# Moral Hazard Problem for Rural Labour Households under JFMP: A Study from Forest Dependent Groups in West Bengal

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# Moral Hazard Problem for Rural Labour Households under JFMP: A Study from Forest Dependent Groups in West Bengal

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*This study seeks to explore policy framework on the impact of moral hazard problem in the JFMP in which government, the owner of forest resource, can not legally monitor actions of JFM households, the agent of the programme, who illegally extract timber forest products. Despite much decrease of illegal collection of TFPs after JFM by the JFM households, some poor JFM households have higher incidence in the illegal extraction of TFPs to meet up their minimum subsistence in which law or force can not effectively control the same which might create more adverse effect on the sustainability of forest resource.*

## I. Introduction

As is well known, situations of asymmetric information are those in which one agent knows something that another does not. Without complete information, markets will be incomplete and can fail to allocate resources efficiently. One type of asymmetric information problem, referred to as moral hazard or incentive problem arises when actions of one person are unobservable to the other. This study seeks to explore policy

framework on the impact of moral hazard problem in the JFMP in which government, the owner of forest resource and regulator of JFM programme, can not legally monitor actions of JFM households, the agent of the programme, who illegally extract timber forest products which create more adverse effect on the sustainability of forest resource. Some researchers (e.g. Agarwal, 1986; Mukherjee, 1995; Naik, 1997; Saxena and Sarin 1999) have questioned the belief that excessive foraging of forest products by the rural poor is primarily responsible for shortages of forest resources and thus threatening the sustainability of forest resources. But, the findings of these studies are largely ignored by many development practitioners (Shiva, 1999; Poffenberger, 1995; Poffenberger et al. 1996; Correa, 1999). They are of the view that commercial demands have resulted in large-scale forest destruction. Earlier, despite government regulation, people would use the forests for firewood, manure and NTFPs. With the introduction of JFMP, people agree not to use the forest for these purposes, or to use only specified areas, thereby restricting their use of the forest (Correa, 1999). It has been proved that such community-based forest protection activities resulted in the rapid regeneration of degraded natural forests and offered the best prospects for sustainable forestry (Poffenberger, 1995: 350-60; Vira, 1999: 259-60). This study seems to be important in that in a comparative study between some JFM and non-JFM households in West Bengal, this paper tries to find out whether JFM programme reduces the moral hazard problem of government securing the right of local need of poor forest communities on forest land with higher sustainability of forest resources and thereby suggest policy prescriptions for broader livelihood perspective.

This paper proceeds as follows. Section II presents the importance of the study. The data set and methodology appear in section III. Section IV presents the key results of the study. Section V provides a simple theoretical model based on the empirical findings. Conclusions are contained in section IV.

## II. Importance of the Study

In the context of Indian forestry, several strands have contributed to the present emphasis on community involvement in forest protection. JFM emerges as the latest in a long history of policy changes, attempting to create a new relationship between 'state' and 'community'. The old custodian forest management systems were rendered ineffective in

the 1950s and 1960s due to various reasons, mainly traditional emphasis on production of commercial wood and disregard for local needs (Sarmah and Rai, 2001:213; Poffenberger, 1995:342-50). Against this old custodian forest management system, the local communities in different parts of India have mobilized repeatedly over a long time to protect their traditional rights of subsistence needs on forest resources. In keeping with this, the local forest fringe communities – *Santal*, *Bhumij* and *Mahato* tribal, and some low cast Hindus – in south West Bengal, the area of our study, mobilized repeatedly with various movement – like *Chur Rebellion* (1767-1805), *Naik Revolt* (1806-1816) and *Hul Rebellion* (1855)- against *Mughal* and *British* rulers to protect their traditional rights on forestland from long past. (Poffenberger, 1995:342-49; Duyker, 1987: 28-35; Dutta 1940: 35; Sarker and Das, 2006a:271). The revision of India's forest policy in 1988 marks a major departure from the earlier policies which emphasized on production of commercial wood and disregard for local need, 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, to secure the right of local need of poor forest fringe communities from forest resources, the 1988 forest policy of the Government of India recognized the need to fulfill the requirements of fuel wood, fodder, minor forest produce and small timber of rural and tribal people, and emphasized the need to create a massive people's movements for protection and development of forests. But the benefit-sharing arrangements between states and forest communities differ widely between states within the country.

Hence the issue is: does these benefit-sharing arrangement between states and forest communities under community forest management programme meet up the survival need of poor forest communities from forest and thereby restricting the latter's illegal collection of Timber Forest Products (TFPs)? Empirical evidence from 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 Buchy, 2002; Martin, 1992; Naik, 1995; Saxena and Sarin, 1999; Singh, 1994 & 2001). But it is argued that the survival of community needs of poor communities should be recognized on a priority basis as pillars for strengthening community participation (Mukherjee, 1995). The most important factors motivating

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massive local peoples' participation for protection and development of forests is the expectations of immediate returns via wages and incomes from sale of old plantation and local consumption need to fill the requirements of fuel wood, fodder, minor forest produce and small timbers (Mukherjee, 1995; Naik, 1997; Saxena and Sarin 1999). The Arjuni (an area under JFM programme) experience in JFM of West Bengal shows that unless survival needs of food and livelihood are met, participation in natural resource management would always remain threatened (Mukherjee 1995: 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. The findings of Naik (1997), based on two case studies in Gujarat, help identify the critical factors in making JFM successful and controllable. Any JFM which does not recognize the significance of creating strategies for sustaining livelihood – basic food security – at the local level has a doubtful future (*ibid*).

While successful examples of joint forest management in India were beginning to emerge in the Arabari Hill in Midnapore district of West Bengal  during the early 1970s (Sundar and Jeffery, 1999:28; Sivaramakrishnan, 1999:90), the JFM movement gathered momentum 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. In keeping with the JFM movement in India, West Bengal government's resolution was also issued in 1989, declaring the principles of sharing of duties, responsibilities as well as the usufructs from the forests to the participant local people living in the fringe of the forests. The procedures for establishment of the institution called Forest Protection Committee (FPC), comprising of these participants as members, were also defined.

The foundation of an innovative forest protection system and the participatory forest management was thus laid for the forests of south West Bengal which covers approximately 38 per cent of the total forest area of the State. While explaining the achievements of JFM programme in West Bengal, the 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).*

Government report (State Forest Report, 2000) reveals that the overexploitation of trees for timber was so severe that thousand and thousand hectares of forest lands in the south West Bengal except Sundarban were almost treated as bare plain land, when the JFM was established; but such lands are almost secured after JFM programme. Secondly, government revenue from the degraded forest was almost nil when the JFM was established, but it has significantly increased after JFM. (Das and Sarker, 2008: 82-91; Sarkar and Das, 2008:22).

Despite such a successful achievement of JFM programme in West Bengal, some poor JFM households have higher incidence in the illegal extraction of Timber Forest Products (TFPs) to meet up their bare minimum level of subsistence in which law or force can not effectively control the illegal extraction of TFPs of these poor JFM households, which live below poverty line (Das and Sarker, 2008:91; Sarker and Das, 2008:35). It is a moral hazard problem for the government because such an illegal extraction of TFPs by the JFM household might be threatening the sustainability of forest resources.

## III. Data set and Methodology

The data have been collected through an intensive field enquiry covering all members from FPCs under JFM villages (study group villages) and non-JFM villages (control group villages) – three sample female FPCs (core group), three joint FPCs (first control group) and two non-JFM villages (second control group). For the selection of female FPCs, random sampling technique (SRSWOR) is used. It is important to mention that each FPC under this study was formed in the respective village; so FPC/village is synonymous in this study. The field survey is conducted during the year 2005-06. In addition to the comparison on current data of after situation of JFM programme, data during before situation of JFM are also collected from all the households through the *reflexive comparison method* where 'after' and 'before' scenarios are compared for the participating households (Ravallion, 2001; Reddy et al., 2004; Reddy, and Soussan, 2004). But the period of data for 'before situation' was not same to all FPCs. 'Before situation' for each FPC is considered for the preceding one-year period from the starting of JFM

programme in the respective FPCs. However, a single 'before situation' is selected by the simple arithmetic mean of FPCs under study[1].

## IV. Key Results

At the very outset, we examine some basic characteristics of our sample JFM and non-JFM (Table 1). All members of four JFM villages out of six and all non-JFM villages are either SC or ST; around 48 per cent of households are landless, 41 per cent of households are marginal and the rest, about 11 per cent are small; over 77 per cent of households in each village live below poverty line[2]; except Baragari and Katul-2, majority of members in each village are illiterate. This study, however, indicates the abject economic and social conditions of the tribal people who are among the most disadvantaged group in rural Indian society.

Table 2 presents per capita annual net real income (in INR)[3] of various categories of households from forest source, non-forest source along with the change of income between two time periods (before and after situations of JFM). A common feature that emerges from Table 2 is that annual per capita net real income from forest source accounts for major share of per capita annual net real income for all categories of households under both JFM and non-JFM villages during both the situations. It also shows that per capita annual net real income for all categories of households increases during after JFM situation under both JFM and non-JFM villages. But such an increase is higher for all categories of JFM households than that of among all categories of households in the non-JFM villages after JFM situation. Categorically, the increase of forest income is higher for landless and marginal landholding households under JFM villages compared with same categories of households under non-JFM villages. The higher increase in income for landless and marginal categories of households under JFM villages has been made possible only due to substantial increase in income from forest source after JFM. It seems to be relevant to mention that during before JFM situation the share of per capita annual net real income from forest source out of per capita annual net real income from all sources for all households under our study (combining both JFM and non-JFM villages together) ranges between 63.56 and 70.58 percentage points indicating that forest was major source of income for all categories of households before JFM. After JFM, the share

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of per capita annual net real income from forest source for the households under JFM villages, combining both female and joint FPC-villages together, works out between 67.96 and 87.45 percentage points. For non-JFM villages, the share of per capita annual net real forest income from forest source out of per capita annual net real income for non-JFM households under our study ranges between 60.29 and 64.09 percentage points during before JFM situation, whereas after JFM situation  it lies between 55.26 and 64.59 percentage points. Table 2 also shows that forest income for all households under JFM villages, irrespective of female and joint FPC-villages, has considerably increased after JFM programme; but the incidence of increase is much lower for the households belonging to the better economic position according to land-based economic status.

Table 3 presents the break-up of household's dependence on forest and non-forest sources of income during after and before situations of JFM programme (share in percentage of annual per capita net real income). An important feature that emerge from the table is that annual per capita net real income (combining all forest sources – NTFPs, forestry wage and timber forest products – together) accounts for major share of per capita annual net real income for almost all categories of households under both JFM and non-JFM villages during both the situations. Table 3 also shows that timber income during after JFM situation for JFM villages is of two types: legal and illegal[4]. Legal timber earning for JFM villages is the share of government's timber revenue received by households legally from the JFM forest. But during before JFM situation households' income from timber for JFM villages was, basically, illegal. For non-JFM villages, timber income during both after and before situations is illegal. What is more important here is that after JFM situation annual net real income from timber forest products (TFPs) generating from illegal source for JFM households decreases to a large extent although the legal timber income constitutes a very small proportion of the annual per capita net real income for all households under JFM villages during the same period. Worthwhile to mention that within JFM villages the rate of decrease of illegal TFP income in the female JFM villages  is considerably high compared with joint JFM villages . Conversely, there is a significant increase in income from NTFPs and forestry wage labour for JFM households after JFM**.** Table 3 shows that before JFM the share of NTFPs' income out of annual per capita net real forest income for JFM households in an average was below 25 percent,

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whereas it was around 16 percent for non-JFM households during the same period. But after JFM situation the share of annual per capita net real forest income from NTFPs for JFM households marks a significant increase –around 158 percentage points for joint FPC households and around 193 percentage points for female FPC households- on an average, whereas such an increase is around 2 percentage points for non-JFM households on an average during the same period. However the incidence of increase of NTFPs' income is more prominent for landless and marginal landholding JFM households after JFM. With regard to forest wage income is concerned, before JFM the share of forest wage income out of annual per capita net real forest income for JFM households in an average was below 8 percent, whereas it was around 7 percent for non-JFM households during the same period. But after JFM situation the share of annual per capita net real forest income from forest wage work for JFM households shows much higher increase – around 194 percentage points for joint FPC households and around 149 percentage points for female FPC-households – in an average, whereas it is around 12 percentage points increase for non-JFM households in an average during the same period. The incidence of increase of forest wage income is more prominent for landless and marginal landholding JFM households after JFM. Table 3 also shows that income other than NTFPs and forest wage work decreases for JFM households in an average after JFM. These results, however, imply that the increase of NTFPs' income and forest wage' income are the only factors for the increase of annual per capita net real income for JFM households after JFM.

As regard forest wage labour is concerned, not only the landless and marginal categories of households but also small landholding households in the JFM villages are involved in forestry works after JFM situation. This is due to attractive high forestry wage rate in forest sector compared with local rural wage rate in non-forest sector. The prevailing wage rate for forest wage labour after JFM situation is fixed at INR 67.50 which is about a double of the prevailing average local wage rate for, usually, eight hours of service from 8am to 4pm (Sarker and Das, 2008:28). This rate is much higher than the forest wage rate of before JFM situation. However forest wage rate is fixed up by the government on the basis of market wage rate. More relevant, although the local rural wage rate was between INR 30 and INR 35 for, usually, eight hours of service from 8am to 4pm while we conducted our survey, it was also higher than the wage rate during before JFM

situation. The wage rate, however, changes time to time. While we undertook our study after JFM situation forest wage rate was fixed at INR 67.50 for, usually, eight hours of service from 8am to 4pm. The number of working days for forest fringe communities as wage labour under forest department is also more or less fixed while we conducted our study. After JFM situation, usually, one person from each JFM household with a family size of five or less gets the opportunity of forest work from thirty five to forty days per year. If the size of member of a household is grater than five, usually, two persons get the opportunity of forest work for seventy to eighty days in total per year from the same family (ibid). The number of days of employment for each forest wage labour per household per year is fixed at 35-40 days for the family size of five or less than five; two persons of a poor household with a family size of greater than five get the opportunity of forest wage work for 70-80 days per year (ibid).

The break-up of annual net real income from legal and illegal forest sources for below poverty line households before and after JFM situations appears in Table 4. It reveals that the illegal income from TFPs after JFM has substantially increased (30.59 percentage point) to poor categories of households which live below poverty line in Baragari joint FPC (column 9). The change of illegal income from TFPs after JFM for the same categories of households to other FPCs/villages is highly negative (ranging between 20.77 and 74.47 percentage points). This is mainly because the change of income from legal forest products of the poor categories of households of Baragari FPC after JFM is much lower than that of same categories of households in other FPCs. In all FPCs, except Baragari, the change of income from legal sources of forest is highly positive ranging between 42.91 percentage point and 117.17 percentage point; in Baragari, this change is negative (12.92 percentage point). It clearly indicates that force or law can not effectively control the illegal collection of TFPs of the poor categories of households, which live below poverty line, until and unless a considerable income from legal forest source meets up their bare minimum level of subsistence.

The study of Sarker and Das (2006a), based on FPCs under western Midnapore division in West Bengal, shows that for the maintenance of regular consumption needs of the local FPC-households, NTFP is the main source of money income because income from the share of government's timber revenue and wages from forestry work constitute a

small part of their total income (p.279-280). Consequently, the NTFP is bound to provide the main and stable source of forestry income and it plays the major role for sustenance of JFM programme (ibid:286). This study also signifies that only government's timber share (without any other share of the forest resource, namely NTFPs) seems to be insufficient to meet the immediate survival needs of poor JFM households. It causes large illicit felling (illegal timber extraction), mainly, by the poor forest communities due to the urgency of meeting immediate seasonal livelihood needs and food insecurity, which plagued the area and led to conditions of semi-starvation among the poor people (p.279).

## V. Theoretical Model

This study, however, lends credence to the fact that despite the execution of JFMP government, the owner of forest resources, has to face a moral hazard problem with all categories of JFM households in general and for marginal and small categories of Baragari joint FPC village in particular who engage in the JFM programme as agents of government. It may be judged by the fact that government, the principal, can not legally control the major illegal felling of TFPs, which plays more adverse effect on the sustainability of forest resources, by these poor households. However, after JFM, although most of the JFM households decrease their illegal extraction of timber forest product they practiced before JFM situation, households below poverty line in one FPC (Baragari joint FPC) increase their illegal extraction of TFPs. Hence the issue is why do government fail to control effectively the illegal extraction of TFPs by the poor forest communities, who are almost depend on forest income as their major source of income and that live below poverty line  in JFM households in general and Baragari joint FPC in particular  after JFM situation? The answer seems to be very simple: the illegal extraction of TFPs may not be effectively controlled until and unless legal income from forest source (NTFPs and forestry wage work) for poor forest communities, who are almost dependent on forest as their major source of income and that  live below poverty line, meets up their bare minimum level of subsistence. A good incentive plan, which depends on the work (or output) related to forest activities, should make the payment of workers. But, to overcome this problem, government should not only expand forest wage work under development programme among these poor households but also grant a lump sum fee so that the bare

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minimum level of subsistence of those poor households may be guaranteed. However, a lump sum fee independent of their production plus a good incentive fee dependent on their work (output) are required for livelihood sustenance of those people and sustainability of forest resources. As regards forest wage rate is concerned, it has been mentioned earlier that the prevailing wage rate for forest wage labour is fixed at INR 67.50 which is about a double of the average local wage rate for crop farm sector, for usually eight hours of service from 8am to 4pm. A simple theoretical model may be of help in examining these facts.

An optimal contracting arrangement by the government – JFM household framework – can be defined as follows: A contract is optimal if it maximizes the expected utility of the government for an expected utility of the JFM household subject to the condition that the JFM household finds it worthwhile to participate in the contract. As is well known, government is the owner of forest land and under JFM programme government employs JFM household (agent) to work under the former for the management of forest resources. Let us suppose that there are only a finite number of output levels ($q_1$, $q_2$, $q_3$, … $q_n$). Let v and r be two efforts that can be chosen by the JFM household (agent) out of some set of feasible efforts. These efforts influence the probability of occurrence of different output levels. Let us suppose that the probability that the output level $q_i$ will occur if the agent chooses effort v(r) by $\pi_{iv}$ ($\pi_{ir}$). Let $x_i = x(q_i)$ be the amount that the government pays the JFM household if output level $q_i$ is observed. We denote the lump sum fee k, the minimum subsistence level of JFM household, independent of $q_i$. Then the expected profit of the principal (government), if agent (JFM household) chooses action v, is

$$\sum_{i=1}^{n} (q_i - x_i)\pi_{iv} - \sum_{i=1}^{n} k_i \quad \text{……………………. (1)}$$

The expected profit is assumed to be linear in $q_i$. It implies that the principal is risk-neutral[5]. We assume that the agent is risk-averse[6] and maximizes the expected utility from the payment. We also assume that the JFM household (agent) finds efforts costly, and write c(v) be the cost of effort v. The cost enters into JFM household's utility function linearly. If JFM household chooses effort v, his/her expected utility less cost is given by

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$$\left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) \ , \text{ where u is the Von Neumann-Morgenstern utility}$$

function of the JFM household (agent).

Two types of constraints are imposed on JFM household in this self-enforcing contract (non-enforceability in the courts does not make contracts valueless. The contract acts in such a way that each party chooses to adhere to its term) – participation constraint and incentive comparability constraint.

Since the JFM household is a utility maximiser, he/she will choose action u if

$$\left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) \geq \left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(r) \ \ldots\ldots\ldots.. \ (2)$$

and will choose effort r otherwise.

This constraint is referred to as the incentive compatibility constraint. The second type of constrain says that the JFM household may have other alternatives available that give him/her some utility $\overline{u}$. Then the participation constrain is

$$\left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) \geq \overline{u} \ \ldots\ldots\ldots\ldots\ldots\ldots..\ldots\ldots\ldots\ldots\ldots. \ (3)$$

The expected utility the JFM household gets from this job must be at least as great as the utility he/she could get elsewhere.

If the payment is based on effort rather than on output, then the government is to determine the expected profit from each effort by the JFM household and then induce the effort that minimizes government's expected profit. But as the efforts of the JFM household are hidden, payment to him/her can not be a function of the unobservable effort (v, r). It can be made contingent on the observed output $q_i$. Attempt has been made to develop results along this line. Suppose that there is no incentive problem. However under the risk-neutrality assumption the government is indifferent to risk and thus there is no need to trade off incentives for risk-sharing. In such a case the principal's (government's) optimization problem is

$$\sum_{i=1}^{n} (q_i - x_i)\pi_{iv} - \sum_{i=1}^{n} k_i$$

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$$\text{subject to } \left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) \geq \bar{u}$$

where maximization is taken place over $x_i$.

In general, government will want the JFM household to choose xi to just satisfy the constraint so that

$$\left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) \geq \bar{u}$$

The Lagrangian for this optimization problem is

$$L = \sum_{i=1}^{n} (q_i - x_i)\pi_{iv} - \lambda \left( \left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) - \bar{u} \right)$$

where $\lambda$ is the Lagrange multiplier.

Government is risk-neutral because her expected profit is linear in $x_i$. Differentiating L partially with respect to $x_i$ and $\lambda$, and setting the derivatives to zero, we have the first order conditions as

$$-\pi_{iv} - \lambda u'(x_i)\pi_{iv} = 0$$

$$\left[ \sum_{i=1}^{n} \{u(x_i)\pi_{iv}\} + \sum_{i=1}^{n} k_i \right] - c(v) - \bar{u} = 0$$

The first of the above conditions states

$$u'(x_i) = 1/\lambda$$ , a constant. i.e., $x_i$ must be independent of i ($x_i$ is a constant).

It may be judged by the fact that, as mentioned earlier, the wage rate for each individual of JFM household, who work under forest department, is fixed. Government' wage rate is fixed at INR 67.50 for usually eight hours of work (8am to 4pm) per day, i.e., $x_i$ is independent of i. The wage rate does not depend on the return (high or low) of forest wage work of JFM household.

This theoretical model seems to be important in that a good incentive fee dependent on their work (output) might not only provide livelihood sustenance of poor people living below poverty line and ensure sustainability of forest resources; rather a

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good incentive fee dependent on their work (output) plus a lump sum fee independent of their production are required for livelihood sustenance of those people and sustainability of forest resources.

## VI. Conclusions

One of the basic problems of this model is that government knows the JFM household's utility function and incorporates this into contract with latter. However, acquiring this information may be harder than monitoring the JFM household's effort. But some common features that emerge out from this study might help government take policy framework in this regard. Government knows that JFM households are almost dependent on forest source for their subsistence and income and more than three fourths of them live below poverty line. Government also knows that forest wage work JFM households perform under forest department is not equally distributed among JFM households. So what government should do in the short-run is to increase number of days for wage work per year for poor households in that area where more illegal extraction of TFPs is existent. Together with this, government should provide all JFM households the lump sum fee k, the minimum subsistence level of income, independent of $q_i$. In the long-run, for higher income and employment government should expand the production of NTFPs in the JFM forest  following the instances of some JFM states such as Andhra Pradesh and Madhya Pradesh which are gradually reorienting R & D of NTFP species to meet community needs (World Bank, 2006:xxi ) and that have reasonable progress towards helping villagers improve sustainable non-timber forest production and harvesting, incorporating modest value addition, and building on local knowledge system( ibid:xxiii). Attempts should also be taken to establish small units of agro-based industry which may use local NTFPs as the main raw materials of that industry in the forest fringe area. To this work, the Ministry of Environment and Forests and state forest departments may wish to consider developing a new national strategic plan for R & D of NTFPs and policies to establish small units of forest based industrial units oriented through community forestry transitions and priorities. Added to it ,as the global market is widening for high-value non-timber forest products (ibid:15), forest communities of JFM programme also need to take advantage of these market prospects supported by appropriate policy and programme reforms.

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**Notes**

**1.** Although 'after situation of JFM' is simply the survey period (2005-06) of this research study 'before situation of JFM' is not the same for all FPCs/villages. 'Before situation of JFM' of this study implies one preceding year of the formation of each FPC under our survey. It is worth important to mention that before situation of JFM of each surveyed FPC differs from one another. Now a *common before situation* (single period) is measured by the Consumer Price Index for Agricultural Labourer [General]. Computation of common before situation (average of one previous year of respective FPCs formation) is made in the following line:

| Type of FPC | Administrative division | Name of FPC | Before situation of JFM | CPIAL of before situation | Average CPIAL |
|---|---|---|---|---|---|
| Female FPC | Bankura (N) | Agua | 1992-93 | 169 | $\frac{169+230+143}{3}$ $=180.67\approx181^{*}$ |
| Female FPC | Bankura (S) | Malibona | 1995-96 | 230 | |
| Female FPC | Panchayat (SC) | Brindabanpur | 1990-91 | 143 | |
| Joint FPC | Bankura (N) | Belboni | 1992-93 | 169 | $\frac{169+230+143}{3}$ $=180.67\approx181^{*}$ |
| Joint FPC | Bankura (S) | Baragari | 1995-96 | 230 | |
| Joint FPC | Panchayat (SC) | Katul-2 | 1990-91 | 143 | |

* The average CPIAL of common before situation of JFM is closely nearest to CPIAL of the year 1993-94 (188)

**2.** Poverty line income in rural West Bengal on the basis of PCME (per capita monthly expenditure) by NSS of 56th round (1999-00) is INR 350.17. Based on the CPIAL (Consumer Price Index of Agricultural Labour [General]) the poverty line income for the year 2005-06 is calculated as INR 394.00 approximately.

**3.** We directly use the study of Sarker and Das (2008) to determine the per capita annual net real income (in Rs.). For methodological details please see the said study.

**4.** Never did the respondents say that their source of income was illegal; rather, while examining the answers from the respondents regarding the break-up of their source of income, the distinction between legal and illegal source was clearly demarcated.

**5.** JFM household is risk-averse because they prefer a certain given forest income either from legal source or from illegal source to maintain minimum subsistence needs to a risky income with the same expected value.

**6.** Government is indifferent between a certain given income and an uncertain income with the same expected value. It may be judged by the fact that SFR (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" (p. 47). Thus due to execution of JFM programme the large scale illicit felling of TFPs, which destroys the sustainability of forest resource, have been largely stopped mainly due to free access of NTFPs by the poor forest communities in most of JFM forests. However, the impact of little illicit felling does not seem to make any significant change between a certain given income and an uncertain income with the same expected utility.

[*Details of methodology and dataset will add shortly in soft version*]

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