FPC was randomly selected from Hatibari Range under West Midnapore division from total joint FPCs of the said range; but female FPC could not be selected from this range because there was no female FPC within this range.

Third, after selecting four sample FPCs under stratified random sampling method, all units of households of four sample FPCs are considered for our field survey. Total number of households under Kherajhore female FPC, Khatgeria joint FPC, Goulbermarshal joint FPC and Amjuri joint FPC are 32, 17,59 and 26 respectively. Combining all households together, the total households considered for our field survey are 134 in number. But this paper is prepared based on the data collected only from head of all households (134 in number) under study.

The period of field survey was between February and October 2005. The reference period for the ‘before’ and ‘after’ situation is in the following lines.

The reference period for 'after' JFM situation was the same with that of the field survey (i.e., between February and October 2005). But the reference period for before JFM situation related to each FPC was not the same. As the reference period of study related to before situation for each FPC is considered for the preceding one-year period from the starting of JFM programme in the respective FPC, this period was different for different FPCs, because the starting of JFM programme in all FPCs are different. JFM programme in Kherajhore, Khatgeria, goulbermarshal and Amjuri was started on March 1994, August 1995, May 1994 and July 1995 respectively. Therefore, the reference period of before JFM situation for Kherajhore female FPC was between March 1993 and February 1994; Khatgeria joint FPC, between August 1994 and July 1995; Goulbermarshal joint FPC, between May 1993 and April 1994; Amjuri joint FPC, between July 1994 and June 1995.

Although this survey attempts to explore information from 647 members belonging to 134 households spread over 4 sample villages, this paper has been prepared based on the data collected from heads of each household only. Hence the number of respondents are 134 belonging to 134 households spread over 4 sample villages under study..

This study, however, has some limitations. In addition to collecting data for before JFM situation by the recollection method (mentioned earlier), the size of sample of this study is small, if not so small. There are instances that the inferences drawn from considerable number of papers is based on little number of households with a little number of distribution for wealth categories (Singh et.al, 2002; Jayasankar and Muraleedharan, 2000; Banik, 1994; Sharma et.al, 1995; Rajasekharan and Krishnamoorthy, 1999)<sup>3</sup> in relation to the relevant research work. Even, in the context of relevant work of Reddy et.al (2004) related to sustainable rural livelihood framework of participatory watershed development in India, while supporting the validity of the conclusion, the number of very poor categories was taken to 50 only. In this perspective, it seems to be relevant to mention that combining all villages together almost all households (127 out of 134) belong to very poor and poor categories. It means that almost all households live in a poor economic condition. Out of 127 households, 86 are very poor and the rest (41) are poor. Hence, the conclusions drawn on the findings of this paper and the statistical validity of the conclusions based on the considerable homogeneous households belonging to lower economic status does not fail, not unexpectedly, to satisfy the robustness of the inference of this research work.

Each FPC was formed in the respective village; so the FPC/village is synonymous in this study. More importantly, although data were collected from two types of FPCs – female and joint, this study seeks to examine its objectives according to category of households as per land status and name of village/FPC, irrespective of female and joint FPCs.

In order to study the different aspects of the stated objectives simple tabular analysis, which presents absolute numerical values, percentage change, simple

proportion, is used in this research work. Real earning (in Rs.) is determined after deflating the money income by Consumer Price Index for Agricultural Labourer (CPIAL)<sup>4</sup>. This paper also examines as to whether there is any significant difference between two mean-values – (i) mean-values of two populations (female member of household and male member of household) for a given variable, say collected quantity of NTFPs, and (ii) mean values of two variables (after JFM situation and before JFM situation) for a given population, say household related to collected quantity of NTFPs (Goon *et al.*, 1985:309-10; Gupta, 1992:1222-28).

All the indicators of social capital are qualitatively ranked by the response description against each indicator given on a four-point scale following either by Sinha and Sour (2006)[ very high (4), high (3), medium (2) and low (1), or always (4), most of times (3), sometimes (2) and rare (1)] or by Reidenbach and Robin (1990)[ high (4), moderate (3), low (2) and unfair/unacceptable/undesirable (1)] Higher score of the indicators indicates higher intensity of participation. The description related to the structure of participation used in this study appears in appendix 1.

This study considers simple technique of measurement like arithmetic mean, proportions, paired t test for equality of two means for examining our stated objectives. OLS (ordinary least square) regressions are considered to study the impact of household level social capital, and risk related hardship faced by the households of sample villages. A Maximum Likelihood (ML) Logit model is considered to examine the important factors that affect households' direct dependence on forest product in our cross-sectional data of all FPC member households in four sample villages. It can be argued that households' decision to depend on forest is also a labour allocation decision, which is relevant to the households' production function. Therefore the important factors affecting labour allocation decision are their factor endowments such as human capital, household assets and other variables, which are related to their preferences to use the forest (Sathyapalam, 2005:62). This model has been estimated using econometric software called LIMDEP.

### *Profile of the Sample Villages*

All the sample villages fall into the semi-arid agro-climatic category with red soils, insufficient rainfall and not good in terms of moisture retention. The socio economic profile of the sample villages is presented in Table 1. It shows that all households belong to either very poor or poor category in two (Goulber Marshal and Amjuri) out of four villages. Out of the remaining villages the incidence of very poor and poor category in Kherajhore and Khatgeria works out to about 93.75 and 70.59 per cent respectively. Although more than two-fifths of the households are landless in all FPs/Villages, the incidence of landless households is relatively high in Amjuri (73.07 per cent) and Goulbur Marshal (57.62 per cent). Moreover, all the households in two (Goulber Marshal and Amjuri) of the

four villages belong to ST category and the average size of household members in these two FPCs/Villages is relatively high in relation to the rest ones. The majority of households in other two villages belong to general category. In fact, agriculture and its allied activities are the main source of income of the households in our sample villages. A considerable portion of land in each village is under wastelands, which are not cultivated. Therefore, dependence on forest resources under JFM programme is expected to have a substantial impact on the livelihood of most of these households.

Table 1: Socio – Economic Characteristics of the Sample FPCs/Villages

FPC/ Village	No. of HH	Ave rage size of HH	Average size of Land Holding (acres)	HH belonging to Wealth Category			% of H H belonging to		% of FPC member	
				Very Poor	Poor	Medium	SC	ST	Illiterate	Primary Edn.
Kherajhor e	32	4.30	3.25(24)	18[14]	12	2	6.25	3.13	56.25	37.50
Khatgeria	17	4.68	3.52(18)	7[7]	5	5	-	14.18	58.82	29.41
Goulber Marshal	59	6.38	2.65(49)	38[34]	21	-	-	100	66.10	20.34
Amjuri	26	6.02	1.35(14)	23[19]	3	-	-	100	69.23	26.92
Total	134	5.60	2.65(32.31)	86[74]	41	7	1.25	73.10	64.17	25.82

Note: HH=Households. Figures in ( ) indicate percentage of area under Wastelands. Wastelands include private as well as common lands that are not being cultivated. Figures in [ ] indicate number of landless labour households.

Very Poor Indicates per capita annual income within the range of Rs.0-8500; Poor implies per capita annual income within the range of above Rs.8500-11000; Medium represents per capita annual income within the range of above Rs.11000-13000. Both very poor and poor income groups live below poverty line. These classifications (very poor, poor and medium) have been taken from Bezbaruah(2004).

Source: Sample Survey, 2005.

### ***Participatory JFM Programme and Rural Livelihoods***

The impact of the JFM programme in the four sample villages we studied is measured in terms of changes in various indicators under five capital frameworks – Physical, Natural, Human, Social and Financial.

#### ***Physical Capital***

Forest related structures reflect the physical capital (for example, NTFP based production enterprises based on sal leaves, kendu leaves, mohua flower and medicinal plants) created at the household and village level based on local forest products under JFM programme. As regards changes(%) in the quantity(kg./unit) of NTFP based production in the sample households of this study is concerned (Table 2), the quantity of all types of forest based production has recorded a significant increase for the JFM programme in sample villages and the

rate of increase is more pronounced among the very poor households in all sample villages, the rate of increase being the least for the medium categories of household in the sample. It suggests that very poor households have benefited more by the NTFP based physical capital created at the household and FPC/Village level for JFM Programme under our study.

Table 2: Change (%) in the quantity of NTFP based production by NTFP based production enterprise of the Sample Households.

('000 k.g./unit)

FPC/ Village	Category of HH (Wealth)	NTFP based production enterprise					
		Sal Plate			Kendu Bidi (local Cigarette)		
		Before	After	% Change*	Before	After	% Change*
Kherajhore	V. Poor	110 (2.05)	317 (5.94)	118.18* (189.76)	24 (1.33)	57 (3.17)	137.5* (138.34)
	Poor	32 (2.67)	54 (4.50)	68.75* (68.54)	50 (4.17)	84 (7.00)	68* (68)
	Medium	24 (12.00)	30 (15.00)	25* (25)	27 (13.50)	35 (17.50)	29.63* (29.62)
Khatgeria	V. Poor	19 (2.71)	45 (6.43)	136.84* (137.27)	11 (1.57)	24 (3.43)	118.18* (118.47)
	Poor	11 (2.20)	24 (4.80)	118.18* (118.18)	25 (5.00)	37 (7.40)	48* (48)
	Medium	10 (2.00)	18 (3.60)	80.00* (80)	72 (14.40)	89 (17.80)	23.61* (23.61)
Goulber Marshal	V. Poor	120 (3.16)	266 (7.00)	121.67* (121.51)	57 (1.50)	133 (3.50)	133.33* (133.33)
	Poor	74 (3.52)	126 (6.00)	70.27* (70.45)	107 (5.10)	168 (8.0)	57.01* (56.86)
Amjuri	V. Poor	72 (3.13)	161 (7.00)	123.61* (123.64)	35 (1.52)	80 (3.48)	128.57* (128.94)
	Poor	7 (2.33)	14 (4.66)	100.00* (85.83)	13 (4.33)	21 (7.0)	61.54* (61.66)

FPC/ Village	Category of HH (Wealth)	NTFP based production enterprise					
		Mohua Flower (Local Wine)			Medicine		
		Before	After	% Change*	Before	After	% Change
Kherajhore	V. Poor	12 (0.67)	27 (1.50)	125* (123.88)	-	-	-
	Poor	61 (5.08)	98 (8.17)	60.66* (60.82)	-	-	-
	Medium	30 (15.00)	41 (20.50)	36.67* (36.67)	19* (9.50)	-	100 (-100)
Khatgeria	V. Poor	4 (0.57)	11 (1.57)	175* (175.43)	-	-	-
	Poor	26 (5.20)	41 (8.20)	57.69* (57.69)	-	-	-
	Medium	67 (13.40)	92 (18.40)	33.31* (37.31)	47* (9.40)	56 (11.20)	19.15 (19.15)
Goulber Marshal	V. Poor	17 (0.45)	37 (0.97)	117.65* (115.56)	-	-	-
	Poor	25 (5.95)	169 (8.05)	32.20* (35.29)	-	-	-
Amjuri	V. Poor	14 (0.61)	32 (1.39)	128.57* (127.87)	-	-	-
	Poor	19 (6.33)	26 (8.67)	36.84 (36.97)	-	-	-

Note: Figures in ( ) indicate average size of livestock unit per household. The change in ( ) is per cent change, not absolute.

\* Indicates that the difference is statistically significant at 1 per cent level. The size of household in + is 2, and that of \$,5.

Source: Sample Survey, 2005.

### Natural Capital

Natural capital is a key to livelihood security in agrarian societies. Our main focus of the measurement of natural capital in this study is in terms of changes in access to fodder, fuelwood, NTFPs and TFPs (Timber Forest Products) that act as a flow input into livelihood activities of household as well as community level in the study area. This is portrayed in Table 3.

Livestock rearing is an important livelihood strategy in the sample FPCs/villages. The availability of fodder on a sustainable basis is the key for the sustainability of livestock rearing. Table 3 shows that fodder availability has made a significant increase in all the sample villages for JFM Programme, the rate of increase being more prominent among the households of very poor category, and medium category is the least beneficiaries by these shifts. This is also true in terms of changes in access to daily fuelwood collection, daily collection of NTFPs, which are also a key to the livelihood security for households we surveyed. But with regard to the changes in the collection of timber forest products (TFPs) per day by the sample households are concerned.

Table 3: Change (%) in the Availability of Fodder (per standard cattle), Fuelwood, NTFPs and TFPs by the Sample Households per day from before JFM to after JFM situations

FPC/ Village	Category of HH (Wealth)	% Change** (fodder)	% Change* (fuelwood)	% Change* (NTFPs)	% Change* (TFPs)
Kherajhore	Very Poor	70.83** (2.6)	19.00* (1.05)	226.87* (8.45)	-90.77*(-2.78)
	Poor	50.79** (3.2)	9.5* (0.79)	252.94 *(7.17)	-75.00*(-1.0)
	Medium	30.33** (4.2)	0.05* (0.03)	-100* (-1.0)	-100.00*(-2.50)
Khatgeria	Very Poor	137.74** (5.4)	9.5* (1.36)	172.73 *(8.15)	-79.17*(-2.72)
	Poor	47.06** (4.5)	5.5*(1.1)	176.19 *(7.40)	-84.62*(-2.20)
oulber Marshal	Medium	31.20** (4.4)	-	150 *(0.60)	-100.00*(2.40)
	Very Poor	78.46** (4.8)	15.5*(0.4)	50.57* (2.34)	285.71*(3.15)
mjuri	Poor	30.61** (3.2)	9.5*(0.44)	56.10 *(2.20)	84.21*(0.77)
	Very Poor	137.73** (6.6)	26.25*(1.15)	139.76 *(5.04)	-66.67*(-0.87)
	Poor	68.29** (4.3)	2.95*(0.98)	200 *(6.0)	-60.00*(-1.0)

Note: Standard livestock is arrived at by converting small livestock on a 3:1 ratio to big livestock.

Figures () indicate average change per household (in absolute term). \* and \*\* indicate that the difference is statistically significant at 1 per cent and 5 per cent level respectively.

Source: Sample Survey, 2005.

Table 3 shows that the rate of change of quantity of TFPs (Kg) per day has significantly decreased in three FPCs/Villages except one for the execution of JFM Programme. This is desirable because law forbids the collection of TFPs by the households other than Forest Department/Government. Rather the members

of the FPC under JFM Programme are entitled to have a fixed share of TFPs (usually 20 to 25 per cent of total income from TFPs) from forest department/government. Despite prohibited by law for collection of TFPs, very poor and poor households under our sample FPCs/Villages are engaged in illegal collection of TFPs<sup>5</sup> although the quantity of collection has significantly decreased in three FPCs/Villages during JFM Programme in relation to the past when the programme was not in operation. But, more importantly, the illegal collection of TFPs has substantially increased to one out of four FPCs/Villages by both very poor and poor categories of households. This is, mainly, because the rate of increase of the collection of legal Forest Products (FPs) -like NTFPs,, Fuelwood - which are also one of the main sources of livelihood security for very poor and poor categories of households, in the particular village (Goulber Marshal) by poor and very poor categories of households is substantially lower than that of the collection of same type of legal Forest Products by all categories of households in other three villages. On the other hand, the illegal collection of TFPs by all categories of households in three sample villages out of four have considerably decreased instead of an increase that has been made in one FPC/Village (Goulbar Marshal) after JFM Programme. At the same time the legal collection of Forest Products–Fuelwood and NTFPs–by the same categories of households in the three villages except one (Goulbar Marshal) has significantly increased after the execution of JFM Programme. It seems to imply that law cannot forcibly control the illegal collection of TFPs of the very poor and poor categories of households, who are almost dependent on FPs for their livelihood security, until and unless they are guaranteed with minimum livelihood security by other sources.

#### *Human Capital*

As regards direct measurement of human capital is concerned, this study considers that changes in education and medical expenditure by the sample households might act as a key factor for SRL due to JFM Programme. Table 4 reveals that medical and educational expenditure has significantly increased for JFM Programme in the sample villages. Out of all categories of households the rate of increase of medical and educational expenditure is more pronounced for the very poor category and the least prominent for medium category in the sample FPCs/Villages. This result might indirectly suggests that the money income of the very poor category has more increased than others in all sample villages for the execution of JFM Programme. However the change of real expenditure (Rs), which is determined after deflating the money income by Consumer Price Index for Agricultural Labourer (CPIAL), on both medical and education variables for households is negative from before to after JFM situations.

Table 4: Annual Medical and Educational Expenditure of the Sample Households during before and after JFM situations (with % change)

FPC/ Village	Category of HH (Wealth)	Before JFM(Expenditure/Household/Year in Rs.)		After JFM (Expenditure/Household/Year in Rs.)		Percentage Change	
		Medical	Education	Medical	Education	Medical*	Education*
Kherajhore	Very Poor	1612[9 (89.56)	2040[11.40] (113.33)	2322 [6.97] (129)	2885 [8.66] (160.28)	44.04* [-22.56] (39.44)	41.42* [-21.03] (46.95)
	Poor	1824[10.19] (152.00)	2658[14.85] (221.50)	2550 [7.66] (212.50)	3857[11.58] (321.42)	39.80* [-24.83] (60.50)	45.11* [-22.02] (99.92)
	Medium	3360[18.77] (1680.00)	6300[35.20] (3150.00)	4385[13.17] (2192.50)	10950[32.88] (5475.00)	30.51* [-29.83] (512.50)	73.81* [-6.59] (2325.00)
Khatgeria	Very Poor	1526[8.52] (218.00)	2272[12.69] (324.57)	2478[7.44] (354.00)	3063[9.20] (437.57)	62.39* [-12.68] (136.00)	34.82* [-27.50] (113.00)
	Poor	2068[11.55] (413.60)	2842[15.88] (568.40)	2808[8.43] (561.60)	3956[11.88] (791.20)	35.78* [-27.01] (148.00)	39.20* [-25.19] (222.80)
	Medium	3930[21.96] (786.00)	7450[41.62] (1490.00)	4548[13.66] (909.60)	12780[38.38] (2556.00)	15.73* [-37.80] (123.60)	71.54* [-7.78] (1066.00)
Goulber Marshal	Very Poor	1570[8.77] (41.32)	1465[8.18] (38.55)	2555[7.67] (67.24)	2084[6.26] (54.84)	62.74* [-12.04] (25.93)	42.25* [-23.47] (16.29)
	Poor	2971[16.60] (141.48)	3490[19.50] (166.19)	3674[11.03] (174.95)	4278[12.85] (203.71)	23.66* [-33.55] (33.47)	22.58* [-34.10] (37.52)
Amjuri	Very Poor	1497[8.36] (65.09)	1685[9.41] (73.26)	2724[8.18] (118.43)	2143[6.44] (93.17)	81.96* [-2.15] (53.34)	27.18* [-31.56] (19.91)
	Poor	1628[9.09] (542.67)	2270[12.68] (756.67)	2856[8.58] (952.00)	4138[12.43] (1046.00)	75.43* [-5.61] (409.33)	38.24* [-1.58] (289.33)

Note: \* Indicates that the difference is statistically significant at 1 per cent level. Figures in ( ) indicate average annual expenditure (Rs.) per household. Figures in [ ] indicate real expenditure (Rs.).

Source: Sample Survey, 2005

### *Social Capital*

Concerning to determining factors for creating community level social capital among sample households are concerned (Table 5), participatory decision making, the presence of FPC members in most of the general meetings of FPCs, the receiving of more information<sup>6</sup> related to the activities of JFM Programme by the majority of FPC members, equity in benefit flows among all members of FPCs are the general phenomena among the households in the sample villages, influencing direct positive influence of developing social capital and participatory programme at the community level.

Table 5: Determinants of Community Level Social Capital among Sample Households of Participatory JFM Programme.

FPC/ Village	Category of HH (Wealth)	No. of HH	Decision making And/Or Participation			Presence in the general meeting of JFM Programme (%)					Households receive information related to the activities of JFM Programme			Nature of distribution of timber share received from Govt. by the households	
			Decision Making with Participati -on	Decision Making without Participati on	Participati on without Decision Making	Below 25	25-30	51-75	75-99	100	No	Less	More	Unequal	Equal
Kheraj hore	Very Poor	18	18	-	-	-	-	-	2	16	-	-	18	-	18
	Poor	12	12	-	-	-	-	-	1	11	-	-	12	-	12
	Medium	02	02	-	-	-	-	-		02	-	-	02	-	02
Khatge ria	Very Poor	07	06	-	1	01	-	-	02	04	-	02	05	-	07
	Poor	05	05	-	-	-	01	-	01	03	-	01	04	-	05
Goulb ur Marsha l	Medium	05	05	-	-	01	-	-	01	03	-	01	04	-	05
	Very Poor	38	32	-	6	11	02	03	04	18	-	16	22	-	38
Amjuri	Poor	21	19	-	2	04	03	-	06	08	-	08	13	-	21
	Very Poor	23	22	-	1	02	-	-	02	19	-	05	18	-	23
	Poor	03	03	-	-	-	-	-	01	02	-	1	02	-	03

Note: 'More' implies more accurate information relating to JFM programme and its management, market price of forest products, forest wage rate etc.

FPC member households usually receives information from the following sources: forest officials, forest executive committee, Panchayet personnel, government deputed agents, market middlemen and media. When FPC member households receive more accurate information, they usually have it from government agents and media in addition to their four additional sources: forest officials, forest executive committee, Panchayet personnel, market middlemen.

Source: Sample Survey, 2005

### *Financial Capital*

Improvement to financial capital under SRL framework in the present context is assessed in terms of sustainable increase in income potentials because of the difficulties in obtaining accurate information on savings for the reluctance of the member of households to talk about their savings. As may be seen from Table 6, the net annual return (in Rs.) and net annual average household income (in Rs.) generated from forest resources for very poor and poor categories of households in sample villages have significantly increased due to JFM Programme compared with the past when the programme was not in operation.

Table 6: Annual Net Households Return (in Rs.) from Forest Sources of Sample Per Year during before and after JFM

(with %change)

FPC/ Village	Category of HH	Before JFM (Rs.)					
		NTPPs, Fuelwood Fodder		Return from Timber sale	Return from Timber Share	Wage income from forest	Net Return from all Forest source
		Consumption	Sale				
Kherajhore	Very Poor	105120	197100	11859	-	6324	314079 [1754.63]
	Poor	91980	96360	2913	-	2175	191253 [1068.45]
	Medium	16060	3650	913	-	-	20623 [115.21]
Khatgeria	Very Poor	38325	71540	4382	-	2728	114247 [638.25]
	Poor	36500	40150	2374	-	925	79024 [441.47]
	Medium	40150	-	2190	-	-	42340 [236.54]
Goulbur Marshal	Very Poor	235790	443840	7698	-	1476	687328 [3839.82]
	Poor	158297	176295	3833	-	2668	341093 [1905.55]
Amjuri	Very Poor	111888	352590	5457	-	5642	475577 [2656.85]
	Poor	19470	30660	914	-	240	51284 [286.50]

FPC/ Village	Category of HH	After JFM (Rs.)						% Change in net return*
		NTPPs, Fuelwood Fodder		Return from Timber sale	Return from Timber Share	Wage income from forest	Net return from all forest source	
		Consum ption	Sale					
Kherajhor e	Very Poor	124830	315360	39420	6498	31500	517608 [1554.38]	64.80* [-11.41]
	Poor	100740	157680	17520	4332	13250	293522 [881.44]	53.47* [-17.50]
	Medium	18250	-	-	722	-	18972 [56.97]	-8.01* [-50.55]
Khatgeria	Very Poor	48545	114975	12775	5852	13580	195727 [587.77]	71.32* [-7.91]
	Poor	43800	62050	3650	4180	4185	117865 [353.95]	49.15* [-19.82]
	Medium	45625	-	-	4180	-	49805 [149.56]	17.63* [-40.58]
Goulbur Marshal	Very Poor	177400	268670	817650	3724	8320	1275764 [3831.12]	85.61* [-0.23]
	Poor	191625	222285	229950	2058	13440	659358 [1980.05]	93.31* [-3.90]
Amjuri	Very Poor	142715	562465	100740	-	31280	837200 [2514.11]	76.04* [-5.37]
	Poor	32995	50180	2190	-	1260	86625 [260.13]	68.91* [-9.20]

Note: \*Indicates that the difference is statistically significant at 1% level; [ ] represents real net return in Rs.

Source: Sample Survey, 2005.

On the other hand, the rate of increase in net return (in Rs.) is around 18 per cent for medium category of households in one FPC/Village (Khatgeria), whereas in Kherajhore FPC/Village this shifts is negative for medium category. It might suggest that very poor and poor categories of households are more dependent on income from forest resources; but medium category of households is more dependent on their income from non-forest sources. It is important to mention that the change of real net return (Rs) (determined after deflating the money income by Consumer Price Index for Agricultural Labourer, CPIAL) is negative for all categories of households from before to after JFM situations.

Turning to the incremental annual net return (in Rs.) of sample households from all sources, Table 7 shows that while the JFM Programme is in operation, the contribution of net return (in Rs.) from forest sources out of the net return (in Rs.) from all sources works out to the major source of income for very poor and poor categories of households in all sample villages. Although the change of real net return (Rs) from all sources is negative for all categories of households from before to after JFM situations, compared with non-forest real income, forest real income is less negative for poor and very poor categories of households in all villages. It might indirectly imply that real income from forest source is more beneficial than non-forest income for poor and very poor categories of households in all villages under study after JFM situation.

Table 7: Annual Net Households Revenue from All Sources, pre and post JFM

FPC/ Village	Category HH (Wealth)	Pre JFM			Post JFM			% Change		
		Net Return from Forest sources (Rs.)	Net Return from other sources	Net Return from all sources (Rs.)	Net Return from Forest sources (Rs.)	Net Return from other source (Rs.)	Net Return from all sources (Rs.)	Net Return from Forest source* (Rs.)	Net Return from other sources* (Rs.)	Net Return from all sources* (Rs.)
Kherajhore	Very Poor	314079 (17448.83)	177427 (9857.06)	491506 {2745.84} [63.90]	517608 (28756)	132664	650272 {1952.77} [79.60]	64.80*	-25.23*	32.30* {-28.88}
	Poor	191253 (15937.75)	227945 (18995.42)	419198 {2341.89} [45.62]	293522 (24460.17)	228773 (19064.42)	522295 {1568.45} [56.20]	53.47*	0.36*	24.59* {-33.03}
	Medium	20623 (10311.50)	70216 (35108)	90839 {507.48} [22.70]	18972 (9486.00)	86060 (43030.00)	105032 {315.41} [18.06]	-8.01*	22.56*	15.628* {-37.85}
Khatgeria	Very Poor	114247 (16321)	80383 (11483.29)	194630 {1087.48} [58.70]	195727 (27961.00)	14592 (2084.57)	210319 {631.59} [93.06]	71.32*	-81.85*	80.61* {-41.91}
	Poor	79024 (15804.80)	103776 (20755.20)	182800 {1021.22} [43.23]	117865 (23573.00)	97579 (19515.80)	215444 {646.98} [54.71]	49.15*	-5.97*	17.86* {-36.65}
	Medium	42340 (8468)	186165 (37233)	228505 {1276.56} [18.53]	49805 (9961.00)	245597 (49119.40)	295402 {887.09} [16.86]	17.63*	31.92*	29.27* {-30.51}
Goulbur Marshal	Very Poor	687328 (18087.58)	430805 (11336.97)	1118133 {6246.55} [61.47]	1275764 (33572.74)	252136 (6635.16)	1527900 {4588.29} [83.50]	85.61*	-41.47*	36.65* {-26.55}
	Poor	341093 (16242.52)	532992 (25380.52)	874085 {4883.16} [39.02]	659358 (31398.00)	534940 (25473.33)	1194298 {3586.48} [55.21]	93.30*	0.37*	36.63* {-26.55}
Amjuri	Very Poor	475577 (20677.26)	293027 (12740.30)	768604 {4293.88} [61.88]	837200 (36400.00)	289315 (12578.91)	1126515 {3382.93} [74.32]	76.04*	-1.27*	44.67* {-21.22}
	Poor	51284 (17094.67)	620114 (206704.66)	671398 {3750.83} [7.64]	86625 (28875.00)	70407 (23469.00)	157032 {471.57} [55.16]	68.91*	-88.65*	-76.61 {-87.43}

Note: Figures in ( ) indicate average net return from forest/other sources per household. Figures in [ ] represent percentage net return from forest sources of net return from all sources. \* indicates that the difference is statistically significant at 1 per cent level. Figures in { } represents real net return (in Rs).

Source: Sample Survey, 2005.

The results of maximum likelihood logit model show the effect of some important determinants on households' direct dependence on forest products (Table 8). The dependent variable has been specified as Y=1, if the household depends on the forest by collecting forest products, O=Otherwise. It is important to mention that all median categories of households do not depend on forest by collecting forest products. The measurement scale of EDN (educational level)

and family size used in the regression model also appears in the appendix. Based on the male and female members of each household female- male ratio (female sex ratio) has been calculated. Some other explanatory variables used in this regression model are usually quantitative in character.

The results of Table 8 reveal that the regression is statistically significant at 1 per cent level; all the coefficients of explanatory variables are also significant and are of expected signs. Households having larger family size, own livestock, lower education level, larger female sex ratio and living for a long time nearby the forest are more likely to depend on forest resource. It also shows that very poor families are more dependent on forest products for their livelihood security. The strong sustainability criteria meets for all very poor categories of households in all sample villages, because the change of each type of capital is greater than zero and the change of their income from non-forest sources is less than zero. The strong sustainability criteria also meet for poor categories of households in two villages – Amjuria and Khatgeria. But in other two villages – Kherajhore and Goulbar Marshal, although the change of income from non-forest for poor categories of households is positive, the positive change (0.36 for Kherajhore and 0.37 for Goulbar Marshal) is very close to zero. So, strong sustainability criteria is also likely to satisfy for all poor categories of households in our sample.; but for medium category of households the contribution of forest income is not so important as the very poor and poor households. Similarly the rate of increase of net return (in Rs.) from forest source has considerably increased for very poor and poor categories of households in our sample villages after the execution of JFM Programme. As may be seen in Table 8, the contribution of forest income is more prominent particularly for very poor category, ranging between 75.32 per cent and 93.06 per cent of the net income (in Rs.) from all sources in the sample villages, while the JFM Programme is in operation. But it is also observed that the forest source was the major source of net income (in Rs.) particularly for very poor category of households before the execution of JFM Programme when the forest was mainly used for commercial purpose and the forest fringe communities were not legally allowed to use forest resources for their livelihood security (Tables 8 and 9). Nevertheless law could not forcibly control the illegal collection of forest products particularly by the very poor and poor categories of households because these people are mainly dependent on forest products for their livelihood security. Additionally, although the new JFM Programme lays emphasis on meeting local needs by supporting them fuelwood, fodder, food, NTFPs and limited use of timber for self consumption, it prohibited the free collection of timber products by the local people to maintain the carrying capacity of the forests. The local people are given a 20-25 per cent of share from the sell of timber by the forest department/Government instead of their free collection of timber products. But, as discussed earlier, despite prohibited by law for the free collection of TFPs, the very poor and poor categories of households in one out of four sample villages has made a substantial increase of their collection of TFPs after the execution of JFM Programme, mainly, because the

rate of increase of their legal collection of forest products-fuel wood and NTFPs (Table 3)- are substantially lower than that of the collection of the same type of Forest Products by the same categories of households in other three FPCs/villages. It clearly seems to indicate that force or law can not effectively control the illegal collection of Timber Forest Product (TFPs) of the very poor and poor categories of households until and unless a considerable collection of legal forest products like fuelwood, NTFPs meet their minimum livelihood security.

In this connection, it needs mentioning that price per unit of some NTFPs like kendu leaves (the most valuable NTFPs per unit in Rs. in the area we surveyed), sal seed, the collectors receive from its purchasers is very low in relation to their market prices. What is more significant is that whatever amount of more valuable NTFPs per unit (in Rs.) the collectors desire to sell in the market they have only to sell it legally to the agents of LAMS (Large Adibasi Multipurpose Society), which usually pay to their collectors considerably lower price per unit. Table 9 shows that net profit per Kg. of kendu leaves for the agents of LAMPS is about hundred per cent of the collector's price. Similarly, net profit per K.G. of sal seeds is more than hundred percent of the collector's price. This situation is more or less similar with Jharkhand state, very close to West Bengal state. In Jharkhand, Jharkhand State Forest Development Corporation (JSFDC), licensed traders operating on behalf of the state, controls kendu leaves marketing in the state, where villagers are little more than collectors operating as pure price takers in a monopsony, with no bargaining position and no incentives to improve quality above minimum standards (World Bank, 2006: 46).

Table 8: Effects of Household's Dependence on Forest: Results of Maximum Likelihood Logit Analysis

Other Variables	Coefficient	t Values
Constant	-1.38	1.84**
PCL (land in acres)		
LSTOCK [with Livestock=1 Otherwise=0]	3.52	4.67*
HHSIZE (in number)	2.83	5.94*
PCEXP (in Rupees)	-1.58	5.02*
S RATIO (female male ratio)	0.94	3.83*
EDN (in years)	-1.69	2.54*
STAY (in years)	2.31	3.92*
Number of observation=134 LR <sub>0.01,7</sub> = 169.34 Log Likelihood=134.06 Pseudo R <sup>2</sup> =0.76		

Note: Dependant Variable (Y=1, if Household depends on forest by collecting forest product; O=Otherwise); PCL = Per capita availability of land; LSTCOK=Ownership of livestock; HHSIZE=Household size; EDN=Educational level; PCEXP=Per capita expenditure; SRATIO=Sex ratio (f/m); STAY=Number of years since the household had settled in the area. \* and \*\* indicate that the values of coefficient are significant at 1 per cent and 5 per cent level of significance respectively.

Source: Sample Survey, 2005.

Table 9: Variation in Price of Some Valuable NTFPs the Collectors' sell to the Agents of LAMPS Rs. per KG Mid value and range<sup>+</sup>

Name of NTFPs	Collectors' price	Processing, transport and other costs	Market price	Profit <sup>o</sup>
Kendu leaves	20±5	13±4	52±4.50	19±4.50
Sal seeds	0.75±0.50	1.50±0.70	4.00±0.60	1.75±0.60

<sup>+</sup>The method is suggested by Rudra (1992) <sup>o</sup>Column 5 = [ 4 - (2 + 3) ]

Source: Sample Survey.

We now examine how far livelihood strategy has been effective among the sample households for JFM programme by the linkages of migration (changes in the pattern of migration, change in employment and wage structure of households). With regard to the changes in the annual migration pattern among the sample households, this study (Table 10) reveals that there is a significant decrease of seasonal migration of the labour categories of households (very poor and poor households), who usually go to other villages/towns when opportunities of employment are limited within their own villages/ regions, in all sample villages for JFM Programme. It implies that the scope of employment for very poor and poor categories of households has significantly increased within their own villages for support activities like fuelwood, NTFPs owing to the exclusion of JFM Programme, although these shifts are more favorable among very poor categories of households. However, higher the employment opportunities within the village or lower level of out- migration from the villages are expected to develop social network at the FPC/Village level.

Table 10: Pattern of Migration among the Sample Households in a year

FPC/ Village	Category HH (Wealth)	Before			After			% Change	
		No. of Persons	No. of days	Distance (Km)	No. of Persons	No. of days	Distance (Km)	No. of Persons**	No. of days*
Kherajhore	Very Poor	12 (0.67)	685 (38.06)	8-300	4 (0.22)	90 (5.0)	4-50	-66.67** (-0.45)	-86.86* (-33.06)
	Poor	05 (0.42)	110 (9.17)	40-250	1 (2.08)	25 (2.08)	2-80	-80** (-0.34)	-82.14* (-7.09)
	Medium	-	-	-	-	-	-	-	-
Khatgeria	Very Poor	4 (0.57)	192 (27.43)	3-240	1 (0.14)	15 (2.14)	6-40	-75** (0.43)	-92.19* (-25.29)
	Poor	2 (0.40)	65 (13.00)	12-230	-	-	-	-100** (-0.40)	-100* (-13.00)
	Medium	-	-	-	-	-	-	-	-
Goulber Marshal	Very Poor	36 (0.95)	2736 (72)	30-250	8 (0.21)	224 (589)	12-55	-77.78** (0.74)	-91.81* (-66.11)
	Poor	16 (0.76)	672 (32)	30-250	3 (0.14)	72 (3.43)	10-55	-81.25** (0.62)	-89.29* (-28.57)
Amjuri	Very Poor	20 (0.87)	1020 (44.35)	12-100	5 (0.22)	115 (5.00)	5-50	-75** (0.65)	-88.73* (-39.35)
	Poor	02 (0.67)	70 (23.33)	8-50	-	-	-	-100** (0.67)	-100* (23.33)

Note: Figures in ( ) indicate average number of persons/days per household annually.\* and \*\* indicate that the differences are statistically significant at 1 per cent and 5 per cent level of significance respectively.

Source: Sample Survey.

However some important features emerge from this study related to SRL framework in all sample villages: **First**, almost all households, poor and very

poor in this study, are dependent on forest resource as the major source of livelihood security. The major source of the very poor category of people was the forest resource before the joint forest management programme, although their forest income has considerably increased after joint forest management programme. About 75 percent or more net income of very poor category in each of the sample village come from forest source after the JFM Programme. **Second**, there are two sources of income from forest resource – legal source that yields from legal collection of NTFPs, fuelwood etc. and the illegal source of income, which comes from the collection of TFPs. The major forest income of the very poor and poor categories of people comes from forest product other than wage income from forest source before and after joint forest management programme. Before JFM Programme, almost all forest income for the poor and very poor categories of people were illegal; after JFM Programme, the illegal income from forest resource has considerably been decreased. But, most importantly, the results also show that force or law can not control the illegal collection of Timber Forest Product (TFPs) of the very poor and poor categories of households until and unless a considerable collection of legal forest products like fuelwood, NTFPs meet their minimum livelihood security. **Third**, the price per unit of valuable NTFPs the collectors receive from the agents of LAMPs is very low in relation to market price

### Policy Model

What are the means to overcome this situation if alternative sources of income other than forest resource are limited particularly for very poor categories of households? There seems to be two ways to tackle the situation – one is to increase the production of NTFPs, fuelwood etc so that the very poor households may increase their legal collection of those products; the other is to increase the collector's price per unit of those FPs they legally collect and sell to the agents of LAMPs. But the production of forest products (like NTFPs) the very poor households legally collect from forest does not usually increase within the very short period; the alternative source to increase the income of the very poor households is to increase the price per unit of FPs the very poor households can legally sell in the market. The following simple mathematical model is an attempt to analyze this issue.

$$\text{We assume } U_i = U(Z_1, Z_2) \quad \dots (1)$$

$$\text{Where, } Z_1 \equiv Y_L \quad Z_2 \equiv Y_I$$

$$\text{Then } U_i = U(Y_L, Y_I) \quad \dots (2)$$

$Z_1$ = Commodity (like NTFPs, fuelwood, wage labour on forest related service) that yields legal income ( $Y_L$ ) from forest resource.

$Z_2$ = Commodity (like TFPs) that yields illegal income ( $Y_I$ ) from forest resource.

$i$  = Employed individual  $i$  of very poor households.

$Y_I$  is risky and punishable offence for the members of a household if legal authority takes action against the criminal. But its implications seem to be insignificant for the individuals of very poor category of households because  $Y_I$  including  $Y_L$ , which would yield illegal income for all  $i$  before JFM Programme, was the major source of livelihood security for the same before JFM Programme; moreover after JFM Programme  $Y_I$  is the major source of the livelihood security for all  $i$  in one FPC (Goulbur Marshall), where legal source of income from forest products is very low in relation to the employed individuals of very poor category of households in other villages (Tables 3 and 8). So it is assumed that  $U(Y_L, Y_I)$  is continuous and have first and second order partial derivatives; it is regular strictly quasi-concave function. The rate of substitution of  $Y_L$  for  $Y_I$  is

$$-\frac{dy_L}{dy_I} = \frac{f_1}{f_2}$$

Let us also assume that individual  $i$  sell the legal forest commodities (eg. NTFPs) they collect from the forest to the agents of LAMPs at  $p$  (price per unit of legal forest products). It is also assumed that the amount of legal work performed by the household  $i$  is  $W_L$  and the legal wage rate  $r$  (hourly wage of each individual is also equal to all individuals of all very poor households). As almost all forest income (in Rs.) for all individuals come from NTFPs, fuelwood etc. other than wage income from forest resource, only  $p$  is taken into account. However, if  $r$  is taken into consideration, the change of  $r$  is zero, because wage rate for forest wage labour is fixed at Rs. 67.50, which is about a double of the average local wage rate, for usually eight hours of service from 8am to 4pm. The number of working days as wage labour under forest department by the poor forest fringe communities are more or less fixed. Usually, one person from each poor household gets the opportunity of forest work from 30-40 days per year.

By definition

$$Y_I = T_F - W_L \quad \dots (3)$$

Where  $T_F$  is the total amount of available time for forest works by individual  $i$ .

The budget constraint is

$$Y_L = rW_L \quad \dots (4)$$

Substituting (3) and (4) into (2)

$$U_i = U(T_F - W_L, rW_L) \quad \dots (5)$$

In order to maximise utility, we set the derivative of (5) with respect to  $W_L$  equal to zero. The usual first order condition states that the rate of substitution of  $Y_L$  for  $Y_I$  is equal to the wage rate

$$\frac{du_i}{dw_L} = -f_1 + f_2 r = 0$$

$$\text{and therefore } -\frac{dy_L}{dy_I} = \frac{f_1}{f_2} = r \dots (5a)$$

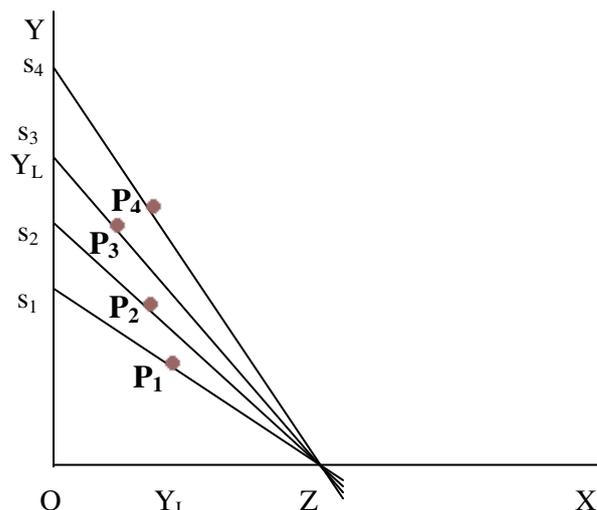
The second order condition is satisfied provided that it is negative.

$$\frac{d^2 u_i}{dw_L^2} = -f_{11} - 2f_{12}r + f_{22}r^2 < 0 \dots (6)$$

Equation (5a) is a relation in terms of  $W_L$  and  $r$  and is based on the individual  $i$ 's optimizing behavior particularly for very poor categories of households. (5a) is the consumer's supply curve for legal work which states how much individual  $i$  will legally work at various wage rates. (5a) is also indirectly the consumer's demand curve for legal income as the supply of legal work is equivalent to the demand for legal income from forest resource. We also assume that  $Y_I$  is a normal good. This might be true because the income effect of  $Y_I$  is positive for individuals of very poor categories of households (Table 9). Then

hours in legal forest work will increase with the wage rate, i.e.,  $\frac{dw_L}{dr}$  is positive.

The higher wage rate (or higher per unit price for legal forest products like NTFPs) will induce the individual  $i$  to reduce his illegal work time of forest related work (like collection of TFPs) and so reduces  $Y_I$  (Fig.1) so long as individual  $i$ 's economic condition does not improve. So, the positive relationship between  $W_L$  and  $r$  and the consequent reduction of  $Y_I$  will continue till the point  $P_3$  (Fig1). After  $P_3$  the wage rate (or price) makes individual  $i$  so well off that he is induced to cut down legal working time  $W_L$  (i.e. increase the  $Y_I$  time) and earn a higher income. But this condition implies a better economic condition (or upward mobility) of very poor categories of individuals. Practically, when the individual will be well off, he will also have more opportunities to increase his income other than forest source. Our study also clearly suggests that more well off individuals are less dependent on income from forest resources (Tables 8 and 9).



(Fig.1)

### Conclusions

The results that emerge from our study suggest that almost all members, including women members in female FPC, actively take decision and participate in the JFM programme and almost all households, which belong to very poor and poor categories that live below poverty line and mainly depend on forest resource for their livelihood security, in all villages enjoy the maximum benefit from forest for the execution of JFM programme; moreover there is an equity in benefit flows for legal timber income. It implies that the JFM programme under the FPCs/Villages we surveyed is participatory. With regard to the SRL framework is concerned, it is argued that JFM Programme would sustain rural livelihoods if it meets strong sustainability criteria. Our results also suggest that strong sustainability criteria meet for all very poor and poor categories of households, who live below poverty line and that are almost dependent on forest resource for their livelihood security in all FPC/Villages, because the change of each type of capital is greater than zero and the change of income from non-forest sources is less than zero or very near zero.

But the change in the free collection of TFPs by the very poor and poor households is negative in the three FPCs/Villages, whereas this shift is considerably positive in one FPC/Village (Goulbar Marshal). Although the positive change of the collection of timber products by the households below poverty line is of help in generating their higher current income, the illegal collection of timber products from forest produces adverse effect on the sustainability of forest resource. But, in fact, the sustainability of forest resource is the pre-condition for the SRL based on forest resource.

The JFM Programme based on the National Forest Policy of 1988 in India lays emphasis on meeting local needs by supporting them fuelwood, fodder, food, NTFPs and limited use of TFPs for self consumption, prohibiting the free collection of TFPs by the local people to maintain the carrying capacity of forest. Instead of free collection of TFPs by the local people, they are given a 25 per cent of share from the sell of timber by the forest department/government. But despite forbidden by law regarding the free collection of TFPs, the very poor and poor categories of households in one FPC/Village have substantially increased their collection of TFPs after JFM Programme, mainly, because the other source of forest income –legal collection of NTFPs, fuelwood etc. – is substantially low for them in relation to the same categories of households in other three FPCs/Villages. Clearly, it implies that force or law cannot effectively control the illegal collection of TFPs for the households living below poverty line, which mainly dependent on forest resource for livelihood security, until and unless a considerable increase in the collection of legal forest products – NTFPs, fuelwood etc. – and wage income from forest meets their minimum livelihood security. This study also suggests that the price per unit of valuable NTFPs the collectors have to sell to the agents of LAMPs is considerably low in relation to its market price.

What are the policy prescriptions in order to overcome this situation? This study suggests that the considerable portion of households is dependent on forest resources for their livelihood security and live below poverty line. So, the policy prescription of the JFM Programme would be such that those poor categories of people can cope with and recover from stresses and shocks and maintain or enhance the capabilities of livelihood and assets both now and in the future, while not undermining the natural resource base. Within the existing JFM Programme based on the existing field study there seems to be two ways to tackle these problems – one is to increase the production of NTFPs, fuelwood etc. in order that the very poor households may increase the legal collection of those products; but this depends on the participatory forest management programme and its proper execution which is often long term in nature. The other is to increase the per unit price of Forest Products (FPs) the collectors have to sell to the agents of LAMS. In order to execute the programme, Government should restrict the power of the LAMPs so that the collectors of Forest Products may sell their collection at the market and increase their income from the sell of Forest Products However, such an increase in income for the households below poverty line is a short term process; it may not increase considerable income for them in the long run because the change of real income for all sources are negative from before to after JFM situations for all categories of households including households belonging to below poverty line. Together with it, more pro-poor programmes under both Government and non-Government initiatives that complement the benefit of JFM Programme need to be introduced to bring about a positive change of the real net income particularly for poor categories of households.

[The financial help for this paper has been taken from my UGC project entitled 'How to execute the Joint Forest Management Programme with Sustainability: A study of Joint FPC and Female FPC in four divisions under Midnapore and Bankura Districts in West Bengal'. The usual disclaimers apply.]

#### Notes

1. Kenneth Arrow (1999) argues that social capital shares the temporal aspect of physical capital but does not require material sacrifice (cited in Sobel, 2002: 144).
2. For details, see Mathai and Rathie, 1977: 12.
3. Singh et.al. (2002) establish their inferences on the basis of 97 farmers, the distribution of small, medium and large being 16,30 and 51 respectively. Jayasankar and Muraleedharan (2000) make the validity of their conclusions only on 37 observations, the number of small, medium and large being 12, 15 and 10. Banik (1994) proved the validity of the conclusions of his study on 99 farmers, the number of small and large farmers being 74 and 25 respectively. Sharma et.al. (1995) establish the validity of allocative efficiency on 75 households in the irrigated villages, the small and large landholding households being 64 and 11 respectively, and 75 households in the unirrigated villages, the number of small and large being 63 and 12 respectively. Rajasekharan and Krishnamoorthy (1999) calculated technical efficiency of production on the basis of only 35 farms.
4. Real earning (in Rs.) is determined after deflating the money income by Consumer Price Index for Agricultural Labourer (CPIAL). Indian Labour Bureau provides Consumer Price Index for Agricultural Labourer [General]. From Indian Labour Journal (1991, 2005) we get CPIAL from 1990-91 to 1995-96 with base year 1960-61 and from 1995-96 to 2005-06 with base year 1986-87. Now we apply base transformation procedure (*splicing*) for a single base year (1986-87). However the CPIAL during after JFM situation is estimated as 333 and during before JFM situation is estimated as 179.
5. Never did the respondents say that their source of income is illegal; rather while examining the answer from the respondents regarding their break up of their source of income, the distinction between legal and illegal source was clearly demarcated.
6. FPC member households usually receives information from the following sources: forest officials, forest executive committee, Panchayet personnel, government deputed agents, market middlemen and media. When FPC member households receive more accurate information, they usually have it from government agents and media in addition to their four additional sources: forest officials, forest executive committee, Panchayet personnel, market middlemen.
7. Participatory Rural Appraisal sessions like group discussions, social mapping, resource mapping, wealth ranking held among all households under 4 sample FPCs provide the basis for estimation of social capital, but data were collected from all individual members of the respective FPCs through the structured questionnaire.

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