Historical Relevance of Joint Forest Management Proggramme and the Key Elements of its Sustainability: An Evidence from Western Midnapore Division in West Bengal

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Historical Relevance of Joint Forest Management Programme and the Key Elements of its Sustainability: An Evidence from Western Midnapore Division in West Bengal

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ABSTRACT: W*hile investigating the historical perspective of joint forest management (JFM) programme, this paper observes that the resistance movement of forest communities in western Midnapore division in West Bengal, which acted as key precursor to JFM programme in India through a June 1990 Ministry of Environment and Forest (MOEF) circular based upon, to a large extent, the successful experience of joint management in Arabari hills, under this division, have been mobilized by the poor forest communities from long past for their community right on their forest resources in connection with the immediate survival needs. The study of existing four-forest protection committees (FPCs) of this area also confirms that this immediate survival needs generating mainly from non-timber forest products' (NTFPs) income of FPC members are the key element for the sustainability of JFM.*

KEYWORDS: *Joint forest management programme, non-timber forest products, bengal forest.*

In the context of Indian forestry, several strands have gone to make up the present emphasis on community involvement in forest protection. Joint Forest Management (JFM) can be seen to emerge as the latest in the history of policy changes, as well as one more in a series of attempt to create a new relationship between the state and the community in terms of forest management .The old custodian forest management system developed were rendered ineffective in 1950's and 1960's due to various reasons. The major reason being traditional emphasis on production of commercial wood and disregard for local need. Against this old custodian forest management system the local communities in different parts of India have mobilized repeatedly from long past to protect their

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resources from manipulation from outside groups. The emergence of new community forest management system in west Midnapore division in West Bengal, like some other parts of rural India, is grounded historically in tribal and peasant resistance movements.

The paper is organized as follows: section I presents the historical perspective of the study, section II provides a short review of the relevant literature, section III covers the data set and findings, and conclusions are contained in section IV.

I. Historical Perspective

In the pre-colonial period, western Midnapore was covered by dense Jungle tracts (dense forest). While patches of forests, particularly along river plains, had been cleared for agriculture, much of the area was wild and remote. Western Midnapore, primarily populated by Santal, Bhumij, and Mahato tribals, with some low-caste Hindus, included the police stations (Thana) of Garbetta, Binpur, Gopiballavpur, Salboni, Sildha and Jhargram. Prior to the colonial era, while this area was nominally under Mughal control due to the inaccessibility of the area, little attempt was made to extract revenues or exert political authority. Forest-dwelling communities of this area could resist incursions into the area. Their superior knowledge of the jungle and their hunting skills made them an effective guerrilla force. Some Bhumij communities gained the reputation as CHAURS (robbers), from their aggressive raids into the plains. Many local rajas (kings) and zamindars (land-lords) preferred to leave them alone and not attempt to extract taxes from them, rather than to enter conflicts with jungle people (Poffenberger, 1995).

Many tribal communities that maintained forest oriented self-sufficient economics were best able to obstruct outside political domination. They alternatively protected their political autonomy and forest resources. The Santal and Bhumij tribal communities of forest inhabitants practiced shifting (swidden) cultivation as well as hunting and gathering forest products[1]. Much of their diet was provided from wild fruits, roots, herbs and the nutritious flowers and fruit pulp of the Mahua (Madhuca) tree, making them less dependent on agriculture. Tribal villagers were also actively engaged in trade in firewood, silk, resin, deer and buffalo, horns, wax, honey, bark fabrics, lac, medicine and charcoal[2].

Along with the survival needs of the forest communities, cultural values of them also retained health, fertility and prosperity of the forest. During the pre-colonial period, and up to the present, the belief systems of the forest communities of this area were strongly grounded in the worship of nature. Religious festivals are tied to both the agricultural cycle and the flowering and

fruiting of the forest trees. The Santal New Year, for example, begins with the blossoming of the sal (shorea robusta) tree in March. This links in tribal beliefs[3] helped the regeneration of natural forest.

In 1760, the district of Midnapore was transferred to the East India Company by Mir Qasim, making it one of the first districts in India to be brought under British rule[4]. During the late eighteenth century the British sent military expeditions into this area in an attempt to extend their authority and extract land revenues. The forest chieftains and tribal communities resisted, ambushing British forces and harassing them whenever possible. Local zamindars also resisted the imposition of colonial authority, refusing to pay their taxes, organizing their paik militias to resist, and falling into arrears on their taxes. In 1798, widespread violent resistance disrupted revenue collection activities in the Midnapore area, forcing the Company to restore lands to hereditary chiefs that had been put up for sale for failure to pay taxes.

Through superior force, however, the British did gradually succeed in extending their control in the area through the nineteenth century. As this process continued, the British empowered a new class of zamindars to control and tax local forest communities, encouraging them to open forest land for cultivation. In order to meet their tax obligation, zamindars were anxious to bring in tribal and peasant cultivators to clear forest and convert it to agricultural land. The tribal communities of this area resisted the imposition of the taxing and conversion system through a series of armed revolts. The first, referred to as the Chuar Rebellions, lasted from 1767 to 1800[5]. Tribal guerrillas were so effective that 'even as late as 1800, after nearly forty years of British occupation, a collector reported that two thirds of Midnapore consisted of jungle, the greater part of which was inaccessible'[6]. Yet gradually the Company succeeded in strengthening its control, despite subsequent revolts by forest people, such as the Naik Revolt (1806-16). Under the Permanent Settlement Act by 1866, 1369 zamindari estates had been established in Midnapore, and given the absolute ownership of agricultural and forest lands as long as they paid government revenues.

The process of forest clearing for agricultural land conversion had sweeping ecological implications, especially for river systems and soil conditions. Removal of forest cover allowed torrential monsoon rains to wash away the shallow top soils, leaving an exposed laterite hard pan that made farming virtually impossible in many areas. Traditional forest based industries like tusar silk, indigo and endi declined dramatically, as did the population density of this area as the forest was cleared.

The pressure on the forest grew further by the 1860s as the growing railway system demanded immense quantities of sal logs to provide sleepers for rail bed. Commercial demand for

timber accelerated forest cutting, and raised the value of forestlands. Timber merchants rushed in, even before the rail lines opened and began leasing or purchasing large tracts from the Midnapore Zamindary Company and other zamindars.

In early 1855, six to seven thousand Santal tribals from, Birbhum, Bankura, Chotonagpur and Hazribagh began meeting for organizing resistance in response to their growing marginalization. On July 16, 1855 some ten thousand tribals, 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[7]. 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[8], and lives on in the songs and oral traditions of the tribal people of this area. Throughout the later part of the nineteenth and first half of the twentieth century, many forest communities on this area became increasingly indebted to money lenders and tax collectors, causing widespread mortgaging and loss of their agricultural lands. Though the alienation of private lands was an important element in the impoverishment of tribal and low-caste communities, so too was the loss of cash and kind income from forest-based activities as the forests were cleared.

The forest policy of post-colonial India continued on the colonial path of commercialization and reductionism, and with it continued people's resistance to a denial of their basic needs, both through alienation of rights and through ecological degradation (Shiva, 1999). Despite the populist government in West Bengal after independence the old custodian system of commercial forestry, which disregarded local need also prevailed in western Midnapore. Throughout 1969 and 1970, some forest communities in this area were discontented with the Forest Department and its policies of providing elites and contractors with low-cost resource exploitation leases. Forests were logged of timber trees and bamboo and villagers lost the raw materials they required for their subsistence and commercial needs. The Dom tribals in particularly were upset by the high prices and fuel wood scarcity experienced by potters, blacksmiths, and other caste groups also increased antagonism towards the forest department and those who acted as contractors for them.

While successful examples of joint forest management were beginning to emerge in Arabari Hill in Midnapore district during the early 1970s, throughout the decade they remained isolated cases with little effect on routine forest management within the state. Recognizing the success of Arabari and a few other villagers where management agreements with forest communities were being made, some senior forest officers like Dr. Ajit Kr. Benerjee, began to encourage field staff to

pursue similar negotiations in wider areas throughout the southwestern part of the state. By formulating agreements that responded to the economic needs of forest communities, new incentives were created among villagers, which resulted in the emergence of effective controls on forest exploitation. The emergence of Chingra Forest Protection Committee, Chandana Forest Protection Committee, Harinakuri Forest Protection Committee are the examples of decentralized nature of forest protection group formation in Midnapore district. This early experience demonstrated that opening communications with forest communities could effectively reduce conflicts between the forest department and forest user groups. Forest officers were able to identify terms for effective management partnerships through discussions. In some communities village men formed volunteer patrols. People who were found cutting green wood or grazing animals were warned by village volunteers. Repeat offenders from the participating villages were fined, and outsiders were turned over to forestry field staff.

The experience of some forest protection committees (FPCs) in this area illustrates the way in which village leaders like Mahadev Munda Singh of Chingra FPC, Lokhun Sahu of Chandna FPC and Joti Naik of Harinakuri FPC were able to work with field staff and other neighbouring communities to identity forest areas for protection and reach agreements, while turning away outsider users. It appears that the ability of local communities to take the lead in defining management territories was a key to the success of the programme. Although field staff helped facilitate this process by encouraging group meetings and authorizing community protection activities, frequently successful FPCs took the initiative in organizing themselves and establishing operational controls over forest access. Most confrontations came into effect during the first and second year of protection after which restriction and right of the protection committees were generally recognized by outsiders.

Despite its early success, these early achievements were limited to small forest tracts of this area. The JFM in this area, however, was largely effective among most of the forest communities neighbouring the forest when West Bengal Government Orders were issued on 12th July, 1989 to formalize the FPC wherein the duties and responsibilities of the FPC members, usufructury, and other benefits to which they would be entitled had been laid down. The departmental appeal to tribal communities to protect forest resources and its willingness to empower them apparently coincided with a growing desire among these communities to take environmental action. It was easier for communities to mobilize because the West Bengal programme did not require complex registration and budgetary allocations processes for communities to take action, but rather presented

communities with a straightforward opportunity (protect the local forest and enjoy the benefits). As each community began protection activities, it influenced the behavior of neighbouring villages. Without necessary waiting for the forest department to take action, villagers were forced to negotiate and discuss management issues and needs with one another (Poffenberger, 1995). It is this community based 'chain reaction' or catalytic effect that is apparently a driving force behind the rapid emergence of localized access controls on state forest lands in southwest Bengal[9]. As per the latest State Forest Report published from Directorate of Forest, Govt. of West Bengal on December 2001, the total number of FPC in west Midnapore division was 542, the highest in number among all divisions in West Bengal. Thus the historical events outlined earlier in this discourse suggest that the communities in this area have mobilized repeatedly over long past to protect their resource rights from manipulation by outside groups. This study indicates that the emergence of new wider community forest management systems with a straightforward opportunity is grounded historically in tribal and forest communities resistance movements. In many parts of rural India, pockets of disempowered people have organized repeatedly to struggle for their survival as their resource base is increasingly captured by local elites, money lenders, tax collectors, and the state. In the past, each time the movement was crushed or collapsed, after some time it would reemerge. The people of western Midnapore in West Bengal represent a classical case.

II. Review of studies

While empirical evidence across the world now confirms that community-based regimes are a viable option for the management of local common property resources (Baland and Platteau, 1996; Berkes, 1989; Bromley, 1992; Correa, 1999;Lama and Marlene, 2002; Martin, 1992; McCay and Acheson, 1987; Naik, 1995; Saxena and Sarni, 1999; Singh, 1994 & 2001 etc.), the theoretical literature has developed an understanding of the mechanism which make these regime work. The early research was pessimistic about the possibilities of group management, arguing that individuals would not face the full costs of their resource use under such regimes, and would have an incentive to over-exploit the resources. This was the 'free-rider' problem and the only way to solve this problem, according to their suggestion, was to create private property rights in the resource, or to regulate resource use by coercion through the state. This early theoretical tradition was inconsistent with the empirical evidence on group management regimes, and it was subsequently pointed out that the free-rider problem was a characteristic of the 'unregulated commons' or 'open access'. This was distinct from 'common property', a regime in which a clearly defined group co-operated to manage

a resource (Ciriacy-Wantrup and Bishop, 1975). It is no longer theoretically disputed that individuals can coordinate their actions and participate in collective regimes.

As better management of common property resources, such as forests, is considered vital for poverty alleviation, sustainable development with equity, ecological stability and preserving bio-diversity, there is a constant search for alternative approaches necessitated by the fact that the usual options of state or market mechanism are not advocated due to their inherent inadequacies. There is evidence to suggest that privatization of such common property, resources would enhance inequity of denying access to underprivileged classes of the community (Karnath, 1996). But the survival of community needs of poor communities need to be recognized on a priority-based as pillars for strengthening their community participation (Mukherjee 1995). Some authors produced general lists of conditions, which facilitate successful community based resource management (McKean, 1992; Wade, 1998; Baland and Platteaee, 1996; Ostrom, 1990). Eleven factors are commonly identified in this literature as creating conditions which are more conducive to local-level management[10]. But expectations of immediate returns via wages and incomes from sale of old plantation and local consumption need to fill the requirements of fuelwood, fodder, minor forest produce and small timbers seemed the most important factors motivating massive local peoples, participation for protection and development of forests (Mukherjee, 1995; Naik, 1997; Saxena and Sarni 1999). The present process and basis of developing VFPCs/FPCs will need considerable strengthening if these have to be developed into robust and confident village institutions. The first important step in this direction is of ensuring that FPC members have clear entitlement to all types of forest produces from redefined JFM areas for meeting their bonafide requirements, with no removal of produce from the area unless it is surplus to local consumption needs. Moreover, the present policy of selecting the most degraded land for planting would have to be modified in favour of greater emphasis on regeneration and less on planting (Saxena and Sarni, 1999; p.213).

But long-term gains hardly matter to people who are facing major problems of livelihood-food security. In depressed areas with higher level of poverty day-to-day existence comes top most on their agenda. The most urgent community need under JFM at Arjuni in Midnapore district, West Bengal is that of alternative means of livelihood during lean season with agriculture being the mainstay in peak season. The Arjuni experience in JFM shows that unless survival needs of food and livelihood are met, participation of natural resources management would always remain threatened (Mukherjee 1995; p. 3132). This experience goes a long way to show that survival needs are of prime importance and can easily destabilize community rights and benefits to resource

management. Any JFM which does not recognize the significance of creating strategies for sustaining livelihood -food security - at the local level has a doubtful future (ibid, p.3132). The findings of Naik (1997), based in two case studies in Gujrat state, can also help identify the factors critical in making the JFM successful and if there are controllable, such as market development and share of the local people in forest produce, necessary steps may be taken to suitably change the factors in order to enhance the chances of success of JFM.The present JFM needs to be remodeled in terms of livelihood benefits which are immediate and less commercial (Mukherjee, 1995; p.3132). To this end, the forest policy of Govt. of India, 1998, recognized the need to fulfill the requirements of fuelwood, fodder, minor forest produce and small timber of rural and tribal people, and emphasized the need to create massive people's movement for protection and development of forest.

But concerning to the benefit-sharing arrangement between states and forest communities and the management of forest polices differ between states within the country. Orissa's NTFP policies are among the most regressive in the country, guided by the principle that all forests and forest produces are state property; the NTFPs gatherers access to income from NTFPs are severely restricted due to existing policies. The Vana Samrakshan Samiti (VSS) gatherers get only wages for collecting the products. Thus even in jointly managed forest lands, the people, who are supposedly co-managers, are treated as mere hired labourers whose earnings are based on the minimum wage rate and not treated to the value of the products (Rao, 2001; p.261). In JFM, and also in the recent NTFP policy in Orissa, no steps have been taken to address the real problem of NTFP's gatherers. The issues affecting the livelihoods of forest dependent poor women and men remain unaddressed, and any talk about community participation in management of forests and community rights remain meaningless (ibid, p.262).

The field context in which JFM is implemented brings together two principal players: the village community and the forest bureaucracy. Forest bureaucracy, in many cases, enforces rather than abdicates its power influencing adversely the relationship between forest communities and forest department. Benefit-sharing arrangement in many states have also been specified in advance, without asking villagers whether they, in fact, want to harvest their timber, and how they would like the proceeds to be distributed. In most states, the committees are simply registered with the forest department. Only in five states (Gujrat, Haryana, Rajasthan, Arunachal Pradesh and Karnataka) do the VPCs have a legally independent existence as co-operatives registered under the Co-operative Society Act at least formally (Jeffery and Sundar, 1999; p.45).

In most cases the forest department also reserves the right to dissolve committees if they perform unsatisfactorily, or at least deny them the shares expected (Poffenberger and Singh, 1996; p.71, Jeffery and Sunder, 1999; p.45). As happened in the Panchmahals in Gujrat, parallel processes exist, refusing to register existing committees, specially if the forests they have been protecting have now turned from degraded into good forests (Agarwal and Saigal, 1996; p.7); or attempting to latch onto existing committees while simultaneously denying the legitimacy of rules they have been framed earlier and which do not fit into state resolutions (Sundar et al., 1996). Moreover, planners, policy makers and forest bureaucracy, in many cases, fails to develop appropriate strategies to successfully involve the poor (including women) who depend much more on the forest as they have little access to alternative source of biomass in community forestry. It has been well documented that community-based projects and programmes (specially in India and Nepal) ignore women and the poor (Agarwal, 1997; Hildyard et al., 1998; Hobley, 1996; Joekes et al., 1996; Locke, 1999; Lama and Buchy, 2002; Sarin, 1998). Gender, class and castes are often overlooked by policy makers. Policy makers do not have understanding of individual relations that have constructed through gender, class and caste. Men and women form the poorer sections of the society, especially of the lower caste, have been excluded or prevented from participating in community forestry programme (Hobley, 1990; Lame and Buchy, 2002). Community forestry in Nepal fails to deliver its promise and instead disempowers those already marginalized. On the other hand, the local elite, rich families, upper caste group and leaders dominate decision-making process and as a result, get more benefit. This will in the long run alienate subaltern groups from mainstream development, hence threatening sustainable management of forest resources.

Although some researchers (e.g. Agarwal, 1986) have questioned the belief that foraging and fuelwood collection by the rural poor is primarily responsible for the shortages, the findings of these studies are ignored by development practitioners. It is commercial demand that have more frequently resulted in large-scale forest destruction (Shiva, 1999; Poffenberger 1995, 1996b; Correa, 1999). Earlier, inspite of govt. regulation, people would use the forests for firewood, manure and NTFPs. With the introduction of JFMP, people agree not to use (or to use specified areas) of the forest for these purposes, thereby restricting their use of the forest (Correa, 1999). It has been proved that community-based forest protection activities resulted in the rapid regeneration of degraded natural forests and confirmed the best prospects for sustainable forestry. Natural regrowth led to substantial increase in biomass productivity and enhanced availability of a range of important minor forest products. The capacity of degraded natural forests to rapidly regenerate and produce fodder,

fuel, fibres and other valuable materials appears to have been instrumental in sustaining community protection activities (Poffenberger et al., 1995,1996b; Correa, 1999).

III. Data set and findings

The study is based on secondary data relating to the study entitled "Role of NTFP in sustenance of JFM a case-study", carried out by the Divisional Forest Officer (DFO) west Midnapore division under the office of the Principal Chief Conservator of Forest, Govt. of West Bengal in 2001. The study was conducted in four FPCs of Nayagram block, in Paschim Midnapore district. The enter block is very well forested with forest covering about 48 per cent of the total geographical area. As per last census, Nayagram block has a total population of 106490 of which 18.33 per cent is scheduled cast and 40.45 per cent is scheduled tribe. Sabar constitute one of the dominant ethnic groups. The main economic activity of the population is agriculture, the income from forest sources being the second most important source.

Almost entire forest was cut down during late `70s and early `80s of the last century mainly due to mass illicit felling by the contractors for the commercial needs. Since then, the forest resuscitated following the adaptation of joint forest management principles. The predominate species of the forest is sal with associates like mohua (madhuca indica), bahera (terminalia balerica), piasal (pterocarpus marsupium), asan (terminalia tomentosa), karam (adina cordifolia), pial (buchanania lanzan) etc. Most of the tree cops are of coppice origin. The study has conducted in following four FPCs:

Ambisole FPC - This forest protection committee is located in the Nayagram beat of Nayagram Range. The committee was registered in the year 1991, it's registration number being 392/WM/FPC/224/NG-42. Total forest area under the forest protection committee is 130 hectares. There are 41 members in this FPC of which 40 belong to scheduled tribe and one to general caste. There are 23 Lodha members in this FPC. All the 40 scheduled tribe members of this FPC are landless.

Bansiasole FPC - This forest protection committee is also located in the Nayagram beat of Nayagram Range. The committee was registered in the year 1990, it's registration number being 330/WM/FPC/45/NG-17. Total forest area protected by this FPC is 102 hectares. There are 60 members in this FPC, of which 34 belong to scheduled tribe and the rest 28 to general cast. There are 18 Lodha members in this FPC. All the 34 scheduled tribe member of this FPC is landless.

Kasia FPC - This forest protection committee is located in Chandabilla beat of Chandabilla Range. The committee was registered in the year 1991, it's registration number being 378/CB/WM. Total forest area protected by this FPC is 215.89 hectares. There are 100 members in this FPC, of which 24 belong to scheduled tribe and the rest to general caste. There are 11 Lodha members in this FPC. Fourty-one families are landless.

Kadokata FPC - This forest protection committee is also located in Chandabilla beat of Chandabilla Range. The committee was registered in the year 1995, it's registration number being 409/CB/WM. Total forest area protected in this FPC is 343.27 hectares. There are 24 members in this FPC. All of them are tribal. The forest protected by this FPCs shows typical characteristic of this area. Tree species in the forest were enumerated by laying out sample plots.

This empirical study might help us know whether the economic returns from forest - the share of net revenue from final harvesting of timber, income in the form of wages from forestry activities and income from NTFP in the forest - are significant for FPC member for the sustainability of JFM. But data in some cases are non-classified and non-tabulated. Despite these limitations, we have attempted to study their findings in simple proportions, averages and in some tabular forms for this paper. A mathematical model is also framed in the light of our empirical results (represents in the appendix).

As may be seen in table 1, the per capita annual money incomes from the share of revenue from timber are dissimilar across four FPCs studied. Since felling intervals are not same for all FPCs studied, area of felling coupe is not uniform and per capita forest of FPC members across the committees are dissimilar; also per capita notional income of a member per year is not equal. It is important to mention that each FPC, according to JFM agreement, becomes eligible to get a share of 25 per cent of total revenue earned from final harvesting of timber products. It is also observed that although per capita annual money income of a member of Ambisole and Kadokata FPCs is higher than that of total average. Out of total forestry income of FPCs, the share of revenue of final harvest of timber is 1.48 per cent in Ambisole FPC, 0.36 per cent in Bansiasole FPC, 0.22 per cent in Kasia FPC and 1 .37 per cent in Kadokata FPC. As the share of revenue from timber is very small source of income for all FPC members and this income is received by the FPC members at some irregular annual intervals, this income, usually, does not meet up their immediate survival needs. It is important to mention that although the success of Arabari experience in JFM in Midnapore district, West Bengal is well known, however, ironically, in the same district, JFM of Arjuni mouza which started from 1991, failed to deliver results after the middle of 1994 as the members of FPC were

only granted to have 25 per cent share of timber, without any other share of the forest resources which was insufficient to meet up the immediate survival needs of poor FPC members. It caused for large illicit felling, mainly, by the poor forest committees due to meeting up their immediate seasonal livelihood and food insecurity, which plagued the area and led to conditions of semi-starvation amongst the poor people.

In order to meet their immediate survival need, the poor FPC members are exclusively engaged as labour in forestry operations carried out in their respective jurisdiction. All such forestry operations, such as raising nursery, planting, tending, harvesting, entry point activities are labour intensive and serve as small scale of their income, particularly in the lean season (Table 2). Income from this source per member per year is computed by adding wage component of total amount spent over 5 years (1996-97 to 2000-01) in a particular FPC and dividing it, first, with strength of FPC members and then with number of years (five years in this case). This source of income, too, is variable across FPCs and depends on the scope of forestry operation in a particular committee area. Income as wages from forestry works constitute 4.80 per cent in Ambisole FPC, 5.67 per cent in Bansiasole FPC, 2.34 per cent in Kasia FPC and 10.98 per cent in Kadokata FPC out of their total income from the forestry sector. Although this source is small, it is one of their sources of survival during lean season (June to September).

In addition to the maintenance of regular consumption needs of the local FPC members, NTFP is the main source of money income for all FPC members under our study (Tables 3a, 3b, 3c and 3d). Some common characteristics may be discerned in this regard. **First**, the money income generated from the share of revenue from timber and income as wage from forestry works are insignificant in relation to NTFPs for all FPCs studied. The contribution of NTFPs' income of Ambisole, Bansiasole, Kasia and Kadokata FPCs are 93.72 per cent, 93.98 per cent, 97.44 per cent and 87.65 per cent respectively out of the total money income (from all sources) of the respective FPCs. **Secondly**, sal leaves (shorea robusta) are the main source of money income of NTFPs for all FPC members. More than 35 per cent of total NTFPs' incomes for all FPC members come from the sale of sal leaves to the local market. The period of availability of sal leaves is the highest (10 months in a year) of all NTFPs. The money income received from other NTFPs are different for different FPCs. **Thirdly**, out of 36 types of NTFPs, 10 types[11] are common to all FPCs studied. The contribution of these common NTFPs' income of Ambisole, Bansiasole, Kasia and Kadokata FPCs works out to 62.58 per cent, 70.18 per cent, 62.20 per cent and 78.64 per cent respectively out of total NTFPs' income of the respective FPCs. **Fourthly**, the period of availability for the same NTFP

does not differ among FPC members. Moreover, the local rate (Rs. per unit) of the same NTFP does not differ among FPC members. The members of each FPC dispose of the same NTFP at a fixed price. The amount of output the members of the FPCs decides to sale seems to have no effect on the local market of the product.

This study, however suggests that the relative importance of NTFPs in forest-based economics is supreme. Consequently, it plays the major role in sustenance of joint forest management and to this end the FPC members are expected to optimize the production from timber to NTFPs (discussed in the appendix with a mathematical model). Although, the sample size (four FPCs) is too small to make a generalization, it may be said that in predominantly tribal FPCs with a good cover of sal forest, NTFPs provide the main source of forestry income.

IV. Conclusion

The historical context in which JFM has emerged as the latest in a history of policy changes in India has been grounded since long past by the community resistance movement of local poor communities against the old custodian system of forest management. In many parts of India where forests are an essential component of the local livelihood support system, a community-based rights regime with build-in safeguard for access and the livelihood of forest dependent people have been grounded historically and that have provided a solution to problems of sustainable forest management as well as sustainable local livelihood maintaining bio-diversity, ecological balance and environmental stability. This study also suggests that the present JFM model needs to be remodeled in terms of livelihood benefits of the poor forest communities which are immediate and less commercial and in line with this, the new policy management of both degraded and non-degraded forests are to be re-oriented from timber production to optimizing the production of NTFPs for strengthing the livelihood of local communities as well as the sustainability of community forest management with environmental stability. Any JFM, which does not recognize significance of sustaining livelihood -food security - at the local level, have a doubtful future.

Appendix

MODEL: The solution to optimal resource exploitation problems of community forestry relating to the sustainability of JFM system may be studied by the form of present-value Hamiltonian function. This form assumes that simple replication of past decision with any other choice (there is none, in fact) to be made at some later date. Each decision imposes an externality on the future (Silberberg,

1990; p.14-15). The solutions to this problem are termed 'open-loop control'. They represent once-and-for-all solutions to dynamic optimization problems, which are as if the firm decides in the initial period what to do for all future periods and stick to that plan. The following assumptions are taken in this regard.

Firstly, the growth function of NTFPs is a continuous time-logistic function

$$\mathbf{v\ (t)=g\ (v\ (t),\ u\ (t),\ t)}$$

where v (t) is the stock and u (t) is the rate of harvest. The logistic growth function is widely used in empirical analysis (Hanley et al., 1997: chapter 10). The growth of NTFPs may continue for some years although ultimately the volume of NTFPs reaches at its peak and then declines as the NTFPs decay and eventually die. It has the characteristics that at low stock rate of growth is low, it peaks at a particular time and then declines towards zero.

Secondly, the total income (nominal and /or physical) of NTFPs is shared equally among the members of local forest communities involved in JFM program. Government does not take any share of income from NTFPs.

Thirdly, the members of FPC in JFM sell the NTFPs in a competitive market at a fixed price (discussed in the text). pu is the net revenue function and u is the control variable.

Finally, both harvesting and planting of non-timber trees are costless.

JFM committee aims to maximize its profit subject to the stock over an infinite time interval. Mathematically the problem is

$$\mathbf{Max_u} \int_o^{\infty} \mathbf{pu\ e^{-rt}\ dt} \qquad \mathbf{(1)}$$

$$\mathbf{subject\ to} \quad \mathbf{v\ = g\ (v,\ u,\ t),} \quad \mathbf{v\ (o) = v_o}$$

where u is the harvest rate at time t (NTFPs are usually harvested every year). v is the stock, pu is the net revenue function and g(.) is a logistic growth function. x (o) is the initial stock [Endpoint conditions vary. Typically the initial stock is fixed, although the final stock may not be (Silberberg, 1990; p 618)]. r is the discount rate. The variables v,u and λ all have time subscripts. The growth function, $\mathbf{g\ (v,\ u,\ t) = av+bv^2- u,\ a > 0;\ b < 0.}$

The necessary conditions can be represented by introducing Hamiltonian function, H (.)

$$\mathbf{H\ (v,\ u,\ \lambda,\ t) = pue^{-\ rt}\ + \lambda g\ (v,\ u,\ t)}$$

This function is equal to the profit plus the change in the stock valued by its shadow price. The Hamiltonian allows a convenient representation of the necessary conditions which compromise the maximum priciple: first differentiation H(.) with respect to u and setting equal to zero.

$$\frac{\delta H}{\delta u} = pe^{-rt} + \lambda g_u = 0 \qquad (2)$$

where the Hamiltonian is maximised with respect to u, and the costate condition is

$$\frac{\delta H}{\delta u} = \lambda = -\lambda g_v \qquad (3)$$

The costate variable is not of direct interest, so (2) and (3) are used to eliminate it. In the same series of manipulations, the time variable is also eliminated so that results can be expressed independently of time.

First writing (2) explicitly for the logistic growth function

$$pe^{-rt} - \lambda = 0 \qquad (4)$$

and note that this implies that harvest continues until the marginal profit (here average profit) equal the marginal value of stock, λ.

Differentiating (4) with respect to time

$$\lambda = -r\, pe^{-rt} \qquad (5)$$

When the specific functional form (logistic growth function) is included, (3) can be written as

$$\lambda = -\lambda (a + 2bv) \qquad (6)$$

The procedure now is to eliminate the costate variable and define a steady-state solution. To this end, equate (5) with the (6) and eliminate λ using (4) to define a steady-state equilibrium

$$r = a + 2bv = g_v \qquad (7)$$

where own rate of return on the stock (g_v) is equal to the discount rate (r).

The term g_v is of great importance: it indicates how the rate of stock growth changes with respect to the stock and it, therefore, represents the return on relating the marginal unit of stock. Thus gv is the own rate of return on the stock.

The system of differential equations is complete by the growth equation

$$v = g(u,v) = av + bv^2 - u \qquad (8)$$

This is the required result, it represents the problem as two autonomous differential equations (7) and (8) which are independent of time. Although there is no guarantee that these equations can be solved analytically, they allow us to assess the optimal harvest rate of NTFPs given initial conditions (v_0, u_0) and a steady-state solution which may be viewed as the comparative static solution to the dynamic problem where the stock and the harvest rate are constant and no incentives exist to adjust them, to the problem (The equilibrium solution in an imperfect market is identical to that of the competitive problem [7]).

The necessary and sufficient condition for the solution to (1) can be achieved by checking that second order derivative of the maximized Hamiltonian with respect to v is non-positive

$$\frac{\delta^2 H}{\delta v^2} = \lambda\, 2b$$

As $\lambda \geq 0$; that is, shadow price of stock is non-negative and $b<0$, the condition for concavity is satisfied and a solution which satisfies the maximum principle conditions is both necessary and sufficient (Hanley et al., 1997; p.200).

If we, however, relax the last assumption and introduce cost function (cost per unit harvesting is declining function of the stock), the problem becomes

$$\mathbf{Max}_u \int_o^{\infty} (pu - c(v)q)e^{-rt}\, dt$$

$$\textbf{subject to } v = g(v,u,t), \qquad x(o) = x_o$$

and the result after manipulation will be

$$g'v) = \frac{c'(v)\, g(v)}{(p - c(v))} = r \qquad (9)$$

From (9) the rate of return on holding the marginal unit of stock can be decomposed into two parts: the return from increased stock growth, $g'(v)$ and the return from reduce cost. This implies that the optimum level of stock is less in the presence of costs than would be case for zero costs.

Notes:

1) See Duyker, Tribal Guerrillas, p. 28.
2) For detailed information, see L.S.S. O'Malley, Bengal District Gazetter: Bankura (Calcutta 1911), W.W. Hunter, Statistical Account of Bengal: vol- III (London, 1876).
3) The links in tribal belief between the health of the forest, fertility and prosperity are clear in the following lines from this Baha festival song.

When the sal trees are in leaf,
On the mountain,
How lovely they look,
Wealth in the house….

See W.G. Archer, The Hill of Flutes, Love and Poetry in Tribal India: A Portrait of the Santals (London, 1974), p.237, for and extensive discussion.

4) See S.Dasgupta, Adivasi Policies in Midnapore
5) The British adopted the Bengali term 'chaur' meaning an outlandish or wild person, to refer to the tribal and low-caste people of the area.

6) For detailed information, see Duyker, Tribal Guerrillas, p. 35.

7) See Dutta (Calcutta, 1940) the Santal Insurrection of 1855-1857, p. 26.

8) For discussion, see Duyker, Tribal Guerrillas, p. 35.

9) It is likely that similar community concerns over environmental degradation in other parts of India could provide effective support for joint management programmes if initiated by state forest departments.

10) The common factors are (i) perceived benefits from co-operating; (ii) clearly defined rights and boundaries for resources; (iii) knowledge about the state of the resources; (iv) small size of the user group; (v) low degree of heterogeneity of the user group; (vi) long-term, multi-layered interaction among the community; (vii) simple rules and adaptable management regimes; (viii) graduated sanctions as punishment; (ix) ease of monitoring, and accountability; (x) conflict resolution mechanisms and the role of leadership; (xi) influences from the wider political economy.

11) The common NTFPs are sal leaves, pial fruit, mohua fruit, mohua flower, kurchi fruit, haritaki fruit, dudhi lata, kurkura mushroom, karan mushroom, ghora insect.

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Table 1: Income from the share of revenue from timber from 1995-96 to 2000-01

Name of FPC	**No. of members**	**Share of revenue for the entire FPC (Rs.)**						**Income/ member/ year (Rs.)**
		1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	
Ambisole	41	0	13373	0	79734	0	0	378 (1.48)
Bansiasole	60	0	15338	0	0	0	11984	76 (0.36)
Kasia	100	0	0	0	0	48084	0	80 (0.22)
Kadokata	24	0	0	0	0	0	80985	562 (1.37)
Total	225	0	28711	0	79734	48084	92969	185 (0.59)

Figures within brackets represent percentages in respect of income from timber out of total forestry income.

Table 2: Income as wage from forestry-works from 1996-97 to 2000-01

Name of FPC	**No. of members**	**Amount spent in the FPC in this five years(Rs.)**	**Income/member/year (Rs.)**
Ambisole	41	251629.33	1227.64 (4.80)
Bansiasole	60	355459.40	1184.86 (5.67)
Kasia	100	432531.18	865.06 (2.34)
Kadokata	24	539749.97	4497.91 (10.98)
Total	225	1579369.88	1403.88 (4.53)

Figures within brackets represent percentages in respect of income as wage from forestry work out of total forestry income.

Table 3a: Period of collection, sale value, collection intensity and annual per capita income from NTFPs of Ambisole FPC.

NTFPs	Period of collection	Local rate (Rs.)	Average daily collection (per member)	Average annual income per member (Rs.)
Sal (*Shorea robusta*) leaves	10 months	14 per thousand	2000 nos.	8400 (35.04)
Pial (*Buchanania lanzan*) fruit	21 days (Apr - May)	20 per kg.	1 kg	420 (1.75)
Mohua (*Madhuca indica*)	30 days (Apr - May)	8 per	90 kg	720 (3.00)
Mohua flower	45 days	8 per kg	2.5 kg	900 (3.76)
Bahera (*Terminalia balerica*) fruit	30 days (Mar - Apr)	3 per kg	5 kg	450 (1.88)
Kurchi (*Holarrhena antidysenterica*) fruit	30 days (Feb - Mar)	22 per kg	1 kg	660 (2.76)
Haritaki (*Terminalia chebula*) fruit	15 days	10 per kg	3 kg	450 (1.88)
Dudhi lata (*Oxystelma esculata*)	30 days	4 per hundred	400 nos.	480 (2.01)
Kurkura (*Lycoperdon sp*) mushroom	30 days (June - July)	10 per kg	4 kg	1200 (5.00)
Karam mushroom	30 days	20 per kg	1 kg	600 (2.50)
Ghora insect	30 days	130 per kg	0.3 kg	1170 (4.88)
Rahara (*Soymida febrifuja*) fruit	20 days (May - June)	6 per hundred	300 nos.	360 (1.50)
Sidha (*Lagerstroemia parviflora*) fruit	15 days	3 per kg	2 kg	90 (0.38)
Anantamul (*Hemidesmus indicus*)	15 days	20 per kg	2 kg	600 (2.50)
Satamul (*Asperagus racemosus*)	15 days	6 per kg	2 kg	180 (0.75)
Chun alu (*Dioscorea deltoidea*)	120 days	6 per kg	2 kg	1440 (6.01)
Kalmegh	15 days	7 per kg	6 kg	630 (2.63)
Paan alu	120 days	6 per kg	1 kg	720 (3.00
Kanta alu (*Dioscorea pentaphylla*)	120 days	9 per kg	2.5 kg	2700 (11.26)
Sal resin	60 days	60 per kg	0.5 kg	1800 (7.51)
Total				23970* (100)

Figures within brackets represent percentages of income out of total income from NTFPs.

*The percentage of NTFPs' income for Ambisole FPC members works out to 93.72 out of their forestry income.

Table 3b: Period of collection, sale value, collection intensity and annual per capita income from of NTFPs Bansiasole FPC.

NTFPs	Period of collection	Local rate (Rs.)	Average daily collection (per member)	Average annual income per member (Rs.)
Sal (*Shorea robusta*) leaves	10 months	14 per thousand	2000 nos.	8400 (42.67)
Pial (*Buchanania lanzan*) fruit	21 days (Apr - May)	20 per kg.	0.5 kg	210 (1.07)
Mohua (*Madhuca indica*)	30 days (Apr - May)	8 per	30 kg	240 (1.22)
Mohua flower	45 days	8 per kg	0.5 kg	180 (0.91)
Bahera (*Terminalia balerica*) fruit	30 days (Mar - Apr)	3 per kg	10 kg	900 (4.57)
Kurchi (*Holarrhena antidysenterica*) fruit	30 days (Feb - Mar)	22 per kg	1 kg	660 (3.35)
Haritaki (*Terminalia chebula*) fruit	15 days	10 per kg	2 kg	300 (1.53)
Dudhi lata (*Oxystelma esculata*)	30 days	4 per hundred	500 nos.	600 (3.05)
Kurkura (*Lycoperdon sp*) mushroom	30 days (June - July)	10 per kg	3.5 kg	1050 (5.34)
Karam mushroom	30 days	20 per kg	2 kg	1200 (6.09)
Ghora insect	30 days	130 per kg	0.25 kg	975 (4.95)
Ban karala (Urea lobata)	30 days	25 per kg	0.1 kg	75 (0.38)
Anantamul (*Hemidesmus indicus*)	15 days	20 per kg	1 kg	300 (1.52)
Satamul (*Asperagus racemosus*)	15 days	6 per kg	3 kg	270 (1.37)
Chun alu (*Dioscorea deltoidea*)	120 days	6 per kg	1 kg	720 (3.66)
Kalmegh	15 days	7 per kg	5 kg	525 (2.67)
Paan alu	120 days	6 per kg	0.5 kg	360 (1.83)
Kanta alu (*Dioscorea pentaphylla*)	120 days	9 per kg	1.5 kg	1620 (8.23)
Sal resin	60 days	60 per kg	0.25 kg	900 (4.57)
Ban kundri (Coccinia indica)	15 days May	20 per kg	10 kg	200 (1.02)
Total				19685* (100)

Figures within brackets represent percentages of income out of total income from NTFPs.

*The percentage of NTFPs' income for Bansiasole FPC members works out to 93.98 out of their forestry income.

Table 3c: Period of collection, sale value, collection intensity and annual per capita income from NTFPs of Kasia FPC.

NTFPs	Period of collection	Local rate (Rs.)	Average daily collection (per member)	Average annual income per member (Rs.)
Sal (*Shorea robusta*) leaves	10 months	14 per thousand	3500 nos.	14700 (40.89)
Pial (*Buchanania lanzan*) fruit	21 days (Apr - May)	20 per kg.	2.5 kg	1050 (2.92)
Mohua (*Madhuca indica*) fruit	30 days (Apr-May)	8 per kg	120 kg	960 (2.67)
Mohua flower	45 days	8 per	3 kg	1080 (3.00)
Kurchi (*Holarrhena antidysenterica*) fruit	30 days (Feb - Mar)	22 per kg	2 kg	1320 (3.67)
Haritaki (*Terminalia chebula*) fruit	15 days	10 per kg	2 kg	300 (0.83)
Dudhi lata (*Oxystelma esculata*)	30 days	4 per hundred	150 nos.	180 (0.50)
Kurkura (*Lycoperdon sp*) mushroom	30 days (June - July)	10 per kg	2 kg	600 (1.67)
Karam mushroom	30 days	20 per kg	2 kg	1200 (3.34)
Ghora insect	30 days	130 per kg	0.25 kg	975 (2.71)
Bhurru (*Gardenia gummifera*) fruit	20 days	4 per kg	5kg	400 (1.11)
Atari (*Combretum decundrum*) fruit	15 days	2 per kg	20 kg	600 (1.67)
Anantamul (*Hemi-desmus indicus*)	15 days	20 per kg	2 kg	600 (1.67)
Asan (*Terminalia tomentosa*) gum	120 days	10 per kg	1 kg	1200 (3.34)
Chun alu (*Dioscorea deltoidea*)	120 days	6 per kg	1.5 kg	1080 (3.05)
Bahera gum	120 days	10 per kg	2 kg	2400 (6.67)
Paan alu	120 days	6 per kg	1 kg	720 (2.07)
Kanta alu (*Dioscorea pentaphylla*)	120 days	9 per kg	2 kg	2160 (6.01)
Sal resin	60 days	60 per kg	0.25 kg	900 (2.50)
Ban kundri (*Coccinia indica*)	15 days (May)	20 per kg	20 kg	400 (1.11)
Pog mushroom	60 days (July-Aug)	8 per kg	1.5 kg	720 (2.00)

Jara kalai (*Glycine hispida*)	75 days (June-Aug)	30 per kg	80 kg	2400 (6.67)
Total				35945* (100)

Figures within brackets represent percentages of income out of total income from NTFPs.
*The percentage of NTFPs' income for Kasia FPC members works out to 97.44 out of their forestry income.

Table 3d: Period of collection, sale value, collection intensity and annual per capita income from NTFPs of Kadokata FPC.

NTFPs	Period of collection	Local rate (Rs.)	Average daily collection (per member)	Average annual income per member (Rs.)
Sal (*Shorea robusta*) leaves	10 months	14 per thousand	5000 nos.	21000 (58.48)
Pial (*Buchanania lanzan*) fruit	21 days (Apr-May)	20 per kg	5 kg	2100 (5.85)
Mohua (*Madhuca indica*) fruit	30 days (Apr-May)	8 per kg	40 kg	320 (0.89)
Mohua flower	45 days	8 per kg	2 kg	720 (2.01)
Kurchi (*Holarrhena antidysenterica*) fruit	30 days (Feb - Mar)	22 per kg	0.5 kg	330 (0.92)
Haritaki (*Terminalia chebula*) fruit	15 days	10 per kg	3.5 kg	525 (1.46)
Dudhi lata (*Oxystelma esculata*)	30 days	4 per hundred	50 nos.	60 (0.17)
Kurkura (*Lycoperdon sp*) mushroom	30 days (June - July)	10 per kg	5 kg	1500 (4.18)
Karam mushroom	30 days	20 per kg	1.5 kg	900 (2.51)
Ghora insect	30 days	130 per kg	0.2 kg	780 (2.17)
Bahera (*Terminalia balerica*) fruit	30 days (Mar-Apr)	3 per kg	3.5kg	315 (0.88)
Atari (*Combretum decundrum*) jhanti	60 days	10 per basket	0.5 pon.	3000 (8.35)
Asan (*Terminalia tomentosa*) fruit	30 days	2 per kg	10 kg	600 (1.67)
Asan (*Terminalia tomentosa*) gum	120 days	10 per kg	0.5 kg	600 (1.67)
Bahera gum	120 days	10 per kg	1.5 kg	1800 (5.01)

Ban kundri (*Coccinia indica*)	15 days (May)	20 per kg	20 kg	400 (1.11)
Pog mushroom	60 days (July-Aug)	8 per kg	2 kg	960 (2.67)
Total				35910* (100)

Figures within brackets represent percentages of income out of total income from NTFPs.

*The percentage of NTFPs' income for Kadokata FPC members works out to 87.65 out of their forestry income.

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