Diversity in communities, divergence in outcomes, dilemmas for policy in community-based forest management

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Abstract

Theoretical and empirical research has invalidated the inevitable notion that collective forest resource management by villagers is ordained to meet with over-extraction and failure. However, community based forest management approaches are not infallible either. The element of cooperation intrinsic to community based forest management models often rely on the rather simplistic assumption of homogeneity among resource users. In reality though, villagers are economically and culturally diverse. These differences lead to varying patterns of dependence on forest resources, which may impede arriving at consensus on arrangements to manage the resource.

Using data collected from 57 Forest Protection Committees under Joint Forest Management in West Bengal, India, this paper finds that committees with members belonging to similar ethnicities and having less disparity in income achieve higher levels of collective action. More interestingly, high levels of collective action are observed in both uniformly rich and poor committees. These two groups have quite distinct patterns of dependence on forest resources, the richer using poles and fodder as compliments for agriculture, while the poor depend on forest products to supplement their subsistence needs. The implications of such divergence in preferences over forest resources are discussed in the context of economic development and forest conservation policies.

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Introduction

The concept of Joint Forest Management (JFM) (1990)[2] took root in India with the acknowledgement that co-management approaches to forest management had efficiency and equity advantages over centralized, command and control regimes. Leading to 1990, constraints of work force had rendered the Forest Department (FD) incapable of protecting the forest from unscrupulous extraction. There was seething antagonism between the FD and the villagers who were shorn of their customary rights over forest resources. There was mounting pressure from donor agencies towards decentralization of control over forests. In these circumstances, JFM was conceived as a win-win situation. The villagers were granted rights to collection of non-timber forest products and a share of the revenue from rotational harvesting following silvicultural rules. Forest Protection Committees (FPC) were created that established a partnership between FD and village communities in managing the forests. These FPC created a social fence around the forest that aided the FD in protecting the forests better. A decade later, the country has witnessed an increase of 38,000 hectares of forest cover (FRA 2000; The Hindu 2001). About 36,130 FPC are managing 10.25 million ha of forest area (FSI 1999) and the apparent success has prompted the adoption of the co-management model of JFM in different parts of the world.

However, it is debatable if the picture at such a coarse scale is a true reflection of ground realities. Will JFM be able to endure the test of

[2] The National Forest Policy adopted by the Government of India in 1990 required the Forest Department to establish local partnerships with villagers living in the forest fringes to protect forests. Each village/hamlet was apportioned portions of the forests and Forest Protection Committees (FCP) was formed with the responsibility to protect the forest from uncontrolled extraction. In lieu of their effort, they were entitled to a share of timber revenue and rights to commercial use of non-timber forest resources.

time and emerge as a sustainable forest management option? The operationalization of JFM has been criticized on the grounds of being incomplete in devolution of control to communities and biased in distribution of responsibilities against the FPC (Conroy, 2002: 236). Besides, the approach in implementing JFM has been to treat the FPC as composed of a homogenous set of resource users, ignoring local variations in socio-cultural and economic dependence on forest resources of FPC members (Kumar, 2002: 766). Efficient forest governance requires a common preference for the resource and mutual trust among resources users is a critical determinant of collective action among them (Ostrom 1990). However, FPC members differentiated by economic status and socio-cultural history may find arriving at consensus regarding forest management difficult. This paper analyzes data collected from 58 FPC in the state of West Bengal, India to study the effect of socio-economic heterogeneity among FPC members on collective action and its impact on patterns of dependence on forest resources.

The paper proceeds with a discussion on different sources of heterogeneity considered in the case study, current theoretical and empirical understanding of impact of heterogeneity on collective action, description of the variables and the methodology used in the analysis and the implications of the results on forest conservation vis-à-vis economic development policies for the region.

Sources, impact and quantification of heterogeneity

Coordination and trust among the FPC members are crucial requisites for the success of any collective forest management activity. However, there exist deep-rooted economic, social, cultural and ethical

differences between members in each FPC. These differences shape preferences of individual members for different services from the forest, which in turn lead to different responses to management regimes and impede formation of consensus among resource users (Kant, 2000: 288). Besides these, the bio-physical characteristics of forest under the governance of each FPC differs, ranging from dry deciduous natural Sal (*Shorea robusta*) forests to plantations of *Eucalyptus sp*. and *Acacia auriculiformis*. Social groups within the FPC have different patterns of dependence on forest resource and the diversity in forest products influence their decisions to participate in its management.

Thus, heterogeneity might arise in the system either from the physical characteristics of the resource or the characteristics of the resource-using group. Among the latter, research has broadly focused on the role of group size and socio-economic inequality on commons management. While there exists considerable unanimity that smaller groups find it easier to achieve higher degrees of collective action, the impact of wealth inequality remains a largely unsettled question (Baland and Platteau, 1997: 451; Bardhan, 2000: 851). Drawing an analogy from Mancur Olson's (1965) hypothesis that more inequality may favor the provision of a public good, an argument can be made that greater economic disparity between FPC members will ensure higher levels of collective action, here sustainable forest management being analogous to the provision of the public good. However, empirical observations across common pool resources from different parts of the world indicate that inequality is often harmful for collective action. Sustaining the efficient arrangement of water management systems becomes increasingly problematic as the inequities in payoffs for participating agents increase (Johnson, 1998). This incongruence in costs borne by a group of resource users and benefits obtained by a different

group is inimical to governance systems and leads to degradation of the resource (Boyce, 1994: 178; Ostrom, 1999:7). In the JFM scenario, cooperation among resource users will be hard to achieve if one social group (stakeholder or interest group) continues to bear a disproportionate cost of managing the forests while others keep staking claims on an equal share of the benefits. In a similar vein, Baland and Platteau (1998: 18) argue "…wealth inequality tends to amplify the distributive effects of regulation and thereby increases the likelihood that some agents will be hurt in the process". Probing into the issue further, Johnson and Bardhan (2002: 482) exhibit that the relationship between inequality and collective action is U-shaped -- at very low and very high levels of inequality, conservation is possible. From an institutional perspective, Ostrom (2001: 762) contends, "heterogeneities do not have a determinant impact on the likelihood or success of collective action". Though differences among resource users lead to difference in interests, prediction of outcomes under such differences of interests require knowledge about the institutional configuration that constrain group behavior and their capacity to modify regulations governing resource use. Whether the rules agreed upon distribute benefits and costs fairly across the resource users depend on the collective-choice rule used and the type of heterogeneity existing in the community. Thus, the effect of heterogeneity on collective action is claimed to be largely contextual.

Empirical evidence on impact of socio-economic heterogeneity on collective action from case studies in community based forest management are inconclusive as well (summary table of case studies reviewed is in Appendix A). The choice of variables and subsequent construction of indices to capture inequality vary in each case study. All of the case studies were from developing countries where income from land is the main source of income. Thus, economic inequality among community

members was measured using differences in asset holding in terms of land and livestock (Tachibana, Adhikari and Somanathan) or considering total income (Gunatilake, Ostrom and Varughese). The literature identifies ethnicity/caste as the proxy for measuring social differentiation. Only in the Malawi case study (Place and Otsuka) do the authors study the impact of inheritance patterns on the decisions to grow trees on non-agricultural land. The formulation of this variable will largely be context-dependent, arriving at some measure of how divided the community is into different social groups (Somanathan, Ostrom and Adhikari). Collective action is measured using either directly observable involvement of agents in designing, monitoring and enforcing rules of governance (Somanathan, Ostrom, Adhikari, Heltberg) or using biometric estimation techniques to assess how well the forest have been managed (Place and Otsuka).

The data and the variables

A survey[3] of 58 FPC was conducted over 1999-2000 in four forest ranges in the districts of Bankura and Medinipore in the Southwest parts of the state of West Bengal. These two districts were chosen because of the dependence of the local village population on common property resources in general (Beck 1994: 188) and forests in particular (Malhotra et al 1992). Incidentally, the first experiments with this form of co-management were conducted in the district of Medinipore. Following detailed discussions with forest officials in the district headquarters and reconnaissance visit to the areas, the forest ranges were selected (Table 1).

[3] The survey was conducted as part of the World Bank aided "India: Environmental Management Capacity Building Technical Assistance Project" and the research was carried out by a team in Bengal Engineering College, headed by Dr. Madhumati Dutta and Souvanic Roy.

DISTRICT	RANGE	FOREST TYPE	
BANKURA	Ranibandh	high density	high diversity
	Radhanagar	low density	low diversity
MEDINIPORE	Belpahari	high density	high diversity
	Jhargram	low density	low diversity

A multistage sampling procedure was followed to select the FPC and the households for detailed interviews. After consultations with officials in the Forest Range offices, a stratified sample of 20% of the FPC were selected controlling for type of forest under management (natural Sal forest or plantation), functional efficiency of the FPC, forest area per FCP member and ethnic composition of the FPC. In each FPC, a stratified (proportionate to the ethnic composition) random sample of 20% of the households were selected for interviews to elicit forest resource use, economic and demographic characteristics. Focused group interviews (more than one where multiple social groups were present) were conducted to assess levels of participation of the members in collective forest management. In each FPC, standard forest mensuration techniques were used to estimate species diversity and tree density. These measures were combined to construct an index[4] that was as an indication of the conditions that the forests were in, higher diversity and greater density implying better management.

Table 2 describes the list of variables in the analysis.

VARIABLE	DESCRIPTION
S	Status of the forest under management of the FPC
AGRINC	Per capita income from agriculture in the FPC
WAGINC	Per capita income from wages and services in the FPC

[4] For detailed methodology of the forest mensuration techniques used, see Roy 2002.

AGWGINI	Gini coefficient calculated using AGRINC & WAGINC
FOOD	Per capita value of forest products consumed as food
SALE	Per capita value of forest products sold in the local market
FOD	Per capita value of forest products consumed as fodder
IMP	Per capita value of forest products used as agricultural implements
FINC	Per capita value of products collected from forest
HOM	1 = 75% of more FPC members belong to same social group
REP	1 = Ethnic composition of the FPC executive same as the FPC
MAT	% of FPC members attending FPC meetings
AGEREG	Age of the FPC since registered in the JFM program
MKT	Local market within 5 km of each FPC

S: This is the index derived from the forest measurements and reflects the density and diversity of the trees in the forest area managed by each FPC. A higher value for the index reflects management that is more efficient. Though some baseline measurements from 1990 would provide an opportunity to estimate change in forest condition over the course of JFM, which would have been more conclusive in deciding the success/failure of JFM in terms of forest regeneration, such data was not available.

AGRINC/ WAGINC: These are average estimates at the FPC level, derived from household responses of production of agricultural commodities as well income from wages and services earned by household members. AGRINC reflects the value of agricultural production in each household, obtained by multiplying total production of each commodity by the unit price of each in the local market.

AGWGINI: This is the measure of economic inequality used in the analysis. It is the Gini coefficient calculated for all the households interviewed in the FPC using the sum of AGRINC and WAGINC. AGRINC was used instead of

landholding as a measure of wealth as household members often included unproductive fallows in the latter.

FOOD: These are average estimates at the FPC level of the value of forest products consumed by households as food. These products are critical nutritional supplements for poorer households in general and tribal households in particular during lean seasons in the year. Prices of these products obtained from local markets were used to estimate the value of the consumption.

FOD: These are average estimates at the FPC level of the value of fodder collected by households. Average fodder consumption by cows during stall-feeding was recorded. These estimates were multiplied by the days that households reported to have let the animals graze in the forest. Price of a bundle of grass that was often sold at local markets was used to calculate the value of fodder consumption.

IMP: Households engaged in agriculture often use juvenile tree trunks as agricultural implements (ploughs). These poles are also surreptitiously sold in the local markets. Price obtained from the local markets was multiplied with the quantity that households reported to have extracted from the forest to estimate the value.

FINC: This measures the average value of the contribution of forest products to household consumption in the FPC.

HOM: This is a binary variable measuring social homogeneity in the FPC. A value of ‘1’ is given to the FPC if any of the social groups (social groups were distinguished by caste affiliations) constituted more than 75% of the FPC.

REP: According to the rules of JFM, every FPC has to be governed by an Executive committee democratically elected from the FPC members each year. This is a binary variable measuring the representativeness of the FPC. It takes the value '1' if all the social groups in the FPC are well represented in the executive committee (EC). The EC is often under threat of being captured by the local elite or by a group that take decisions only to benefit certain sections of the FPC members. Representativeness of the EC ensures that all interest groups get their opinions across and the management arrangements do not unduly benefit any particular group. Democracy and equity are important means to environmental protection (Boyce 1994).

MAT: This variable is used as the proxy for collective action in subsequent regressions. It is an estimate of the percentage attendance of FPC members in meetings held in the community to discuss forest management issues. These meetings could be to resolve conflicts among FPC members regarding disputes related to resource extraction and sharing management responsibilities, take decisions to sell trees (if permitted by the Range officer) damaged by storm, take inventory of trees in the forest under their management, assess the effectiveness of the vigil in the forest and allocate responsibilities among members. 19 out of 58 FPC surveyed had no formal arrangement for guarding the forests and therefore it was not used as a measure of collective action.

AGEREG: Once a FPC is formally inducted in the JFM program, it has to be registered with the FD. Though the FD maintains the right to dissolve the FPC, the FPC members perceive being registered as an indication of long-term commitment on behalf of the FD towards the program. The FPC members feel more assured of devoting time and resources to managing the

forests hoping they would soon be considered for the share of timber revenue from rotational harvesting as promised in the JFM agreement.

MKT: This variable captures the location of a FPC vis-à-vis local markets, where members can sell non-timber forest products, bags of dry leaves and bundles of dry twigs in small teashops as fuel. The government market agency for selling non-timber forest products (LAMP)[5] is in a moribund state, and these local markets are centers for poor FPC members to supplement their meager income.

Results

The data is analyzed using a two=stage least square model and collective action is treated as an endogenous variable. HOM, AGWGINI, REP and AGER are used as instruments to predict MAT (table 3). The predicted MAT is used in the second regression to explain impact of collective action on forest condition (table 4).

Collective action = f (homogeneity, economic inequality, representativeness of the FPC, registration of the FPC)

Forest condition = g (collective action, intensity of extraction of forest products, accessibility to market)

Regression results in Table 3 show the explanatory variables that help explain collective action at the FPC level. Socially homogeneous FPC achieves higher levels of collective action. Intra FPC conflicts regarding sharing of responsibilities are comparatively less in

[5] Large Scale and Multipurpose Cooperative Society

socially homogeneous FPC, compared to a heterogeneous one. Members tend to share identical cultural relations with nature that results in similar attitudes towards forest management. There appear fewer disputes in allocating responsibilities and a higher element of trust on commitments made by other members.

Higher economic inequality among FPC members, measured by disparity in income from agriculture and wages, is not conducive for collective action. Economically heterogeneous members have varying opportunity costs of participating in forest management activities. However, all members are entitled to equal shares of the benefits, which make certain members bear disproportionate costs of the management. The square of AGWGINI was introduced in the regression to test for a non -linear relationship between inequality and collective action. Though the sign of the coefficient of the squared AGWGINI was positive and AGWGINI was negative, indicating a U-shaped relation (Bardhan), neither of the coefficients was statistically significant.

The positive relation between representativeness (REP) of the executive committee (EC) of the FPC and collective action is also meaningful. Democratically elected EC possibly makes governance rules that are fair and equitable for all members concerned. Earlier registration of the FPC is perceived by members as a positive signal from the FD towards maintaining prolonged commitments towards sustaining JFM. This assures them to invest more in the functioning of the institution and helps establish higher levels of collective action.

Dependent variable MAT (collective action)			
Explanatory variables	coefficients	standard error	p-value
intercept	29.87	13.13	0.027
HOM	24.44	6.67	0.006
AGWGINI	-60.21	27.93	0.0357
REP	15.91	6.34	0.0151
AGER	2.69	0.92	0.0051
N = 58 R^2 = 0.43 adj. R^2 = 0.39 F-stat = 10.05			

Table 3. Explaining collective action

Regression results in Table 4 show the relation between the condition of the forests being managed by the FPC with levels of collective action, pressure on the forest in terms of resource extraction and accessibility to the market. Not surprisingly, the predicted levels of collective action (obtained from regression in Tale 3) appear significantly and positively related to the condition of the forest. Greater collective action leads to higher exercise of control over resource extraction, members allow limited grazing in the forests and prevents illegal over harvests. As a result, there is occurrence of higher tree density and species diversity in these forests. Interestingly, the positive coefficient of FINC indicates that extraction of forest resources is not necessarily detrimental to forests. This is evidence against the poverty-environment hypothesis of greater dependence of poorer people on forest hastens forest degradation. Though the causality between the forest condition and resource extraction from it is contentious, nevertheless, the positive relation indicate that group of resource users can design arrangements of sustainable use of forest resources. The nearness to the market (MKT) variable has a negative effect on forest condition. Opportunity to sell fuel wood, poles used in agriculture and non-timber

forest products in the local markets can often be enough of an incentive to members to break rules of resource extraction and over harvest.

Dependent variable S (forest condition)			
Explanatory variables	coefficients	standard error	p-value
Intercept	1.97	0.23	<0.0001
Predicted MAT[6]	0.02	0.009	0.052
FINC	0.0004	0.039	0.0388
MKT	-0.19	0.1223	0.1355
N = 58	R^2 = 0.25	adj. R^2 = 0.2	F-stat = 5.83

Table 4. Explaining forest condition

Implications of the results on policy

The analysis thus far shows that heterogeneity among FPC members is not conducive to collective action. Now, a FPC can be described as economically homogeneous if the members are uniformly either rich or poor. Interestingly, these two groups tend to have quite different patterns of dependence on forest products that will have significant impacts on the forests over the long run. Hence, it is important to acknowledge that high collective action might have divergent impacts on the forest with respect to resource extraction.

In order to probe into this hypothesis further, forest dependence is classified into collection of forest products as food and as agricultural complements. Poorer households depend more on those non-timber forest products that are nutritional supplements (FOOD) as well as

[6] Predicted values of MAT are obtained from the regression presented in Table 3.

those that are sold in the local markets (SALE)[7]. In comparison, richer households depend on forests mainly for fodder (FOD) and agricultural implements (IMP)[8]. The average of the predicted value of collective action (from regression in table 3) is 56. Considering only those FPC with predicted collective action above the average (N = 31), a correlation of -0.28 is found between (FOOD+SALE) and (FOD+IMP). This indicates that members within FPC have quite distinct preferences of forest resources, depending on their economic status (figure 1).

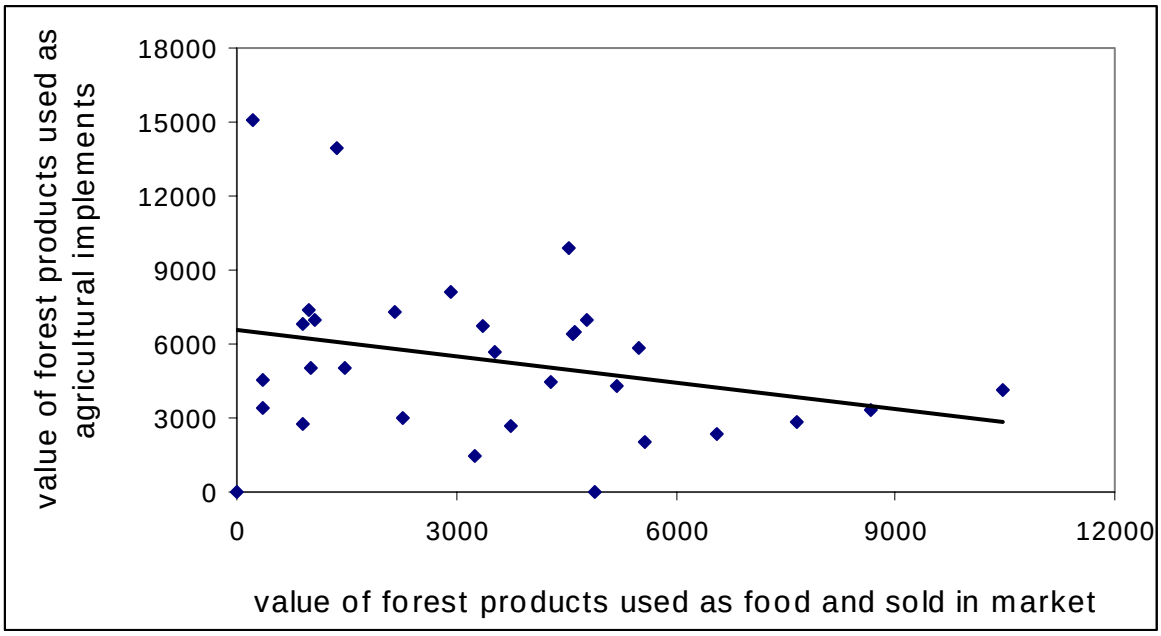

Figure 1. Difference in dependence on forest products

[7] Some of the non-timber forest products sold in these local markets is seasonal. With the onset of monsoon when the paddy fields have been planted, significant proportion of the poor population collect mushrooms and tubers from the forests, both for domestic consumption as well as for sale in the market. This being a lean season as far as getting opportunities to work as daily agricultural laborers, the sale of forest products helps many households survive these difficult months. During dryer seasons, they weave plates with Sal leaves and sell them.

[8] Amacher et al (1993) mention that households with large landholding in mid-hill districts of Nepal use leaf litter from forests for soil enrichment as well as for livestock feed-supplement.

Besides conservation and regeneration of forests, another objective of JFM was to encourage participation of forest-fringe villagers in forest management by giving them financial incentives. Granting FPC members rights to commercial use of certain NTFP and 25% of the revenue from rotational timber harvests were meant to include poverty alleviation components in the JFM program. There were other forms of initiatives undertaken with donor money like establishing village cooperatives to produce handloom, building ponds for pisciculture and providing capital and skills for apiaries through Integrated Conservation and Development Schemes. However, these schemes were randomly distributed among FPC and poorly monitored. Some of them were introduced in communities where members were well-established farmers and hardly had time to invest in these activities. While, the negligence and lack of involvement of the FD has been identified as a reason for failure of these initiatives, another reason not often cited is the ignorance of the fact that communities differ over their preferences for forest resources. As a result, members in different FPC do not perceive incentives arising out of different policies in the same way. If development of markets for non-timber forest products is pursued as a way to encourage villagers to put in greater effort in conservation, distribution of benefits of such a policy will be biased for poorer households.

Simultaneously, the government is following a more general agricultural intensification based rural development strategy. Promotion of high-yielding variety of seeds, inorganic fertilizers and more mechanization of rural agriculture means multiple crops are being cultivated on the same field in different seasons. Forests thus become even more necessary as a grazing resource for these households, who once let there cattle roam in the agricultural fields when they were left fallow. Therefore, intensification of rural agriculture will only benefit the rural landholding elite.

At the same time, with mechanization, local demand for agricultural labor decreases rendering section of the poorer household jobless in the agricultural season --- their main source of sustenance. As a result, the region is experiencing increasing seasonal migration of male members of households to other areas for labor opportunities. The women thus have the increased pressure of maintaining their families and resort to collection and sale of forest products for subsistence.

Thus, given that different policies give rise to different trajectories of resource extraction by socio-economically different communities, community based forest management initiatives like JFM need to reassess their blanket policy. Participatory management options need to incorporate local realities while designing incentives. This implies that policy-making needs to be scaled down, tailoring them to specific characteristics of the region/community, rather than making assumptions of similarity. It is indeed a difficult task, but nonetheless imperative for long-term success of community-based forest management.

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Appendix A

Author	Region	CPR type & unit of analysis	Indicators/variables		Estimation	Indicators of collective action	Effects on collective action	
			Social	Economic			Social	economic
Tachibana et al (2001)	Tarai of Nepal	Forest Household	Proportion of largest ethnic group; Number of wards people access forest from	Landholding	Ordered probit	Formal Forest User Groups	0.132 -0.096*	0.05
Adhikari (2002)	Midhills of Nepal	Forest Household	Proportion of lower caste	Landholding; Livestock	Log-log 2SLS	Fuel wood collection	-2.27*	0.78 0.59
Heltberg (2001)	Rajasthan, India	Forest Village		Development index (infrastructure facility in village)	Logit	Enforcement of conservation rules		-2.85*
Ostrom, E., Varughese, G. (2001)	Midhills of Nepal	Forest Village	Index of fractionalization along castes	Index of wealth disparity	Tau	Rules of access, harvest and monitoring	0.20	-0.32
Gunatilake (1998)	Srilanka	Forest Household		Total income	SLR	Forest dependency		-0.003
Somanathan (2002)	Kumaon, India	Forest Village	1 – sum of square of shares of households of each caste	Ratio of minimum to maximum landholding in village	SLR	Hiring watchmen, meeting frequency, net benefits from forests	0.89	1.667**