Role of Community Participation through JFM for Rural Development in India

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ABSTRACT

Poor people are both cause and effect of environmental degradation. Environment of poor is more degraded than the rich and the environmental degradation hurts the poor more than the rich. Incomplete property rights reinforce vicious poverty-environment degradation circle and CPRs (Common Property Resources) supplement rural livelihood and act as a safety nets for the poor, seasonally and specially in times of agricultural crises. Scarcity motivates the people more to participate in JFM (Joint Forest Management) and participation improves the welfare of the people. This analysis tries to answer the two important questions: a) who participates in community forestry (small scale forest management) and what are the determinants of participation? And b) what is the impact of participation (role of non-market institutions-JFM) on household consumption and extent of poverty eradication for rural development? The evidences and facts in the analysis suggest that the poor people are very much linked to CPRs, thus the protection of those natural resources is essential for reducing the extent of poverty and simultaneously regenerating the environment.

I. INTRODUCTION

In current development discourses it is rather odd to find any discussion about poverty minus the environment or about nature without people. There is much controversy surrounding the poverty-environmental degradation nexus. The predominant school of thought argues that poverty is a major cause of environmental degradation and if policy makers want to address the environmental issues, they must first focus on the poverty problems. Poverty problem is prevalent in most of the developing and underdeveloped countries.

The links between poverty and the environment are conditioned by the interaction of economic, social, demographic and even climatic factors. An examination of India, one of the world's largest and most populous countries, is essentially an examination of a microcosm of the earth. Its populace encompasses the entire range of the income and education spectra, its culture consists of diverse religions, languages, and social systems, and its geography is a sample of almost every terrestrial climatic zone of the planet. It is this variation that makes India's environment so interesting. India holds the dubious honour of suffering from poverty-induced environmental degradation at the same time, pollution from affluence and a rapidly growing industrial sector. In light of this dichotomy, it is a tricky task to understand the complexities behind the state of India's environment. Furthermore, these problems will only be exacerbated in the years to come, as India remains one of the fastest growing countries in the world, in terms of population as well of economy. And what is learned from the Indian development experience will afford other countries valuable insight into the best path to take for environmentally sustainable development.

The first and overriding priority of developing countries is economic and social development and poverty eradication. India, too, recognizes that environmental degradation has social reasons, and that combating poverty is a prerequisite for sustainable development. It has been recognised

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that the sustainable development approach is the key to a continuous growth of the economy. The government of India has a firm belief that only people's participation can achieve highest level of successful implementation of existing programmes of conservation and environmental protection.

Here we seek to examine the complex interplay of environment and poverty in the context of the role of India's Joint Forest Management (JFM). The whole analysis is organised into five sections. Section II deals with the basic definitions of poverty, environment and, finding the linkages between them. Section III gives the detailed report of community participation and the extent of JFM in India. Section IV examines the advantages of JFM in India. The main findings and the policy suggestions are set out in Section V.

II. CONCEPTUAL FRAMEWORK

Common Definition of Poverty

Poverty is, in absolute term, the inability of an individual to satisfy certain basic minimum needs for sustained, healthy and reasonably productive living. Conceptually, any attempt at quantifying the incidence of poverty in population requires, taking into account the level and pattern of an individual's personal consumption expenditure as well as their access to social transfers and public provisioning. The proportion of population not able to attain the specified level of expenditure is then segregated as poor.

Measures of Poverty

A variety of descriptive indices are used to measure poverty, but the most common are the headcount index (HCI), poverty gap index (PGI), and squared poverty gap index (SPGI). The headcount index, also called the headcount ratio (HCR), is the most widely used index. If a household spends below a pre-defined level, then it is considered to be poor. The index measures the portion of families below the poverty line. The HCI is useful since it allows one to calculate the marginal impact of additional spending, output, etc. on the number of people lifted out of poverty. The HCI is specified by,

$$HCI = \frac{HC}{n}$$

Where n is the total population and HC is the number of households that satisfy the condition yi < p, where p be the poverty line and yi be the expenditure level of an individual or household i (both measured in the same currency).

A problem with the HCI is that it ignores concerns about the distribution of income among the poor. Consequently, more sophisticated measurements of the Foster-Greer-Thorbecke form are also used when measuring poverty (Foster, Greer, and Thorbecke 1984). The two most common are the PGI and SPGI. The former measures how far poor individuals are from the poverty line. Individuals above the poverty line have a zero poverty gap. The calculation of the PGI is described by,

$$PGI = {}^{1}/_{n} \sum_{y_i < p} \left(\frac{p - y_i}{p} \right)$$

The HCR and the PGI share a problem: neither is especially sensitive to the destitute. For example, if a poor individual receives an income transfer from a much poorer one (with both of them still below the poverty line), neither index would change.

Higher-order poverty indices such as the SPGI give greater weighting to those further away from the poverty line than the PGI[1]. An observation from Indian poverty research is that the information provided by all three measures is roughly the same.

Present Status of Poverty in India

Using such an approach the planning commission, Government of India has been estimating the head count ratio at state level, separating for rural and urban areas for over three decades[2]. It is currently adequacy norm of 2400 and 2100 kilo calories per capita per day to define state specific using a minimum consumption expenditure, anchored in an average (food) energy poverty lines, separately for rural and urban areas. These poverty lines are then applied on the NSSO's (National Sample Survey Organization) household consumer expenditure distributions to estimate the proportion and number of poor at state level.

In 1962 Planning Committee first attempted to define an official poverty line for India. At the national level the incidence of poverty on the head count ratio declined from 44.48 per cent in 1983 to 26.10 per cent in 1999-2000. In absolute terms, the number of poor declined from about 323 million in 1983 to 260 million in 1999-2000. While the proportion of poor in the rural areas declined from 45.65 per cent in 1983 to 27.09 per cent in 1999-2000; the decline in urban areas has been from 40.79 per cent to 23.62 per cent during this period. The Tenth Plan (2002-07) has set a target of reduction in poverty ratio by five percentage points to 19.3 per cent by 2007 and 15 percentage points by 2012. The targets for rural and urban poverty in 2007 are 21.1% and 15.1% respectively.

III. COMMUNITY PARTICIPATION AND JOINT FOREST MANAGEMENT IN INDIA

India's national forest policy of 1988 was a landmark policy for local people's rights over forest resources. The policy recognized people's participation in using and protecting forests and suggested the forest communities should develop and conserve forests together with the state forest departments. This reform in forest policy has begun to transform how forests are protected and used in India. Communities that were historically perceived to be encroachers and illegal users of forests by the state were invited to partner with the state in protecting forests. Following national implementation guidelines in 1990, various state governments began implementing their own Joint Forest Management strategies. By 2001, some twenty-two states had adopted JFM (Joint Forest Management)[3] (Agarwal 2001). JFM was launched in the early 1990s and made it possible for the forestry department to involve people and communities in the management of certain forests. JFM caught on very quickly, and by 2001 some 45,000 JFM groups were protecting approximately 12 million hectares of government forests (Kumar, 2002).[4]

The following figures outline the overall position of forest cover in India. The area under forest cover has been fallen from the year 1987 to 1999 and also from sixth five year plan to ninth five year plan in most states. The per capita availability of forest land has been reducing from 1950-51 to 1998-99. Madhya Pradesh is distinctively having the highest forest area cover and this is followed by Orissa, Andhra Pradesh and Maharashtra.

Under the terms of JFM, Village Forest Institutions (VFI)[5] is given conditional access to specified forest products in accordance with the guidelines laid by the forest department. The products usually include fuelwood, fodder, and non-timber forest products. Forest departments also provide VFI's with information, training, and wage employment related to forest management. Initial community funds may also be provided. In many states, JFM resolutions mandate that villagers be solicited to make micro-plans for forests (Sundar 2000). Organizing into a VFI can result in access to wage employment and fuelwood through forest management activities such as lopping, clearing of debris, and cutting. In return, VFIs agree to certain conditions such as collective protection of the forest against encroachment, poaching or timber smuggling, and, monitoring of restrictions on some types of use. After a period of protection (5 to 10 years or more), the VFI and its members are entitled to 25 to 100 percent of the net income from the sale of major forest produce, timber (Khare and others 2002).

The organization structure and membership rules of VFIs differ in each state. For example, in Andhra Pradesh, all households living in a JFM village are eligible for JFM membership. While membership is optional for the general population of the village, it is automatic for ST and SC households (GOAP 1996). In Madhya Pradesh and Orissa, two persons (one of which must be a woman) from each household living in the JFM village are automatically considered members (GOO 1993 and GOMP 1996). In Uttar Pradesh, membership to JFM is either automatic to the village residents who are registered in the electoral rolls of the village or those who are existing members of the forest panchayat system. In West Bengal, only "economically backward people living in the vicinity of forests" are considered to be members. However, every family living in the vicinity of the forests has the option of becoming a member (GOWB 1990). In general, VFIs have an

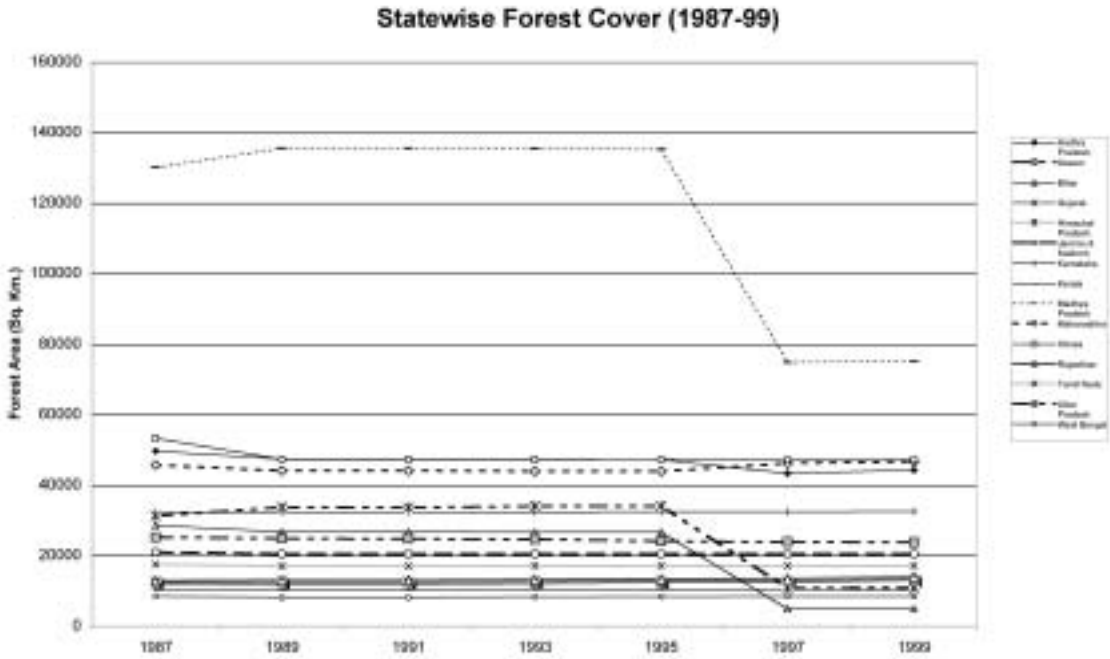

FIGURE1: State-wise Forest Cover India (1987-1999)
Source: State of Forest Report 2001, Forest Survey of India, Ministry of Environment and Forest, Govt. of India.

FIGURE 2: Per Capita Availability of forest Land in India (1950-51 to 1998-99)
Source: Selected Socio-economic Statistics 2002, Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Govt. of India.

executive committee that makes major decisions. VFIs have no independent legal existence as they are usually registered with the forest department alone.[6] Authority to enforce protection varies.

In addition to state supported joint forest management, India has a history of community forest management undertaken either by self-initiated groups, with NGO support, or initiated in colonial times with British support (Khare and others 2000, Ballabh and others 2002, Agarwal 2001, Lise 2000). These 'traditional' groups are particularly evident in the states of Orissa, Bihar, Uttar Pradesh and Jharkhand. For example, in Orissa, only 1,200 out of the approximately 5,000 community forest management groups are

estimated to participate in JFM. (Singh, 2002). It appears that these traditional groups are often not officially recognized under JFM rules, and in many cases are compelled to change their structure and functioning in order to be officially recognized and receive benefits associated with JFM (Sundar 2000, Khare and others 2002).[7]

IV. ADVANTAGES OF JOINT FOREST MANAGEMENT IN INDIA

Some theoretical issues underlying the advocacy for community forestry can be analysed by using the Von-Thunen conceptual framework of rural landscape. Consider some homogenous landscape with a local community located at the center 'O' in figure-3 below. The horizontal axis measures distance from the community center or market while the vertical axis measures the value of land employed in agriculture and forestry at any distance. Without the loss of generality, we assume that all households and firms face homogenous inputs with cost of access being the only factor explaining the difference in production costs. In this case, land value in agriculture (V_a) decreases with decreasing access. As the distance to the market increases, agricultural land value function eventually falls to zero at point B. Beyond this point, no single farmer will find it profitable to invest in agriculture because the cost of secure property rights exceeds returns on any agricultural investment on the land. This description also applies to the forest value function (V_f). Households and firms will protect their ownership rights, crops and livestock at some cost. Secure property rights on agricultural land and property is feasible and enforceable for land in the region O-A_1. Although households still take advantage of forest resources in the neighbourhood of O-A, investment in them is unprofitable due to high cost of establishing and enforcing property rights on them. As a result, land in the neighbourhood of OA is often used as communal grazing land and for collecting of timber and non-timber forest products under open access.

At the early stages of rural development, forest products; construction timber, mushroom, firewood, edible caterpillars, etc are plentiful and commands no price (i.e. the shadow value of the resource is zero) and as a result the forest resource is subject to over-exploitation and degradation.

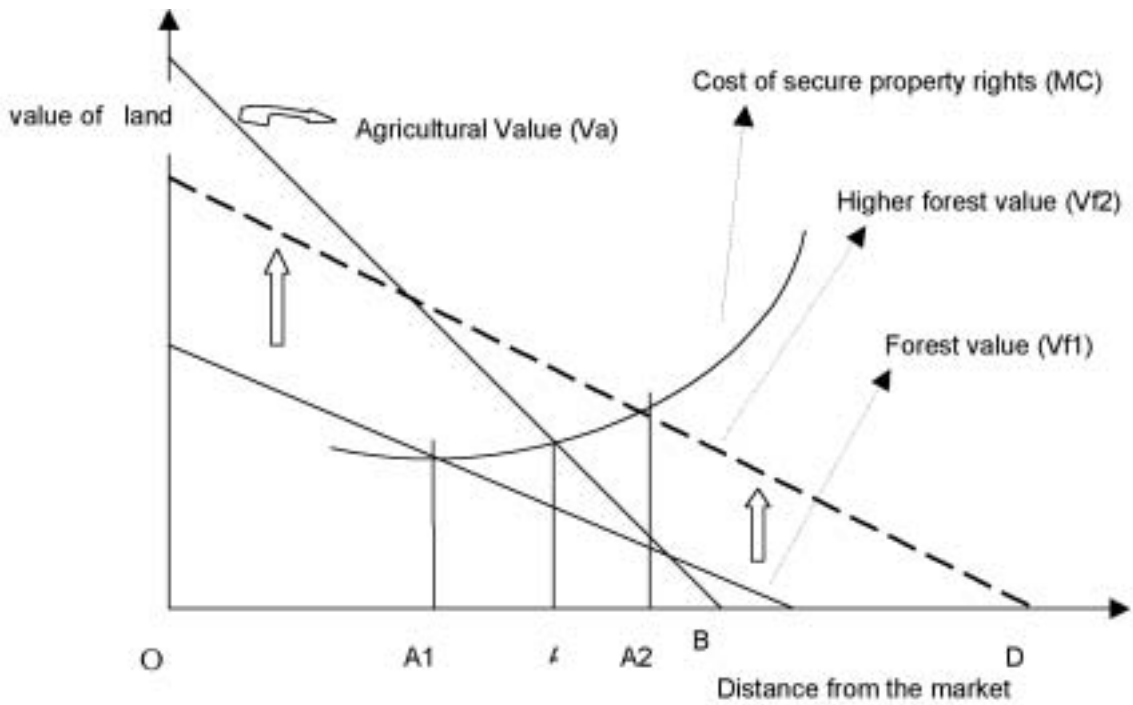

FIG.3: Forest Land and Property Rights

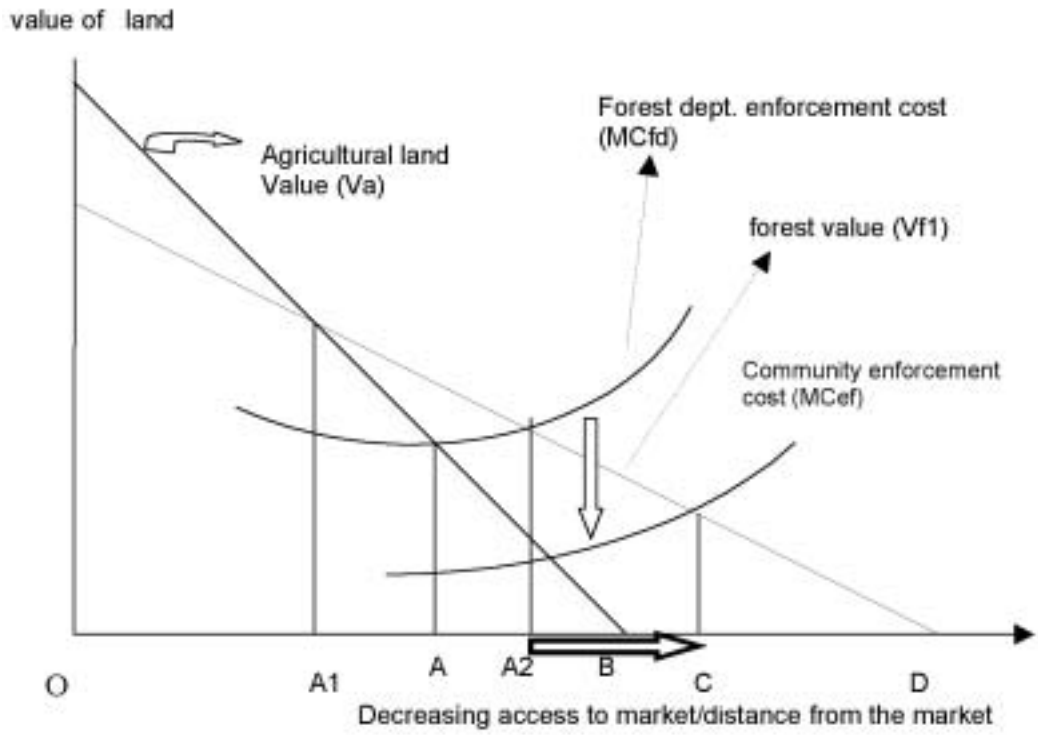

FIG.4: Advantage of Community Forestry

As the neighbourhood forest becomes degraded, forest products become scarce and therefore economically valuable (i.e. the shadow price exceeds zero) and the forest value gradient shifts outwards to V_{f2} from V_{f1}.This shift increases land under enforceable property rights from A to A_2, and the local community can use this additional land either for plantation forestry, agro-forestry or indigenous forest management. Households still rely on open forests for additional forest products for own consumption and for sale. So, they will continue to collect forest products in the region to the right of A_2. This general description illustrates a key point that some private forest management is possible. It is at this point that we begin to examine community or Joint Forest management and discuss its advantages basically for any community that fits this theoretical description. Most natural forests are located on customary lands surrounding local communities and far from government local and central offices, a feature that makes government an 'absentee landlord'. Moreover, government officers including forest officers at district level will not have the same knowledge about the resource and local community that the local landowner has. This means that local forest management will be less expensive if managed by the local community than by any government ministry.

Figure 4 reproduces Figure 3 with two cost functions of indigenous forest management, one for the Forest Department (MC_{fd}) and the other for local community management or JFM (MC_{ef}). Apart from its potential to reduce the costs of management, local community management also brings more forest land under sustainable management depicted by distance, A_2-C.

How much forestland can effectively be managed at the local level depends, to a large extent, on the strength of collective action, which in turn depends on factors that influence the marginal cost and benefits of collective management.

The data set is taken from the fifty-fourth round of India's National Sample Survey (NSS), undertaken between January and June of 1998. The fifty-fourth round was the first national survey in which household and village level information was collected regarding common property rights and resources in India. The survey focused only on rural India. (Chopra and Dasgupta, 2003)

To focus on the nature of dependence of the households on natural resources and CPRs, four

major states (Bihar, Karnataka, Madhya Pradesh and Maharashtra) are considered. These states are selected on the basis of the level of development, both agricultural and industrial. States are ranked according to per capita income from agriculture and industry respectively. The four states with the highest ranks of income from agriculture are: Punjab, Haryana, Karnataka and Gujarat. The lower ranking states with regard to agricultural income per capita are: Bihar, Tamil Nadu Jammu and Kashmir, Uttar Pradesh and West Bengal. With respect to industry, Punjab, Tamil Nadu, Maharashtra and Gujarat are the most developed and Bihar, Jammu and Kashmir, Orissa, Rajasthan and Uttar Pradesh are the least developed. Using further the criteria of the significance of CPRs in the economies of the states, we have selected Karnataka and Bihar as the agriculturally developed and backward states, respectively, and Maharashtra as the industrially developed state. Madhya Pradesh, the central Indian state with a large plateau and forest region inhabited by tribal communities is selected as the fourth Indian state.

This table indicates the nature of dependence of households in these states on CPRs as measured by number of households collecting each of the three commodities, fuelwood, fodder and NTFPs. Large numbers collect fuelwood from the commons in all four states, the percentage varying from 40% to 60%, while the average for India is 36%. The percentage of household collecting fodder is lower, ranging from 9% for India to 17% for Karnataka. NTFP collection also involves low percentages of households, with the range varying from 7% to 24%, Madhya Pradesh having the highest percentage at 24%.

Table 2 gives a picture of the range of non-timber forest products collected in the states and in the country as a whole. At the all India level, leaves, weeds, cane grass, bamboo constitute a large part of total collections. These are followed

TABLE 1: Distribution of Households collecting from Commons

(Number and percentage of households)

State	Fuelwood	Fodder	NTFPs	State Total
India	24744 (36)	6450 (9)	9365 (14)	67674 (100)
Bihar	2977 (40)	1117 (15)	582 (7)	7482 (100)
Karnataka	1666 (53)	539 (17)	304 (10)	3161 (100)
Madhya Pradesh	3184 (55)	516 (9)	1408 (24)	5812 (100)
Maharashtra	3222 (60)	679 (13)	514 (9)	5374 (100)

Note: Figures in parentheses denote percentage of households in each category

Source: NSSO 54th Round

TABLE 2: NTFPs Collected and percentage distribution of collected items

State/NTFP	India	Bihar	Karnataka	Madhya Pradesh	Maharashtra
1. Fruits	17.86	15.48	31.03	28.21	25.29
2.Roots,Tubers, spinach, etc.	9.10	14.22	1.59	7.93	0.33
3. Gums & resins	0.61	-	-	1.65	0.16
4. Honey	2.96	1.83	9.28	2.21	2.30
5. Medicinal/herbs	2.72	0.69	-	2.38	0.49
6. Fish	16.93	19.72	11.41	4.96	16.91
7. Leaves	26.51	28.78	10.34	43.28	29.72
8. Weeds, Grass, Cane, Bamboo	23.31	19.27	36.34	9.38	24.79

Note: column totals equal 100

Source: NSSO 54th Round (1999)

by fruit and fish. Maharashtra and Bihar follow the same pattern but in Karnataka, cane grass and bamboo are more significant than leaves. In Madhya Pradesh where 24% of households are engaged in NTFP collections, 43.28% of the collections consist of leaves (possibly tendu leaves for bidi making contribute significantly to this).

Probit Model of Village Participation[8]

In our analyses, we consider the decision of a village to engage in a community forestry program to be influenced by three types of variables, state, village, and households.

We estimate the probability of a village to be in a community forestry program by a Probit model written as:

$$\Pr(JV=1) = \Phi(C + C_1V + \eta) \text{ ---------- } (1)$$

Where JV is an indicator variable for CF village and V is a vector of village characteristics and η is the error term. The independent variables used in the estimation of (1) and the reasons for using them are discussed below.

We use four state dummies, Andhra Pradesh (AP), Madhya Pradesh (MP), Uttar Pradesh (UP), and West Bengal (WB) taking value one if a village is located in that state and zero otherwise, to test for differences in state geography and policies. Orissa (OR) is the default dummy. Forest Dummy takes the value one if the village reports forests within its jurisdiction. We expect the Forest Dummy to have a positive coefficient as villages with access to forest resources are more likely to join the community forestry programs. Villages with access to forests outside the village boundaries may join CF to protect their own forests and degrade outside forests for domestic use. We test this hypothesis by including Forest outside village in our analysis as a dummy variable. A significantly positive coefficient for this variable would imply villages with access to outside forests are more likely to join CF as compared with those with no access to outside forest. Majority fuelwood dependent is a dummy with value one if the village reported that the majority of the households use fuelwood. Our data does not permit us to test for endogeneity of fuelwood dependence at the village level.

There is considerable literature on access to markets and its impacts on common property institutions (Agrawal 2001). Access to markets and increased opportunities for labour and resource exchanges outside the village is generally believed to make cooperation a less desirable strategy. Thus, we expect better access to external markets, as measured by the all weather road dummy, to reduce forest dependence and make CF in the village less likely.

A village where majority of households are fuelwood dependent is more likely to engage in CF. Thus, we hypothesize that the coefficients of these variables are positive. The Land Gini coefficient measures economic inequality. Residents of a village with unequal land distribution are expected to find it more difficult to take collective action.[9]

Evaluating the impacts of participation on fuelwood consumption

To evaluate the impact of participation we focus on the question how much does fuelwood consumption change because of the participating households' decision to participate in CF. To answer this question we need to know how much fuelwood a participating household would have consumed if it did not participate. However, the answer to this hypothetical question is not observable in the data. So we construct matching comparison groups of non-participant households to estimate the answer.

The accuracy of the quantified impact of participation depends on how the comparison group is constructed. Let α_i be the true impact of household participation on fuelwood consumption.

$$\alpha_i = F_{1i} - F_{0i} \text{ ----------(2)}$$

Where F_{1i} is fuelwood consumption if household I participates in CF and F_{0i} is fuelwood consumption if household I chooses not to participate. However, since a household cannot both be participant and non-participant at the same time, we cannot observe the true impact of participation on fuelwood consumption. Instead,

the observed fuelwood use of household I can be expressed as:

$$F_i = J_i F_{1i} + [1-J_i]F_{0i} \text{ ---------- } (3)$$

Where Ji=1 if household i is participant in CF and zero otherwise. Given the impossibility of observing the true impact of participation in fuelwood consumption, the goal is to get an unbiased estimator of α for the average household.

To measure the estimate of α we consider the simple difference in mean fuelwood consumption between participating and non-participating household.

Comparison of Mean Differences between Community Forestry Groups

This method essentially involves comparing the mean fuelwood consumption between two groups of households and villages: those participating in community forestry and the non-participants. The differences in mean consumption between the two groups are expected to capture the impact of participation. A significant t-test suggests that community forestry increases mean consumption and household welfare.

RESULTS

In this section we outline the results on village and household participation and their determinants as well as the impact of participation on fuelwood consumption.

The summary statistics of the village level variables used are in table 3. The mean column for the dummy variables represents the proportion of villages where that dummy variable takes the value one. For example, 8 percent of the 524 villages report presence of CF, while 43 percent report having government forests within the village. In an average village and 37 percent of the villages reported that majority of the residents depended on fuelwood as fuel.

The estimation results of village level participation are in table 4. Only three variables are significant in explaining village level participation – villages with government forests within village boundaries, villages with at least one member with middle school or higher education, and, villages where the majority of households are dependent on fuelwood. The positive and significant relationship of the three indicators with the probability of participation is expected.

Table 3: Village Participation in Community Forestry

Summary statistics of village level variables				
Variables	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
CF Village	0.08	0.27	0	1
Andhra Pradesh	0.17	0.38	0	1
Madhya Pradesh	0.20	0.40	0	1
Orissa	0.27	0.44	0	1
Uttar Pradesh	0.31	0.46	0	1
West Bengal	0.06	0.23	0	1
Forest Dummy	0.43	0.50	0	1
Forest Outside Village Within Reach Dummy	0.50	0.50	0	1
All Weather Road Dummy	0.64	0.48	0	1
Middle School Education Dummy	0.73	0.44	0	1
Self Help Group Dummy	0.15	0.36	0	1
Majority Fuelwood Dependent Dummy	0.37	0.48	0	1
Gini Coefficient for land possessed in village	0.51	0.17	0	0.92

Total number of villages 524

Source: NSSO 54th Round (1999)

Table 4: Probit analysis of determination of village level participation in CF

Dependent variable: CF Village	Coefficient	Standard Errors
Constant	-3.02**	0.61
Andhra Pradesh	-0.04	0.36
Madhya Pradesh	0.13	0.26
Uttar Pradesh	0.15	0.35
West Bengal	0.76+	0.43
Forest Dummy	0.86**	0.24
Forest Outside Village Within Reach Dummy	0.13	0.27
All Weather Road Dummy	0.11	0.22
Middle School Education Dummy	0.58*	0.25
Self Help Group Dummy	0.17	0.30
Majority Fuelwood Dependent Dummy	0.96**	0.28
Gini Coefficient for land possessed in village	-0.29	0.61
N	524	
Log likelihood	-106.68	
Pseudo R squared	0.25	

Notes: ** significant at 1 percent, * significant at 5 percent, + significant at 10 percent

Explanatory variables that are not statistically significant in explaining the probability of CF participation are important too. For example, anecdotal evidence suggests villages with access to forests outside their boundary may choose to protect their own forests and exploit those outside. Thus, such villages may be more likely to participate in the CF program. However, our results do not support this hypothesis.

Table 5 shows the results of ordinary least square regression (OLS). The most important results regarding CF on fuelwood consumption are presented here. We find that households residing in CF villages consume as much fuelwood as those residing in non-CF villages (see Appendix). However, households that participate in CF consume significantly more fuelwood as compared with the households that do not participate. This implies the CF program does not benefit all residents of the CF village in terms of higher fuelwood consumption. However, the program does benefit the participant household. Since CF participant households consume more fuelwood, we conclude that these households have greater access to fuelwood as compared with households who do not participate in the CF program.

Among other factors that determine fuelwood consumption, household occupation plays a role. As compared with households self employed in agriculture, the agricultural labour households consume more fuelwood and households in other non-agricultural occupations consume less. Given different opportunity costs of fuelwood collection, the differences in fuelwood consumption between different occupational categories are expected.

Ownership of land, phone, radio, and TV reflect greater wealth of the households. The asset index is based on the principal components of these assets and is associated with lower consumption of fuelwood. Education reflected by readers of newspaper in the households may increase the opportunity costs of fuelwood collection and has a negative relationship with fuelwood consumption.

Households with more members consume more fuelwood. The coefficient of fuelwood price is negative, large, and statistically significant. Thus, we cannot reject the hypothesis that the village fuelwood price reflects relative fuelwood scarcity. Total government forest and total village common are both sources of fuelwood, and, larger areas may reflect larger supply of fuelwood (given forest quality). We find that households in villages with larger forest and village commons consume more fuelwood.

Table 5: Household fuelwood consumption analysis, OLS method

Dependent Variable: Annual Fuelwood Consumption	OLS Coefficient	Standard Errors
Constant	1043.67**	118.49
Andhra Pradesh	-251.87**	78.79
Madhya Pradesh	-324.66**	82.35
Uttar Pradesh	-530.83**	80.05
West Bengal	-444.41**	94.88
Fuelwood used for consumption & enterprise	209.25	130.89
Self Employed in Non-Agriculture	-35.85	51.20
Agricultural Labor	109.29**	32.44
Non-Agricultural Labor	59.08	69.16
Other Non Agricultural Occupation	-165.88**	46.95
Asset Index	-40.84**	14.85
Read Newspaper Dummy	-242.48**	44.75
Fuelwood Price (Rs/Kg)	-398.35**	71.83
Total Govt Forest Area (ha)	0.22*	0.11
Total Village Common Land (ha)	0.21*	0.10
All Weather Road Dummy	-37.58	48.51
CF Village	59.76	101.95
Households Participating in CF	28.82	109.98
N	8307	
R Squared/Log likelihood	0.16	

Notes: ** significant at 1 percent, * significant at 5 percent, + significant at 10 percent

Impact of participation on fuelwood consumption

The table 6 identifies simple mean differences in fuelwood consumption between participating and non-participating households and villages. Our results show that households who report that they participate in community forestry consume almost 260 kgs more fuelwood than households that do not participate. This difference is statistically significant. Further, average fuelwood consumption in villages that are CF villages is 27 percent greater than that in non-CF villages. Among CF participants, households that do not read newspapers consume four times more fuelwood as compared with households that read newspapers.

Asset poor households are defined as those in the bottom two quintiles of the asset index constructed from possessed land and other assets.

V. CONCLUSION

To summarize our main household level results, we find that household participation in CF is influenced by state geographic and policy differences, literacy, fuel wood scarcity. A key policy relevant result is that scarcity is correlated with participation. This suggests that new government guidelines need to be cautiously implemented. Our findings regarding fuel wood consumption reinforce the poverty-environment hypothesis, which suggests that fuel wood collection will decrease with wealth because of increased opportunity costs of labour and changes in preferences (Bardhan and others 2002). Community forestry and JFM in India appear to be a case where some participants actively join a village forest institution and are rewarded for their membership. Households who do not join, i.e., those who do not claim to be participants - either because it is not important to them, or because of ignorance, or for some other reason - do not gain in

Table 6: Average differences in fuelwood consumption for participating households and CF villages (Mean Difference comparison)

Firewood Consumption	Households	CF Villages
Fuelwood consumption	259**	202*
For participant only:		
Asset non-poor	80	
Do not read newspaper	829**	

Notes: ** significant at 1 percent, * significant at 5 percent.

Asset poor households are defined as those in the bottom two quintiles of the asset index constructed from possessed land and other assets.

the short to medium term. We conclude that programs designed to increase participation in community forestry are important.

The above evidences and facts suggest that the poor people are very much linked to CPRs, thus the protection of those natural resources is essential for reducing the extent of poverty and simultaneously regenerating the environment, so that sustainable development can be achieved. In conclusion, it can be suggested that for the success of non-market institutions in reducing poverty and improving the environmental quality in developing countries, one should not only seek the perfect bonding of social capital, cultural institutions, will for participation, decentralisation, participatory governance, administrative reforms and role of international development organisations, but also quite essentially the political will and commitment.

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Notes

1 There are some concerns with the SPGI, even though it tackles distributional concerns among the poor better. Leach and Mearns, (1991) briefly address the issue. The sensitivity of the SPGI to measurement errors tends to be higher than the HCI or PGI. For a more precise mathematical interpretation of the SPGI, see Dasgupta, and Mäler, (1994).

2 De Janvry, Fargeix, and Sadoulet, (1992) discusses the strengths and weaknesses of a calorie-based poverty line. He points out that as average income rises, the correlation between per capita consumption and under-nutrition tends to be lower.

3 The terms social forestry, community forestry, joint forest management are used synonymously and interchangeably.

4 The total land area coming under community management is likely to be much higher as the above figures do not include the many traditional groups which are not recognized under JFM.

5 The Village forest Institutions are known by various names in the different states. For example in Andhra Pradesh, they are known as Vana Sanrakshana Samithi (VSS) and as Forest Protection Committees (FPC) in Orissa.

6 The exception is Gujarat, where committees are registered under the co-operative society act (Sundar, 2000).

7 For instance in UP, the JFM order of 1997 required the existing Van Panchayats to accept in writing that the Panchayat rules no longer apply under JFM (Khare and others, 2000).

8 G.S. Maddala, 1983, Limited-dependent and Qualitative Variables in Econometrics, Cambridge University Press.

9 The empirical literature on the impact of heterogeneity on collective action is ambiguous (Agrawal 2001). Baland and Platteau (1996), for example, conclude that heterogeneity of endowments may lead to improved natural resource management but heterogeneity of interests and identity may have the opposite effect. In general, this is an issue that remains to be resolved.