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IFRI panel: Dynamics of Natural Resource Policy Decentralization

Conservative attitude of forest dwelling communities: Hope for JFM to succeed
Evidence from repeated field experiments in central India

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ABSTRACT

Decentralization in natural resource management is becoming a norm in majority of developing countries for ensuring economic efficiency, sustainability of the resource, and socio-economic equity. In the Indian forestry sector, decentralization got ushered in through programs like JFM, and successive legislations since the Forest Policy, 1988. Although several studies have documented suitability of the participatory approach, often questions are raised whether the relationship between forest and forest dwelling communities continues to be symbiotic, or if it has changed under the influence of globalization and commercialization. Based on four repeated field experiments in a community located in central India, this paper indicates that in case of indigenous communities, their relationship with forest continues to be non-exploitative and non-commercial. By increasing complexity in subsequent games, an attempt has been made to create real-life like situation in the context of forest use - open access and with JFM, where individuals in a community harvest forest products – timber, fodder, fuel wood, either independently or after consulting the community. The findings of the paper support participatory management strategy that provides opportunities for communities to make collective decisions through enhanced communication. The paper confirms the argument that decentralization would not only encourage sustainable resource use due to increased sense of ownership, but could potentially lay foundation for equitable distribution too.

Key words: Decentralization, communication, attitude of communities, repeated field experiments, India.

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Introduction

Decentralization[3] of forest management in India is almost two decades old. The underlying argument promoting devolution of authority, accompanied by 'downward accountability', is that it would ensure economic efficiency - since local people have better knowledge of the resource they regularly use; sustainability - since it is the source of sustenance for the local people; and improved social and economic equity - since local users know each other well by interacting on day to day basis, and would have better knowledge of their own needs and aspirations. Thus, decentralization can provide incentives for local communities to make locally informed decisions (Agrawal and Ostrom, 1999; Fisher, 1999; Ribot, 2002, 2003; Ribot et al 2005). Decentralization in India, initially prompted by external pressures, was seen as a strategy of governance to facilitate transfer of power closer to those who are affected by the exercise of power (Agrawal and Ostrom, 2001). Starting with the Joint Forest Management (JFM) program in early 1990s, to the recently passed Forest Rights Act (FRA)[4] that has extended rights over the forestland, devolution of authority has only been increasing, based on the premise that forest dwelling communities have symbiotic relationship with forests, and protecting it is in their own interest. Yet, it is important to ensure time and again whether the communities continue to have the traditional relationship with the resource, it being the basis of the success of decentralization. The question we address in this paper is if the forces of globalization and privatization have impacted the attitude of the forest dwellers in recent times - do forest dependent communities now look at forests as commercial resource to be exploited in the market economy?

In order to understand the existing attitude of the communities towards forest we undertook a case study wherein multiple methods were used for collecting data. Along with household survey and focused group discussions, we applied IFRI protocols to collect institutional as well as forestry information. In addition to these traditional methods we also conducted a series of field experiments by creating real life like situations to directly observe the harvesting behavior of the participants in the experiments. Present paper is based on the observations made during the repeated field experiments.

We first present background of forest ownership in India, and then discuss the decentralization initiatives of Government of India. This is followed by details of the case study selected as a representative of the forest dwelling communities in central India, especially Vidarbha region of Maharashtra State. After making a case for field experiments as a research method, and explaining the structure of the four experiments used in the study, we present results and discussions for each experiment. The paper concludes with policy implications.

Forests in India

[3] Decentralization includes transfer of administrative and financial responsibility to lower levels of government, or devolution of power within state bureaucracies, and increased political power to local authorities (Shyamsundar, 2008).

[4] Complete title of the act is 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

Around 20 percent of India's land is classified as forest, which is around 64 million hectares. Of this total forest area, 50 percent is dense, 40 percent is open and 1 percent is coastal (mangroves). Ownership and management of 65 percent of the forest is with the government. Government and communities under Joint Forest Management Program jointly govern 27 percent, and only 8 percent is under private ownership. Forestry and logging contribute just about 1.1 percent of India's GDP (in 2001). However, according to one estimate, the value of India's forest is INR 59,20,190.2 crore[5] for its environmental functions, according to the Net Present Value assigned by the Supreme Court of India[6] (Down to Earth 2005). Taking into consideration the rich biodiversity of the country, even this can be considered a gross under estimate. Moreover, if one is to include the economic function – in the form of providing subsistence needs of the forest dwelling population – the forests perform, its value is likely to increase manifold.

Such a valuable resource was under the state monopoly for a long time. The recent trend of decentralization in forestry sector has come after almost 127 years of systematic centralization and consolidation of authority for commercial gains by the British and then by the government of independent India as well (Guha 1983). To mention that until the end of the nineteenth century, at least 80 percent of India's natural resources were common property (Singh 1986) is important here to drive home the point that concepts like polycentric ownership and decentralized management are not entirely new to India. The perception that the decentralization effort has a chance to succeed is supported by the fact that despite the existence of vast tracts of seemingly inexhaustible forests with low population pressure, restrictions on reckless and indiscriminate exploitation have always been the foundation of the social and cultural institutions developed by people in various forest areas of India (Gadgil and Berkes 1991, Gadgil and Subhash Chandra 1992, Sarin 1996, Ghate 2004). This reality was ignored, as reflected in the very first policy statement in 1894, which termed forest communities as 'intruders' and 'aliens over the state property'. Forestlands were transformed into mere sources of revenue for the British Government (Rangarajan 1996) even at the expense of forest areas allocated to villagers' use (Guha and Gadgil 1989), resulting in erosion of localized institutions. Concentrating on situation in central India during the British rule, Satya (2004: 3) notes, "colonial capital and technology worked hand in glove to exploit the rich resources of Berar". Also, "it has been noted that the colonial state constantly strove to devise more and more sophisticated and efficient ways of not only extending its control but also of extracting revenues, resources, and labour".

This situation started changing after Government of independent India realized that unless the biomass-dependent communities were accepted as stakeholders of the forest resource, its protection would be extremely difficult.

Decentralization initiatives in forest management

[5] 1 crore = 10 million = 100 lakh

[6] The rates assigned to different categories of forest are: INR 5.8 lakh per hectare of scrub forest, 7 lakh for open forest and 9.2 lakh for dense forest.

Decentralization of forest management in India began ever since the acceptance of people oriented forest policy in 1988, on which the JFM program was based. The *Panchayat* Extension to Scheduled Areas Act (PESA) of 1996 gave power to the *gram sabha* (village assemblies) in scheduled areas over community resources, especially over minor forest products. PESA took the decentralization of management and ownership of forest resources in areas beyond the Forest Department managed territory. Government of India established Forest Development Agencies (FDA) in each state at forest division level in the year 2000, for federating JFM committees, indicating its commitment towards continuation and expansion of the program. Passing of Forest Rights Act in Indian parliament on 18th December 2006 was another major step in the process of recognizing and re-establishing indigenous people's symbiotic relation with forest. While impact of PESA is not well understood as yet, and FRA is too recent to evaluate, JFM and FDA are well established and growing. According to latest data, JFM program covers 27 states, 85,000 villages, and 17.3 million hectares of forestland.

All these steps towards decentralization are significant because forests continue to play a crucial role in the lives of roughly 275 million poor rural people in India – 27 percent of the total population – who depend on forest for at least part of their subsistence and cash livelihoods, which they earn from fuel wood, fodder, timber poles and a range of non-timber forest products, such as fruits, flowers, and medicinal plants (World Bank Report, 2006). Change in forest policy affects their access to forest. Since the provisions in the forest policy of 1988 were significantly different from the earlier forest policy of 1952, its impact on the lives of people, who got their wherewithal from forests, would also be different.

Background of JFM: Joint Forest Management (JFM) is the most common operational form of one of the major devolution policies for the 'inclusive' decentralized management of forests in India. The JFM system envisages involvement of local communities in the management of state-owned forests under partnership arrangements with the state Forest Department (FD) [7]. Usufruct rights on forest products for subsistence, restoration of degraded as well as preservation of well stocked forest lands, sharing of benefits flowing in the long term, and making available other development funds for poverty alleviation (under FDA) are the broad incentives offered under the program, with operational variations between states, and alterations/modifications over the time. JFM is looked as an attempt to reverse the process of forest degradation on the one hand, and meet people's needs on the other. This explorative initiative to bring together the Forest Department (FD) and the resource users - the forest community people, through formation of Joint Forest Management Committee (JFMC), was undertaken almost a decade and half ago. This was done with the belief that the communities living the vicinity of the forests, and depending on them

[7] No.6.2/89-Forest Policy, June 1, 1990; No.22-8/2000-JFM(FPD), February 21, 2000; Strengthening of JFM Programme, Guidelines, by MoEF, on December 24, 2002; NAEB 25-1-1/99-B-2 Dated 4-01-2000 issued by Central Government to all States; Government Regulation No. MSC/2000/143/F-2, 25.4.2003 issued by Government of Maharashtra.

for their wherewithal continued to have symbiotic relationship, and would not treat the resource commercially for short term gains, and thus harm it.

There is a large body of literature on JFM. Research scholars have extensively studied various aspects of JFM – provisions, structure, working, and impacts. In the following paragraphs an attempt has been made to take a brief review of literature with a focus on attitudinal aspects of the communities towards forests.

Critique of JFM: JFM program, which got started in response to pressure from donor agencies as well as recognition of the failure of past approach of the state agencies (Thompson 1995, Matta 2006), has been critiqued on various aspects. From the outset, JFM has been looked as a unique approach, which blends both scientific management techniques and age-old indigenous practices to conserve forest on sustainable basis (Mukhopadhyay *et al*, 2007). It not only kindled lot of hope, but also led to skepticism during the initial years. While Poffenberger et al. (1998: xi) had enthusiastically expressed that JFM had brought in "reversal of the alienation of forest people's rights, of institutional conflict, and of ecological patterns of forest degradation", and that "India's grassroots experience of ethno-forestry can be replicated across regions and nation-states, provided communities are allowed to regain management authority over the integral resources that sustain their livelihoods" (p. 13), other studies showed that JFM would suffer because in many instances both the partners –Forest Department and the communities – were not ready for the new institutional arrangement (Parul 2006). The Forest Department staff, with a long history of 'command and control', was not adaptive enough to the change in approach. Need for the forest department staff to make fundamental shift in its attitude, policies, and procedures to respond effectively to the needs of the local forest management groups was highlighted by Palit (1998), a forest officer himself. Similarly, the communities found it difficult to reconcile with the idea of being equal partner in managing a resource from which they were strictly kept away for so many years and whose use invited punishment (Sarin 1998). The early criticism of JFM was based on it being a typically top-down approach of the state; asymmetric power relationships between the state functionaries and the people; power imbalances within communities, and inadequate benefit-sharing provisions (Sundar 2001, Conroy et al. 2000). Another major limitation discussed in 1990s was in the context of 'tenure' being unclear, insecure, and without unambiguous, exclusive rights of access to the resource (Lele and Rao 1996). Absence of legal status to Forest Protection Committees (FPCs), government's right to dissolve FPCs, unilateral decision-making, and inappropriate sharing of forest produce were some other aspects criticized by scholars (Pattnaik and Dutta 1997).

Almost a decade after its introduction, many evaluation-based studies have been published offering both (few) positive and (more) negative outcomes of the JFM. The studies demonstrate that in most places protection committees created under JFM do not last long, or end being unequal partners (Matta and Kerr 2004). They become dysfunctional either after initial enthusiasm dies down or after the incentive money is exhausted (Kumar 2002). In some cases village level JFM committees exist only on paper, and are ineffective in protecting the resource (Ghate and Nagendra 2005). Some

note that communities by and large have remained unconvinced about the benefits to be gained from accepting the state designed arrangements at considerable loss of autonomy, while there are also concerns over what is being perceived as covert attempts by the state to expand its authority over forests (Sarin *et al* 2003), leaving no room for people's participation (Ballabh, Balooni, and Dave 2002). Some studies are harsh at the attitude of forest officials towards JFM committees, which are looked at 'not as people's organization' but as 'a creature that works under the thumb of a forester' (Shah 2003). The reluctance to actively participate in JFM could also be related to the current global market dynamics and associated pressures that are significantly transforming community characteristics, values, traditions, and livelihoods (Jodha 1998; Sundar 2000). There is evidence that improved accessibility to otherwise remote forest villages, has led to unsustainable commercial use of forest products, encroachments and overexploitation of common lands (Jodha 1992: 37). These transitions greatly influence local people's need, ability, vision, and willingness to work collectively for forest management – especially where the immediate benefit to local people is small - and where the issue of public good value is significant (Balland and Platteau 1996).

On the other hand, there are studies claiming that the forest committees in several instances are working not merely as the 'sounding board for schemes that the department would wish to undertake in villages', but have successfully used the forum, both formally and informally, to secure forest usufruct (Tiwari 2005). Shylendra (2002) has found that JFM in Gujarat has been able to incorporate and address various issues concerning the livelihood security of the local people. Another multi state study indicates that biomass growth rate has been comparatively higher in JFM forests as compared to the national average (Murli *et al*. 2002). Similarly a study on JFM in Gujarat has found that JFM forests are meeting substantial biomass needs of the community and contributing towards achieving sustainable forestry (Patel *et al.* 2006). Similar positive results have been quoted from Rajasthan as well (Aggarwal *et al.* 2006). In a study conducted in Dehra Dun district of Uttar Pradesh, it was observed that the household income has considerably increased due to alternative job opportunities, as well as agricultural production. There was reduction in distance traveled and time spent for fuel wood and fodder collection, and thus village women are now financially empowered, and institution building has paved the way for sustainability of the whole process (Srivastava *et al*. 2004). According to Balooni *et al* (2007: 1443) "Recent literature does suggest that the paradigm shift from centralised to decentralised forest management has increased the access of local communities to forest resources, increased internal social mobilization has helped communities challenge the traditional state authority and enabled them to create political capital, exposed the conflicts over resource interests, paved the way for positive changes and explored potentials for better forest management".

There are few studies that have looked at attitudinal aspect of community members in the context of the JFM. While opinions of forest officials and community members on performance of JFM and identifying most appropriate indicator of institutional performance were the two main objectives of Mukhopadhyay *et al.* (2007) article, Matta (2006) has looked at the role of incentives in degraded forests of Tamil Nadu. He

employed a semi-structured interview questionnaire on selected foresters and sought information on how they perceived and valued JFM and community involvement in forest management, and what they considered as important challenges in the JFM. He opines that “It is particularly not clear as to what extent different incentives bring in success or otherwise to Participatory Forest Management, analyzed from the perspectives of key stakeholders”(p. 6). He, as well as Sekhar (2001), points out that unlike the CBNRM, where collective action is the result of strong community action and local interaction, the group formation and institutional development in participatory forest management is an induced activity, mostly sponsored and supported by the state agencies. While the crucial role of these agencies in enabling the co-management approach has been highlighted in several studies, (Lise 2000), systematic studies on their perspectives on challenges involved in making this strategy sustainable, are lacking (Vira 1999). Vira (2005: 5074) further warns that if JFM fosters only bureaucratic participation, and “fails to account for the specific characteristics of the local context within which these partnerships are to be developed”, its success would be limited despite soaring numbers.

Through a case study we try to find if attempts like JFM are useful for communities that want to protect their resource; in what way it helps collective action; which forest products do the communities prioritize; and if the attitude of forest dwelling communities has become exploitative and commercial.

Study area

Maharashtra is one of the larger states of India, of which almost 20 percent (approximately 60,955 sq km) area is classified as forest. Six districts of the state namely, Thane, Dhule, Nandurbar, Amravati, Chandrapur and Gadchiroli have relatively more proportion of area categorized as under ‘forest’, indicating that sometime ago there was sufficient forest cover to prompt Forest Department to take the area under its jurisdiction.

Kargata, our case study village, is located in Chandrapur district of Maharashtra, around 79º41.863 E and 20º18.942 N at an elevation of 232m above mean sea level (Map-1). Surrounded by good quality dry deciduous forest, the temperature in this area ranges from a minimum of about 10ºC to a maximum of about 46ºC, with the average annual rainfall of 1173.6mm. It is well connected by a tarred road with its sub-district head quarter at Sindewahi, 6 km away. It is a small village with only 40 households, living in a neatly organized settlement, at subsistence level. ‘Vikalp’, an NGO, has been active in this village.

Socio-economic background: Presently the three predominant communities in Kargata are *Gond* tribe (70%), *Mana* (15%) - a special backward class, and *Dhiwar* (13%) – a fishing community; while the other 2% belong to *Pradhan* and *Koli* tribes. The 40 households constitute 180 persons, living in typical family structure consisting of husband, wife and dependent children and aged parents. In the last two decades the number of households has doubled. All the people belong to *Hindu* religion; speak

Marathi as well as *Hindi* languages. Most of the people in this village are literate wherein 150 individuals have passed primary school. Out of these, 30 have passed high school but none have attended college. Primary education is offered in the village by the *Zilla Parishad* (district level government) primary school whereas for high school, students have to go to Sindewahi. Sindewahi is the closest market place and the administrative center. Members of Kargata community travel to Sindewahi roughly twice a week to access the market and once a month to visit the administrative center. There are number of government departments located in Sindewahi, including the Range Forest office, Office of Agricultural Department, Rice Research Institute (a center of Panjabrao Krishi Vidyapeeth, which is a state Agriculture University), and a Police Station. Sindewahi is a hub for ground transport where buses ply to Nagpur (the divisional head quarter) and Chandrapur (the district head quarter).

Kargata community is predominantly agrarian in nature either cultivating on their own land or working for wages on other people's land. Paddy is the major crop grown. Besides this agricultural activity, employment is available with the Forest Department as well as wage labor under the National Rural Employment Guarantee Act. Land ownership is the defining aspect of the economic status of families; those who own land are considered to be wealthy while the landless are regarded poor. There are only 4 households in the village regarded as rich and 17 households as distinctly poor. Every household depends on the forest for fuel wood, timber for housing and making agricultural implements, and for grazing their livestock as well as to collect grass used as thatch roof for cow sheds.

Forest: Forest around Kargata is old and mainly natural, belonging to the class of 'dry deciduous', on a largely flat land. There are two categories of forest within Kargata's revenue boundary, namely, Reserved Forest (31.32 hectare) and Protected Forest (45.07 hectares). There is a forest patch belonging to Forest Development Corporation of Maharashtra (FDCM) very close to the village. The third category of forest, which is handed over to the community under the JFM (449.61 hectares), is outside the village boundary, in an adjoining compartment of Reserved Forest. The FDCM forest is used for commercial harvesting wherein at the time of study, clear felling was being carried out for planting Teak. In 1995, bamboo plantation was undertaken in the FDCM forest. As it failed, it was being replaced by Teak. Within the JFM forest, there was one plantation site which was established much before the JFM was introduced in Kargata. There exists a sacred grove in the Protected Forest Area within the village wherein a deity is kept on a *Moha* (*Madhuca longifolia)* tree. This sacred grove is about 1 hectare in area, and has been there from early times.

The quality of forest in general is good especially where it is protected by the community, although according to the villagers the overall density of trees has decreased in the past 5 to 10 years. Commercial exploitation in the FDCM forest, recent clearing of forest for canal construction, and selective felling by Forest Department in the Reserved forest, are some of the activities sited by the villagers responsible for degradation of the forest. Before Forest protection Committee was set up under the JFM program in the year 2000, Kargata community was already protecting the forest

from the timber poachers coming from nearby villages. Timber poaching was reportedly going on for a long time, and the species for common collection had diminished considerably. With forest protection the density of trees started improving, and at present a total of 33 species are found, with *Cleistanthus collinus, Tectona grandis, Terminalia alata, Chloroxylon swietenia, Largerstroemia parviflora* and *Madhuca longifolia* being among the most abundant species. The first three along with *Anogeissus latifolia* and *Terminalia bellerica* are the most commonly collected species by the villagers. Following are some of the standard indicators of the forest quality -

Average Stand BA per ha.	13.03
Stems per plot	9.23
Stem density per ha.	294.05
Average height of trees (meter)	10.83

Forest Association: The Forest Association in Kargata is known officially as the Joint Forest Management Committee. It came into being when two members of an NGO called 'Vrikshamitra' came to the village in 1999 to inform the people about the JFM program. Following this, the community approached the Forest Department with an application to set up a JFMC for the village. As a result the committee was established in 2000 and was registered in 2002. Later in 2004-2005 this JFMC was included in the Forest Development Agency program. The committee consists of seven members, two of which are women, and the present body continues to be the same since inception. During the early years of its establishment, the committee members used to meet frequently to deal with the timber theft that was highly prevalent at the time. They even organized patrolling teams which proved fruitful as subsequently the number of thefts reduced substantially. Patrolling is not carried out regularly anymore, and meetings are also held less frequently. Records of meetings, income and expenditure incurred, contributions made to the association in kind or in cash, are maintained and submitted to the Forest Department regularly. When illegal harvesters are caught, the patrolling team confiscates the products, and either takes the culprit to the Forest Department staff, or releases him/her with a warning. The Sacred grove is used only for worship while from the other parts of the forest people can collect only what is needed. There are times such as weddings when families can request the committee for letting them harvest more than the usual amount. Besides occasional monitoring, and determining the permitted amount of product that can be collected by authorized households, there are no other rules. The association has not yet undertaken any forest improvement activity. Kargata community feels concerned about increasing population within the village as well as in neighboring areas, limited agricultural land, and limited options for employment, as these are likely to result in encroachments on forestland. Moreover, it feels that the clear felling in FDCM forest area and for the canal construction, are bound to negatively impact quality of forest, and thereby availability of the forest produce. Thinning of forest has also resulted in increased instances of crop depredation.

Because of its socio-economic, geopolitical, and demographic characteristics, Kargata is indeed a typical representative forest village for the purpose of studying harvesting behavior of indigenous communities through field experiments.

Research Method: Field Experiments

Case for Field Experiments

Field experiments increasingly play an important role in studies relating to the behavioral aspects of subjects by simulating real life situations. They allow for the re-creation of an environment where *"economic phenomena present themselves"* (Reiley and List, 2007, p.9) in a form that captures the typical characteristics of a real world scenario as a means of understanding implicit interrelationships. *"Distinct from traditional empirical economics, field experiments provide an advantage by permitting the researcher to create exogenous variation in the variables of interest allowing one to establish causality rather than mere correlation"* (Reiley and List, 2007, p.2). In a field experiment, the researcher considers the actual preferences and institutions of the real world, jointly testing both the structural assumptions (such as the nature of the values of a good) and behavioral assumptions (such as the Nash equilibrium) (Reiley and List, 2007).

In behavioral economics, which is inclusive of normative behavior, economists are widely resorting to field experiments as a means of supplementing data from surveys. Carpenter (2002) offers three reasons to do so. The first reason is that surveys often suffer from what is called hypothetical bias, which means that people respond to situations differently when the situation is hypothetical than when the situation is real. The second reason is the idealized 'persona bias' and the 'surveyor effect'. The idealized persona bias occurs when people respond to questions as the person that they wish they were rather than the person that they really are, while the surveyor effect refers to the phenomenon where survey-takers often try to figure out what the researcher would like to hear and then give either that response or its opposite. The third reason refers to the notion of incentive compatibility, where the experiment participants often have an incentive to truthfully reveal private information (Cardenas and Carpenter, 2005).

Field experiments also come in handy for all three purposes for which researchers normally collect data: that is, to construct a theory; to test a theory, and to make measurements of key parameters (Ostrom, 1998; Reiley and List, 2007). Barr (as quoted in Cardenas and Carpenter, 2005) believes that the data generated through experiment is cleaner as (i) there is more control on the data generation process, (ii) it generates data on revealed preference directly, and (iii) it is analyzed directly. Comparability and replication are additional incentives for conducting field experiments. They allow researchers not only to compare experiments across cultures but also to replicate them within cultures to check the robustness of the results (Cardenas and Carpenter, 2005).

Although there is greater recognition of field experiments as a more faithful way to gather data in instances where there are incentives for truthful revelation of behavior/information, they are not without lacunae. For example, control, which is one of the most striking features of experiments, may not be perfect. Further, due to

logistical/practical constraints, the number of participants in an experiment is likely to be small, hence raising questions regarding the significance and relevance of the inferences made from the observations which are small in number. Another issue pertains to the representativeness of the participants. In the case of the experiments conducted in this study due to social inhibitions, women did not volunteer to participate in the experiments, which is the major limitation in the universality of representation. A major advantage in our study, however, was that the participants in the experiments were actual harvesters of the forest resource. Therefore, the experiment was not about an artificial situation, but very much about a situation that they were familiar with. However, since the participants were playing a game, there could not be any assured guarantee that their observed behavior would any way replicate their actual behavior in the real-world economic settings that the experiment was supposed to represent.

For this study we conducted four experiments with a batch of same five participants over a period of six weeks. The games were designed to capture - one, the attitudinal aspects of individual behavior expressed through privately taken decisions of forest use; and two, individual decisions of forest use arrived after communication amongst the participants. At the time of conducting household survey, an attempt was made to identify willing participants for the experiment, and attempt was made to make the team representative of different age groups, educational levels, and land ownership to capture economic variations, and socio-political classes by including *sarpanch* (head of *gram panchayat*) or police patil (village level employee of the police department), or president of JFM committee (see Appendix-1). In order to avoid 'persona bias' or the 'surveyor effect',[8] we spent some time building rapport with the community, conducted village level interviews, household surveys (12 households), and collected forest information through IFRI[9] protocols before conducting the experiments. The study was conducted in the first quarter of the year 2009.

First field experiment[10]

Structure: First experiment consisted of two games. While the first game tried to replicate the open access harvest situation (with no communication amongst participants), the second tried to mimic the JFM situation partially[11] by allowing the participants to discuss and decide forest use/harvest strategy. The games started with a given forest of 100 tress (the maximum possible size), displayed on a board. Each game was played over 10 rounds, although this number was not disclosed to the participants. The game could, however, end before ten rounds if less than five trees remained in the forest. Thus each game in effect would be played over at the most 10 rounds.

[8] The idealized persona bias occurs when people respond to questions as the person that they wish they were rather than the person that they really are. While the surveyor effect means that survey takers often try to figure out what the researcher would like to hear and then respond in that way or the opposite way.

[9] IFRI refers to a protocol developed by the International Forestry Resources and Institutions, Indiana University, and University of Michigan, USA.

[10] The idea of this field experiment is taken from an experiment designed by Cardenas, Janssen, and Bousquet. http://www.umass.edu/resec/seminars/docs/Cardenas%20Janssen%20Bousquet%20EnvExpEconHandbook.pdf

[11] We are aware that JFM is much more than providing a platform for communication through Forest Protection Committees. But in this paper we are assessing the impact of communication on harvesting behavior through field experiments.

Maximum number of trees that could be harvested by individual participant in any round was according to Table - 1.

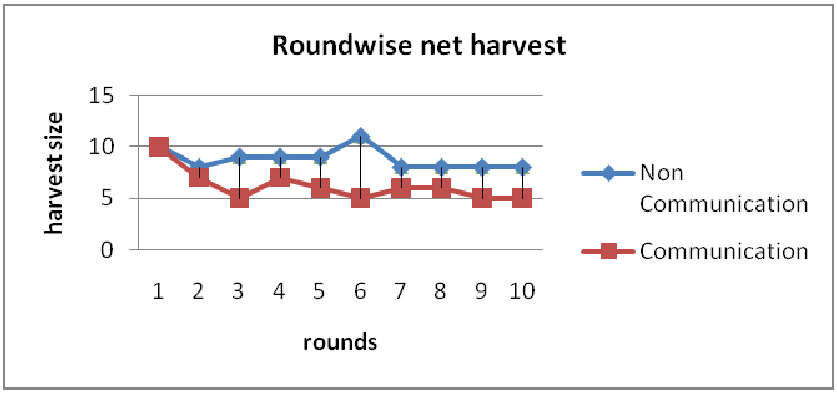
Table - 1: Maximum allowed Individual harvest in a round

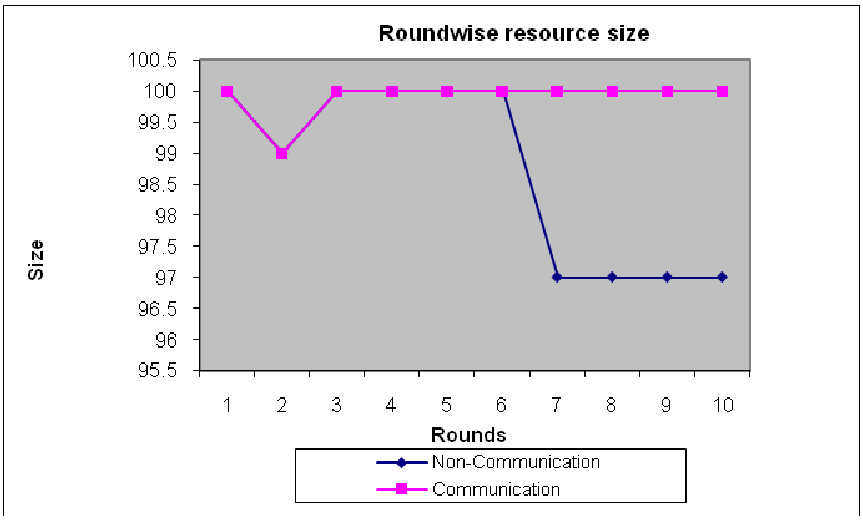
Resource level	100-25	24-20	19-15	14-10	9-5	4-0
Harvest	5	4	3	2	1	0

At the end of every round, 10% of the remaining trees were added to the pool of trees to be considered for the next round to capture the regeneration in any natural forest. While doing this, care was taken that the resource size did not exceed 100 (capacity of the forest) at any stage. For each tree harvested, the harvester was entitled to a pay off of INR 10. All payments were made at the end of the game. Harvesting decisions were made individually and in privacy. At the end of each round, the participants were informed about the total harvest of the group, and not of individuals. Thus at the beginning of each round the participants were aware of the resource size. The only difference in the two games was that while in the first game there was no communication between the participants, and individual harvesting decisions were taken privately, in the second game, the participants were allowed to communicate throughout the game, to make collective decisions, formulate strategies and rules for harvesting, try to identify the rule breaker etc (as they are expected to do under the JFM program). However, even in the communication game actual individual harvesting decision was made privately, and not disclosed to the group until the end of the game.

Before the game was actually played there were three practice rounds to make sure that all the participants understood the game well. The participants were made to calculate the resource size at the beginning of each round, and also their pay offs to make sure that they made informed decisions.

Results: In each round, the aggregate harvest of the community was low when communication was allowed compared to when no communication was allowed. Net individual harvest in the non-communication game was high with average of 17.6, and reduced in the communication game to the average of 12.4 trees. In case of non-communication game the individual net harvest varied from a minimum of 8 to maximum of 22 with standard deviation of 5.77. For the communication game, the net individual harvest varied from a minimum of 12 to a maximum of 14 with standard deviation of just 0.89. The resource size (at the beginning of each round) reduced to 89 in the non-communication game from 7^{th} round onwards. It was maintained at 100 in the communication game throughout except the second round where it reduced to 99. Harvesting behavior in non-communication and communication games was (statistically) significantly different (Wilcoxon signed ranks test: p=0.007). For the non-communication game, players 2 and 5 who were relatively politically dominant harvested the maximum number trees. However, when the participants discussed their harvesting strategies together, the disparity in harvesting reduced resulting into parity of the behavior.





Discussion: The harvesting behavior, as observed in this experiment, was non exploitative since the net individual harvest was substantially less than Nash equilibrium harvest of 23 in the non-communication game. Had each participant harvested the maximum allowed in each round, the net harvest of the five players would have been 115 and the game would have been over in just five rounds. Even in communication game, with the additional information that the games would not last more than 10 rounds; the group could have strategized harvesting of 165 trees, with no tree left at the end of 10th round. It is important to note that at no stage did the participants ask about the number of rounds the game would be played, meaning that they did not plan or strategize their harvesting decisions to maximize gains. The participants were concerned about maintaining the forest size and their harvesting behavior was sustainable. However, the harvest was not optimum. As with communication allowed, the participants could have planned to harvest total of 9 trees in each round while maintaining the forest size at 100 in each round. This way each participant could have harvested 18 trees. Harvesting behavior of the community was non exploitative, non commercial and not even economically rational. Communication led to homogenization

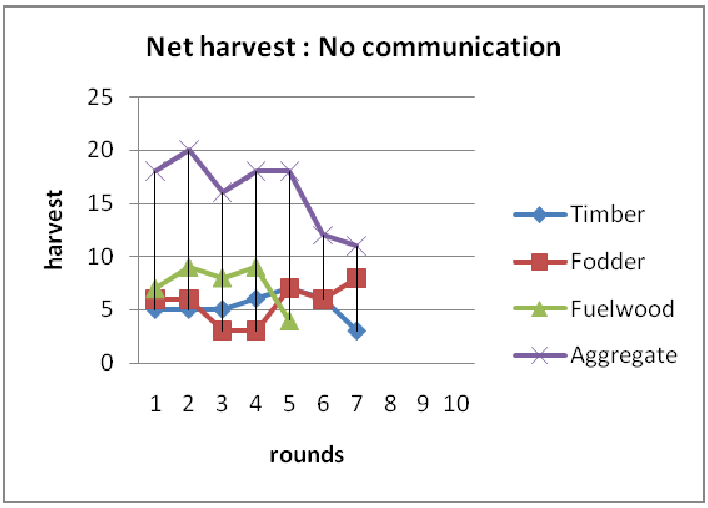
of harvest as depicted by the significant reduction in standard deviations from harvest in non-communication game to communication game.

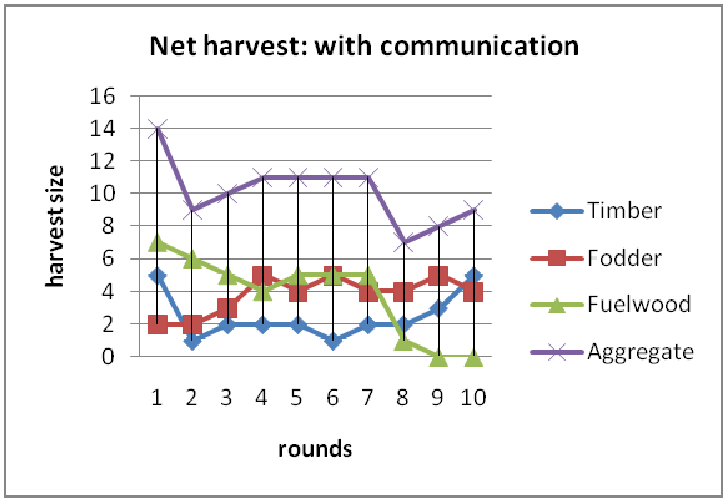
Second Experiment: Participants from Kargata mentioned that their dependence on forest was mainly to meet their subsistence needs – fuel and fodder. Fuel wood was collected mostly from fallen/lopped branches and twigs. Tree was rarely cut down for that purpose, and whole tree was harvested only when it was needed for house construction, that happened only once in a long time. It was felt that that the players were not able to translate their dependence on forest merely in the form of tree harvesting. In order to incorporate their more important dependence on forest in the form of fuel wood and fodder, we created a forest on the board that had 33 trees, 33 bundles of fodder and 34 loads of fuel wood. This was considered the maximum size of the forest. Players could choose any combination of these three, not exceeding 5, in each round as in the first experiment. However, depending on the size of individual forest products the maximum the players could harvest varied. For example, there could be 30 trees, 18 fodder units, and 12 fuel wood units. In this scenario a player could harvest 5 trees but not 5 units of fuel wood or fodder. He could take maximum 3 units of fodder and maximum 2 units of fuel wood in his combination of 5 units of trees, fuel wood and fodder. All other rules remained the same. Regeneration for each product was 10%, and price of each product was Rs.10. Although it is difficult to equate the prices of one tree with one bundle of fuel wood or one bundle of fodder, we found that the value of one tree was comparable with fuel wood and fodder requirement of a household in a year. Even the regeneration of the three products is different; the logic of keeping it same at 10% was that although grass grows at faster rate, its life span is one year. Similarly, not more than 10% of trees would dry-up or branches of trees would fall off, which the villagers collect as fuel wood. Harvesting of any product continues unless there are less than five units. We decided to first have maximum of 10 rounds of non-communication game followed by maximum of 10 rounds of communication game.

Results: It was observed that with various components of forests made explicit, net harvest increased. The average individual harvests were 22.6 units and 20.2 units respectively in case of non-communication and with communication situations. In the non-communication game Timber units in the forest reduced to 4 (from 33) at the end of 7^{th} round; fodder bundles reduced to 4 at the end of 7^{th} round; and fuel wood bundles reduced to 2 at the end of 5^{th} round itself. The game did not go beyond the 7^{th} round. However, the communication game lasted full 10 rounds, and at the end of the game (tenth round) there remained 28 trees, 12 units of fodder, and 5 units of fuel wood. In this game also fuel wood units depleted fast but once the number reduced to five, there was no harvest of fuel wood. During the discussions one of the participants mentioned, “now that the fuel wood is not available in the forest, we will have to look for alternatives like cow-dung cakes”.

Round-wise average harvests for fuel wood, fodder, and timber were 7.4, 5.57, and 5.28 units in the absence of communication, while with communication these reduced to 3.8, 3.8, 2.5 units respectively. However, the average individual harvests for fuel wood,

fodder, and timber units in the absence of communication were 7.4, 7.8, 7.4, while with communication these were 7.6, 7.6, and 5.0 respectively.



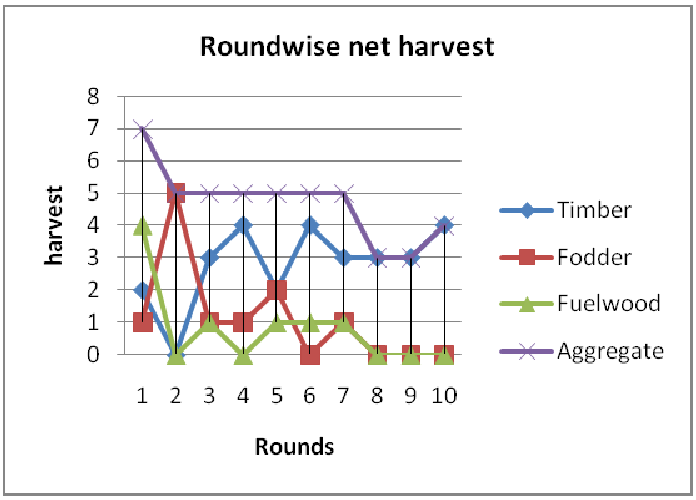


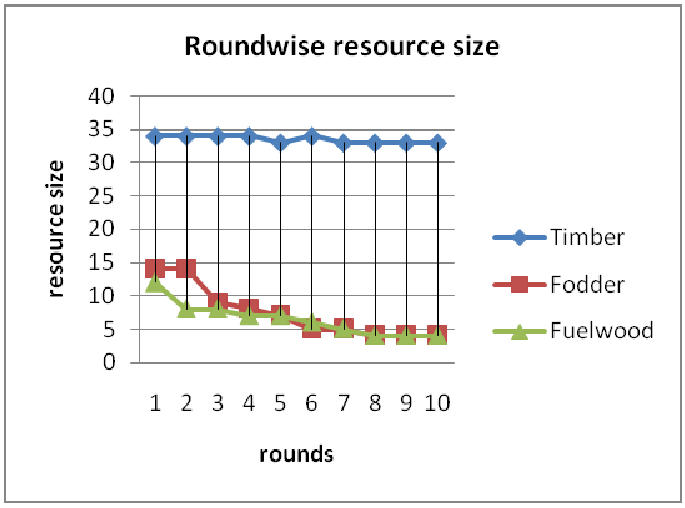
Discussion: Fuel wood being an everyday requirement, it is the primary forest product for forest dependent communities. In the absence of any communication/group strategy there is a rush for fuel wood harvest resulting in its fast depletion adding pressure on timber stocks. In the presence of group strategy (with communication), there is concerned effort for sustained harvest resulting in stocks lasting longer. There is hardly any difference in the average individual harvest of fuel wood and fodder with or without communication. These are two forest products that are harvested by the villagers frequently and regularly. Communication thus helps in sustainable use of these depleted resources. If the requirements of fuel wood and fodder are fulfilled, the villagers would not harvest timber. When communication is allowed villagers seem to adopt a strategy wherein without substantially compromising fuel wood needs no untoward pressure is put on the timber stock.

Third Experiment: In normal course, Joint Forest Management committees have to deal with forest resources at various levels of degradation. Plantation is one of the first activities to be offered for restoration of the forests under the JFM program. The committee is supposed to have a say in deciding the kind of plantation. We tried to replicate this situation in our third experiment. This was a communication game, wherein the initial forest was now a degraded one. It consisted of 4 trees, 4 fodder units, and 2 fuel wood units, as left from the previous experiment of non-communication game. The participants were reminded that the forest was reduced to this condition when they harvested it in absence of any communication. And as is a common practice under JFM in India, the committee (all the 5 players in our experiment) was offered plantation of 50 units, giving it the choice of any combination of timber, fodder, and fuel units. The players decided to choose 30 trees, 10 fuel wood and 10 fodder units after some deliberation. We observed that arriving at this decision they had difficulties in deciding how to use units of fuel wood plantation because what they usually collect is fallen branches as fuel. While deciding upon these figures the committee's main concern was 'trees' in general as it is trees which not only support their timber requirements but also fuel wood requirements in the long run. This was reflected in the higher number of trees chosen in comparison to fodder and fuel wood units.
Thus, with the plantation given, the first round started with a forest that had 34 trees, 14 fodder, and 12 fuel wood units altogether making a total of 60 units. Therefore, at the beginning of the game participants could harvest at the most 5 units (a combination of at the most 5 trees, or at the most 3 fodder units, or at the most 2 fuel wood units due to the respective resource size).

Results: In the very first round the preference for fuel wood was obvious, and for the second round only 8 fuel wood units were available, with unchanged number of fodder and tree units. In the second round each person harvested only one unit of fodder, no tree or fuel wood. After the sixth round when there were 33 trees, 5 fodder and 5 fuel wood units, the committee was curious to know how many more rounds were left. This was because at this stage they had to make an important decision of harvesting mostly the trees for themselves. But we did not reveal the number of rounds remaining. There after they persisted with their conservative strategy till we stopped the game at the end of 10^{th} round. The group decided to harvest only 3 trees in each round from the seventh round onwards (so that there was no net fall in the tree cover as these many trees would be regenerated in the beginning of next round), also determining who was to harvest how much in each round. They together harvested 3 trees in 7^{th}, 8^{th}, and the 9^{th} round as per the decision, but 4 trees were harvested in the 10^{th} round. There was some discussion on finding the one who had breached the rule. However, it did not take long for Participant 5 to accept that he had harvested one tree more by mistake. After the seventh round, fodder and fuel wood units were no longer available for harvest. However, the committee continued to maintain the number of trees at the best possible level. The logic behind was summarized by one of the participants as, "*only if there are trees we will get fallen branches as fire wood, grass will grow, and forest will be like forest".*

Round-wise average harvest of timber, fodder, and fuel wood were 2.8,1.1, and 0.8 respectively (with aggregate of 4.7), while the average net individual harvest of timber, fodder, and fuel wood were 5.6, 2.2, and 1.6 respectively (with aggregate of 9.4). As far as individual harvest pattern was concerned there was almost parity in the harvest of fuel wood (1, 1, 2, 2, 2 units). Individual timber harvest was 7, 8, 4, 4, 5 units, while fodder harvest was 1, 1, 4, 4, 1. The harvest of individual harvester was decided by the group as a whole according to his needs based on his background. Thus while players 1 and 2 wanted trees for their timber use (for house, furniture, and also possibly for fuel), players 3, and 4 showed preference for fodder due to the comparatively large livestock they had.





Discussion: Top priority is given for maintaining tree cover since it leads to better availability of fuel wood in the long run. Since fuel wood is a regular requirement, timber is harvested only if fallen branches are not available. Communication leads to sustainable harvesting of all forest products, and a community as a whole can plan the harvest of its scanty resources purposefully and possibly without endangering it in long turn.

Fourth Experiment: In this experiment, conservation benefits were introduced. These were of two types. One was at the end of each round wherein low level of harvest in that particular round was awarded with number of additional trees in the forest for the next round. The other was in the form of cash incentive to the community depending on the number of trees that remained in the forest at the end of the game. In order to bring into picture the impact of commercialization and market demand for forest resources, the payoff for each harvested tree was doubled. In order to keep the game as simple as possible, only trees were considered in the forest.

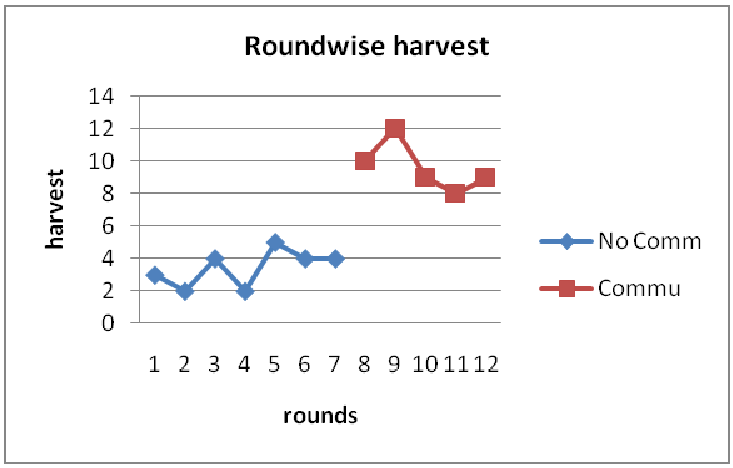
The game started with 50 trees in the forest (a degraded forest). It could grow to the maximum size of 100 trees. At the end of each round there was the usual 10% re-growth. If the net harvest of a round was at the most 5 trees then 10 trees would further be added to the forest stock to be considered for the next round. If the net harvest of a round was between 6 to 10 trees then 5 trees would further be added to the forest stock to be considered for the next round. For the net harvest of more than 10 trees in a round there was no conservation incentive. At the end of the game (after ten rounds) if the number of trees in the forest was more than 50 (the starting resource size) then the group as a whole would be paid Rs 10 per additional tree. It was the group's right to decide the distribution of this cash incentive. The game was to be played as an open access situation wherein each individual was free to take his decision of harvest in private and no communication was allowed. Harvesting of trees was made more lucrative by raising the cash payoff for each tree harvested to Rs 20.

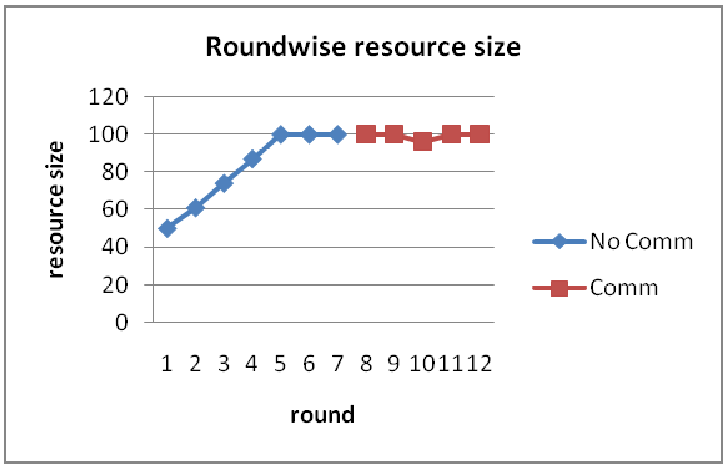
Results: It was interesting to see that the participants were more concerned about increasing the number of trees. By the fifth round the forest had already reached its capacity i.e.100 trees. Three more rounds were continued in the similar manner. The forest size did not come down below 100 trees. From the eighth round onwards participants were allowed to discuss with each other and take decisions. The intention was to see whether the community was willing to formulate any rules despite the forest being well stocked and whether they had the capacity to decide on rules, and if there were any infractions because of higher pay offs. The harvesting pattern shows that the participants formed rules regarding 'who is to harvest' and 'how much', and these were followed strictly each time. Their discussions have been recorded but it is interesting to know that there were very few exchanges, and only the two senior most participants did most of the talking at the beginning of the eighth round. After that, at the beginning of each round there were only a couple of sentences exchanged. Five rounds with communication were played.

It is surprising to note that even in the open access situation the participants did not maximize their pay offs by harvesting more trees. They could have done this while simultaneously improving or maintaining the forest size. When asked about this anomaly, Participant 5 said, "I did not harvest much thinking that if others harvested more then the forest will get degraded". This is an example of 'prisoner's dilemma in 'reverse direction'. In the later rounds when the participants could communicate with each other and decide on the harvest level of each individual, the pay offs increased but

the harvest was still below the optimum. Even when the last round was announced before hand, the behavior was identical to the previous rounds i.e. low level harvesting. The harvesting rules made by the committee were followed with no infractions.

For the first seven rounds the average round-wise harvest was 3.428, and for the later five rounds it was 9.6. The average individual harvest for the first seven round was 4.8 (the actual figure being 4, 4, 5, 5, 6) and for the later five rounds it was 9.6 (the actual figure being 9, 9, 10, 11, 9). Thus, in the absence of communication, the participants being wary of others' harvesting size harvested less. When communication was introduced they could plan and thus improve their harvest without affecting the forest size.





Discussion: Restoration and conservation of forest through sustainable use is the foremost concern of communities. Behavior of forest dependent communities is non exploitative, non commercial, as well as economically non rational.

Conclusions and policy implications

We do not want to conclude, from this one case study, that attitude of all forest dwelling communities towards forests in general continues to be non-commercial and non-exploitative in today's world where marketability of forest products is high. It is possible that Kargata community is unique in its approach towards forests, and represents groups that have strong social bonding within the community (Mitra and Gupta 2009), which received impetus from an NGO as well forest officials through their conviction in the JFM program. But, if these results are seen along with our earlier study (Ghate and Ghate forthcoming), using the same methodology (though only the first game) in six villages spread over Maharashtra state, we can conclude with some confidence that attitude of the forest dwelling communities is likely to be non-exploitative and non-commercial.

This case study also substantiates our observation made through earlier studies that the three forest products constituting subsistence dependence are fuel wood, fodder and small timber for housing. However, the nature of dependence is different. While the forest dependent communities require timber for housing and making of agricultural implements once in a while, they need fuel wood on everyday basis leading to its frequent harvest. Even fodder is an everyday requirement for those who own cattle. The communities are well aware of the fact that maintaining tree cover would ensure long term availability of their subsistence requirements, though over emphasis on maintaining tree cover is likely to lead to sub-optimal harvest, at times leading to negation of prisoner's dilemma or Hardin's conjecture. Management of forests by bringing the community together for taking collective decisions leads to both sustainability and need-based forest use. The behavior described above is what Cosmides and Tooby (1994, quoted in Ostrom, 1998) would call *"better than rational"* because in addition to ensuring the sustainability of the natural resource, it leads towards equality (of resource use) through communication.

The major strength of programs like JFM is that it brings the resource users to a common platform where they can discuss forest related issues, make decisions on resource use, form rules, impose sanctions, and the like. JFM provides a forum for exchange of ideas and face-to-face communication, which is likely to be sustainable and equitable use of forest. Communication can also lead to search for options and alternatives to forest products resulting in lower dependence. However, while planning the program, it is important to keep in mind that if the size of a resource is too small or highly degraded, then even subsistence level harvesting can make it vulnerable, irrespective of institutional intervention. Secondly, while planning plantations under JFM, consideration should be given to immediate or frequent, short term and long term needs of the villagers from forests. Since fuel wood and fodder are the two primary requirements of rural communities, species for plantation need to be selected accordingly.

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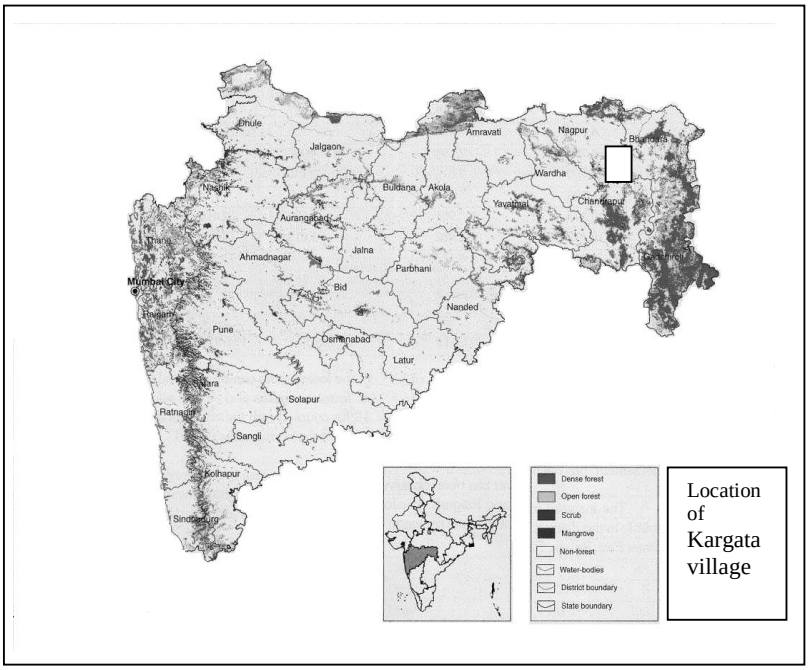
Map -1: Location of Kargata village in Maharashtra state



Participants' details

Participant no.	Age	Education	Background /Occupation	Land-holding
1	20	11th	laborer	0.8 ha
2	55	4th	laborer, Ex-*Sarpanch*,	1 ha
3	30	3rd	Laborer	1.6 ha
4	35	4th	Fisherman	0.8 ha
5	42	6th	Laborer, President of JFMC	nil