Institutional dysfunctionality:
A case study in participatory management of forest in Buxa Tiger Reserve in North Bengal, India*

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Abstract

In the context of a multi-tier participatory institution for forest management prevailing in Buxa Tiger Reserve and its fringe area in North Bengal. India, various forms of institutional dysfuntionality have been discussed in the paper in a descriptive manner. Dysfunctionality develops and its form changes over time. As it develops in a participatory institution it blocks the participatory mechanism, the devolution of decision-making power and smooth flow of information between the participatory agents. This in turn creates a stalemate on conservation programme. In analytical section of the paper this problem has been handled in terms of distributed game. There are different sets of players with different games at three different locations i.e three different tiers of forest management institutions: (1) Forest Department, (2) FPC/ EDC. i.e., forest management committee, and, SHG, i.e., Self Help Group. The player's strategy is jointly determined by set of his location specific action along with set of message transmission. If institutional dysfunctionality prevails, this blocks message transmission, generating binding restrictions on action of the players that affects cooperative equilibrium. All these matters have some notable policy implication in practical world.

Key words: Institutional dysfunctionality, Participatory management, Forest Protection committee, Eco-development committee, Self-help group, Micro financing, Group level action, Principal-agent framework, Message transmission, Parallel prisoner's dilemma game, Distributed game, Cooperative equilibrium,

Introduction

Degradation of natural resources (mostly common pool in character) in Third World countries has inflicted a number of serious problems on environmental sustainability and sustainability of livelihood of poor folk in the country. For resolving the problem various institutional approaches including property rights giving to the community with varying forms of community-participatory management along with variant structured rules of social interaction have been taken into consideration in policy framework. Evolving an appropriate institution for common property management is a difficult task. The difficulties have been addressed in the literature in the context of effect of heterogeneity (economic, political cultural etc) and group size on accomplishing collective action

(Baland and Platteau, 1996; Ostrom, E, 1990). Modern bargaining theorists show that it is due to unequal bargaining power, where potential winners of efficiency enhancing institutional change are wealth constrained - appropriate institutions fail to emerge (Busch and Muthoo, 2003). Then two pertinent questions come out: (1) what do we mean by 'efficiency enhancement' and (2) can participatory institutions always enhance efficiency in management of common pool resources? The strand of modern institutional economists is not to ascribe optimality property to the institutions; rather, it is to believe in constrained efficiency (Stiglitz, 1989) of the existing institution, at the outset of incomplete information, missing or thin market etc. Following this strand, in the present context where institutional efficiency is tagged with the objective of resource conservation, by efficiency- enhancing institutional change, we mean both: i) movement towards productivity enhancing institutional change, and, ii) movement towards equity enhancing institutional change, by reducing those constraints from incomplete information etc, which will ensure conservation. By dysfunctionality therefore we mean some kind of pervasive movement taking away from productivity enhancing (Bardhan, 2003) and equity enhancing institutional changes, creating stalemate on conservation programme.

Regarding second question i.e., about the role of participatory institution, argument may go in both ways. People's participation may promote democratization and decentralization. In this way, efficiency of resource management institution may improve by increasing the flow of information among the agents of community. It may also increase the cost of management by making relatively less informed agents involved in decision-making.

In empirical context several times it has been observed that, after a participatory management institution for CPR management in a specific form gets evolved, in due course of time, its form, its institutional character and its objective become changed. Institutional evolution and changing institutional form in due course of time is a path dependent process. According to Elster (1989) when an institution starts developing it originally comes about unintended and in due course of time as agents become aware of it's functioning and its incentive structure, they try to preserve it. North (1990) established that through the process of interaction between 'mental models' those

members of the society posses, along with incentive structure, shape of the institutions gradually changes. Dysfunctionality in institution persist in the long run and why does it persist - has been the primary concern of most of the institutional economists (Busch and Muthoo, 2003, Bardhan, 2005). Least of them however have been concerned with changing form of dysfunctionality of the institution over time. Institutional dysfunctionality, even if it exists, in the very beginning, its form changes continuously so that, the persistence of the original form does not take place.

The present paper intends to highlight the dysfuntionality issue both from empirical and theoretic perspective. Whole analysis is backed by a recent field study on participatory forest management of 8 selected villages by 11 selected SHGs under 5 Forest Protection Committees (FPCs) and 3 Eco Development Committees (EDCs) in Buxa Tiger Reserve (BTR) forest area conducted by the author and her research team as a part of an on-going research project sponsored by SANDEE in North Bengal, India[1]. Schematically paper is organized into two parts: Part - I principally sketches out the empirical context of dysfunctional character of participatory forest management institution in the study area. Part –II is concerned with the implication of these dysfunctionalities in a theoretical construct. Section 2 of Part –I gives a general description of the study site, institutional arrangement of participatory management with a sub-section providing with some examples of various forms of dysfunctionality with its implication on forest conservation programme. Part –II in Section 3 proposes an analytical framework in terms of distributed game, and moral hazard to elucidate the implication of these dysfunctionalities on conservation of forest resources. Finally, Section 4 concludes.

Part I

2 Participatory management institutions: A case study in joint forest management in BTR in North Bengal India

2.1 General description of study site

In West Bengal, India, in its north eastern part in district of Jalpaiguri, Buxa Tiger Reserve (BTR) constitutes wild life sanctuary of 252 Sq. Km, national park of 117 Sq. Km and 392 sq. Km of reserved forest under 13 forest (6 in East and 7 in West) ranges in two forest divisions East and West. The protected area surrounding this reserved forest is located in the confluence of three major Bio-geographic zones viz., (i) lower Gangetic

plains, (ii) central Himalayas and (iii) Brahmaputra Valley. Geographically its location is very significant as it is a corridor to link Assam and Bhutan with altitudinal variation from 125 m to 1750m providing with safe seasonal movement for animals and birds. Conservation of BTR started in 1983 as it came under Tiger Project. Regarding forest management there exist a multi -tier management institutions: At the level of government at the top, there is Field Director (FD) under Principal Chief Conservator of Forest and Wild Life Warden of West Bengal. Next to FD there are two Deputy Field Directors (DFD) in East and West Divisions, who are taking charge of Forest Ranges. Respective Forest Range officers are controlling Beat Offices. Villages in protected area of the forest are under the purview of Beat offices. At the level of people's participation there exists either (1) Forest Protection Committee (FPC) or (2) Eco- Development Committee (EDC), each of them carrying out participatory management in the village or some times in 2 or 3 villages altogether either directly or indirectly through Self Help Groups (SHG). SHGs are self consolidated groups of community members developed under self employment generation programme of Government of India for which micro finance institutions for developing micro entrepreneurship among the low income group of people. There are 62 FPCs and EDCs altogether in BTR East and West Division. A general description of our studied FPCs / EDCs and name of selected SHGs in terms of forest profile and general profile of management committee is shown in Table 1.

Selected FPC (F)/ EDC (E)	Selected SHG	Forest Division (E/W)	Number of member households of FPC/EDC	Number of non-member households of FPC/EDC	Area under natural forest (ha)*	Area under plantation forest (ha)*	Area under degraded forest (density ≤ 0.2 ha) *	Village type: FV/ RV	Number of members of exec. Body
Turturikhand Shanti (E)	Saraswati Shibani	BTR- E	203	37	1161.6	168.66	0	RV	11
Pana (E)	Ekta Himalaya	BTR- W	96	0	582.2	511.2	0	FV	12
Dalbadal (F)	Saipatri	BTR-W	19	26	62.87	604.39	0	FV	7
Nimati (F)	Taliline Lakshmi	BTR-W	120	11	42.02	380.05	0	FV	
Checo – Kalkoot (F)	Anand	BTR-W	119	15	115.72	549.41	0	FV	8
Teamari (E)	Nil;giri	BTR - E	34	26	116.56	142.1	40	FV	9
Balapara (F)	Rangjali	BTR - E	38	11			0	FV	8
Volka-Salbari-Lepraguri (F)	Saradamoni	BTR - E	111	330	209.51	453.97	0	RV	

Table1: General profile of studied FPCs / EDCs and SHGs

The executive body of FPC and EDC other than Beat officer and also in case of FPC the *Panchayat* (village Council) nominee as ex-officio members, is constituted by members elected for 4 years by general members in annual general meeting. Both FPCs and EDCs are entrusted with carrying out broadly the government's conservation programme. In some minor cases they can change the Forest Department's conservation plan, subject to the approval of government itself. EDC and FPC cannot co-exist in the same village. EDCs are existing inside the 'core zone' i.e., in national parks and wild life sanctuary and in reserved area with rich biodiversity, where as FPCs mostly exist in degraded land in the fringe of protected area. EDCs came into operation by the Government's order (3841-For/ FR/6/11M-7/95) in June 1996 principally to launch Central Government's eco-development programme sponsored by World Bank. FPCs on the other hand have been originated from State Government's Joint Forest Management Programme in 80's (Wild Life Wing: Directorate of Forests, WB, 2002). Some of the conservation programme in our studied area directly executed by Forest department of the government, but most of them are carried by FPC / EDC or by Self Help Groups (SHG) induced by FPCs / EDCs (Fig-1).
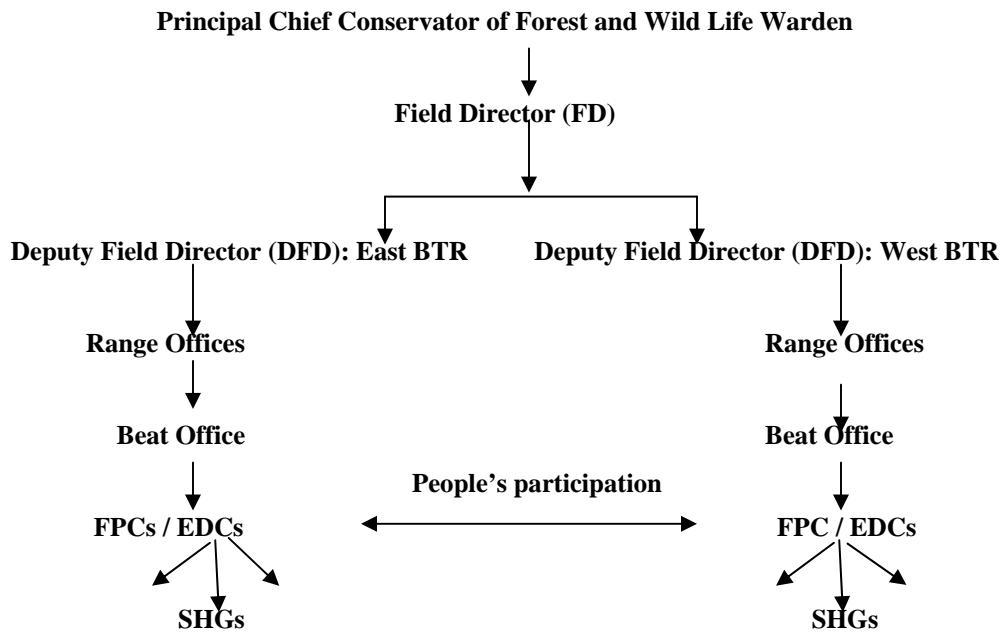
Principal Chief Conservator of Forest and Wild Life Warden

↓

Field Director (FD)

Deputy Field Director (DFD): East BTR   **Deputy Field Director (DFD): West BTR**

Range Offices   **Range Offices**

Beat Office   **People's participation**   **Beat Office**

FPCs / EDCs   ←→   **FPC / EDCs**

SHGs   **SHGs**

Fig.1: Multi-tier forest management institution

2.2 Some forest management related activities and institutional dysfunctionality

In management programmes of FPC/ EDC in our study area, there are some activities which are directly related to forest conservation like: (1) forest patrolling to restrain illicit felling, poaching, wild life depredation (mostly by elephants in this area), (2) restriction on fuel wood collection, (3) intercropping, (i.e., cultivation in plantation area in the forest so that new plants along with the cultivated crops are protected from open grazing and fertility of degraded land is increased by fertilizer applied for cultivated crops), and (4) cleaning. There are some activities also which are indirectly related to forest conservation, like: (1) cultivation, (2) animal husbandry, (3) developing a picnic spot, and (4) development of small-scale handicrafts with non-timber forest products, and so on. These activities improve the economic condition of user community and there by reduce dependence on forest.

In this area it is neither true that all activities mentioned above, take place in all FPCs and EDCs and in all its constituent villages. Nor it is true that mode of performance of those activities are uniform in all FPCs and EDCs. In some cases some activities are performed at the group level, while in some cases they are done at the individual level. In cases activities are performed at the group level, it is a matter of public goods action where benefits from local public goods, mostly forest resources are non-sub tractable. Examples are forest patrolling, intercropping, and development of a picnic spot by the group and so on. In case of group based intercropping, and picnic spot development, taking a parcel of forest land a self organized group jointly contribute labour, capital and other inputs and after every production cycle being over, all members share the resultant profit equally. In case of individual level action producing private goods with the help of forest resources (e.g., in inter-cropping, individually, taking the use right to a piece of forest land) as local public goods, private benefit from public goods provision takes place. If from forest resources profit from group action can be shared equally, there is greater possibility to restrain large number of people from over extraction of forest resources. In case of individual level of action producing private benefit from public goods, logically greater possibility of depriving some group member from benefit by powerful and influential members will occur. From this common understanding in the second case therefore the objective of forest conservation is likely to fail because large

number of those deprived people who are eking out their livelihood from forest, will still remain dependent on this.

Financing i.e., providing loan and consolidating capital to support those forest management related activities is the other part of the story. In this context Govt. of India's Swarnajayanti Gram Swarojgar Yojana (SGSY) – Rural Self-employment Generating Scheme (started in April, 1999) is playing a significant role. Under this scheme District Rural Development Cell (DRDC) is providing cash credit (a part of this being subsidy) to the self-organized solidarity group (all from households listed as below poverty line: BPL), namely, Self Help Group (SHG), to finance 50% of a project cost. In this case, principal emphasis is given to group activity. Since 1998, Forest Department in our studied area in collaboration with FPCs and EDCs and some reputed NGOs has been taking initiative to form SHGs. FPC/ EDC are assigning their various forest management related actions to those SHGs (mostly constituted by women members with group size varying from 10 to 14). Principally those actions of SHGs are being financed by (i) group's self-generated and self-rotated fund, (ii) DRDC fund- coming directly to SHG from BANK or indirectly through FPC/ EDC.

In our particular context the participatory forest management and micro finance programme through SHG are entwined with each other. Micro finance is for providing finance to the low income borrowers, who have no access to loans from established formal institutions, there by helping to generate non-forest based income and thus restraining them from illicit felling, poaching, firewood selling and many other activities that go against conservation. Their objective is not only to transform the user-community from forest-dependency to self-reliance by mobilizing fund through micro credit system via SHG, but also in the process of that transformation make them directly involved with forest conservation programme, so that participatory management of forest resources becomes successful.

Institutional dysfunctionality in this whole process, as it would be highlighted in the following sections is factually interlocked into micro finance institutions and management institutions for forest conservation. The resulting consequences that create asymmetry of information among participant members of these programmes finally lead

to moral hazard and adverse selection, which has a serous implication on conservation programme.

2.2.1 Major indicators of institutional dysfunctionality

Our research team in 8 FPC / EDC villages selecting 11 SHGs have detected some major forms of institutional dysfunctionality which are as follows:

(1) Irregular and poor attendance of general body meeting of FPC and EDC and failure to maintain minutes book and record resolution taken in the meeting by FPC / EDC

(2) Greater proportion of loan to finance individual activity

(3) Concentration of loan into hands of Secretary, President and Treasurer in SHG

(4) Withdrawal of group fund without taking majority consent of the group and significant percentage of transaction of group fund not through bank.

(1) Irregular and poor attendance of general body meeting of FPC and EDC

Regarding the meeting, keeping records of the proceedings of the meeting of forest protection committee attendance etc there is a government order (vide resolution no. 5062-For/D/IS-16/88) dated27th July, 1990), which is as follows:

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- The Forest Protection Committee shall hold a general body meeting once every year where activities of the Committee as well as details of distribution of usufructuary benefits are to be discussed, besides electing representatives of the beneficiaries to the Executive Committee.
- The forest Protection Committee shall maintain a minutes book where in proceedings of the meetings of the Executive Committee held from time to time as well as the proceedings of the Annual General Meeting of the Forest Protection Committee will be recorded under the signature of the President of the Committee and such minutes duly attested shall be sent to the concerned Range Officer for record.

The above statement has been repeated in the government order issued in the year 1996 vide resolution no. 3841-For/FR/6/11M-7/95 dated 26th June for the constitution of Ecodevelopment Committees. In our study area among those 8 FPCs and EDCs, however, for one FPC and one EDC the minutes book i.e., record of the proceeding of the meetings for the last 5 years is completely missing. Among those remaining ones, for two FPCs the record for the last two years and not before that and for one FPC, record for the last 3 years are only found (Table 2)

FPC (F)/ EDC (E)	NUMBER OF GENERAL MEETING DURING 2000 – 2005				
	2000	**2001**	**2002**	**2003**	**2004**
Turturikhand Shanti (E)	MINUTES BOOK NOT FOUND				
Pana (E)	7	6	2	4	1
Dalbadal (F)	MINUTES BOOK NOT FOUND			3	1
Nimati (F)	MINUTES BOOK NOT FOUND				
Checo –Kalkoot (F)	MINUTES BOOK NOT FOUND			4	5
Teamari (E)	1	0	1	3	4
Balapara (F)	9	0	1	3	1
Volka-Salbar-Lepraguri (F)	MINUTES BOOK NOT FOUND		13	4	5

Table 2: Number of meetings of general body of eight selected FPCs/ EDCs held during last 5 years

Number of meeting however does not show the real picture. Wherever records are available, from Table 3 we see that for all cases (other than that of Teamari EDC and Balapara FPC during 2001, there was not a single meeting took place) at least one meeting every year took place. If we consider this with respect to attendance there is a sharp mismatch for some cases. For example for Volka – Salbari- Lepraguri FPC, 22 meetings of general body altogether had taken place but even not in a single meeting at least 50% of the members were present. For Pana EDC during last 5 years, out of 20 meetings, in 2 meetings only 50% or more than that of the members had attended. For Teamri EDC attendance record is comparatively satisfactory. In 2001 although no meeting took place in other years out of 9 meetings, in 3 meetings only, attendances have been less than 50%. In case of Balapara FPC only in all meeting attendances have crossed 80% In this FPC once attendance had been recorded as more than 100%. It was because of attendance of some members from an NGO in general body meeting. (Fig .2)

(2) Greater proportion of loan to finance individual activity

It has been already mentioned above that, the major components of participatory forest management in our study area are Self Help Group (SHG) and micro financing of group activity (to generate alternative source of income) to restrain over extraction of forest
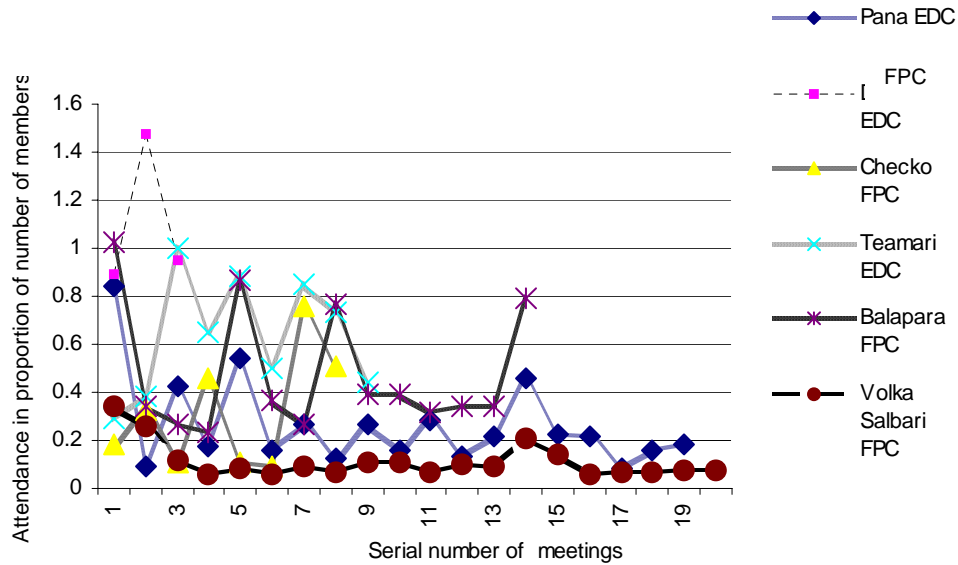
Fig 2: Proportion of members attended in meeting of general body of 6 FPCs and EDCs during last 5 years

resources.   In *Swarnajayanit Gram Swarojgar Yojona,* (SGSY) i.e Rural Self-employment Generating Scheme the objective has been clearly stated to put emphasis on group based activity rather than individual based activity (vide Annual Action Plan Report of DRDC, Cooch Behar of 2001-02). The result of our study however shows a completely different picture. Among those 11 studied SHGs, only for 5 SHGs a certain potion of loan has been utilized to finance group activity for the last 2 years and for those
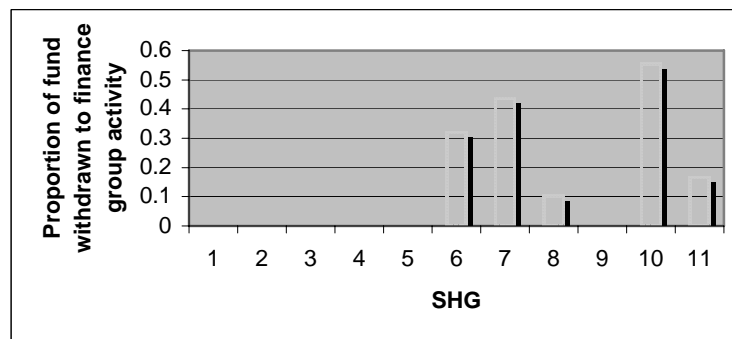

Fig 3: Proportion of fund withdrawn to finance group activity in 11 studied SHGs in the last two years

remaining 6 SHGs even not a single activity has been financed by loan. For 2 SHGs among those 5 one the proportion of fund for group activity did not even cross 20% (Fig

3) A tabular description of various types of activities at individual and at group level is made in Table 3. In those shaded SHGs for the last 2 years no group activity by the loan has been financed. Among the group based activities in 5 SHGs predominant ones are commercial crop cultivation, intercropping, animal husbandry and trading of agricultural produce. Among these only intercropping is directly related to forest management. Others are indirectly related. In the Annual Action Plan (ibid, 2001-02) of SGSY emphasis has been given to group based activity on the ground that micro finance would be untenable for SHGs to be formed by all living below poverty line (BPL). Although in many of the.

NAME OF SHG (*under FPC/ EDC)	GROUP ACTIVITY							INDIVIDUAL ACTIVITY							
	Commercial crop cultivation	Other crop cultivation	Inter cropping	Forest patrolling**	Animal husbandry	Trading of Agricultural produce	Eco-tourism	Commercial crop cultivation	Other crop cultivation	Intercropping	Animal husbandry	Grocery	Medical treatment	Child education	Others
SARASWATI (1)				+											+
SHIBANI (1)													+		
EKTA (2)									+				+		+
HIMALAYA (2)												+			
SAIPATRI (3)	+		+			+					+		+		
TALILINE (4)	+		+		+	+									+
LAKSHMI (4)	+		+	+	+	+		+	+						+
ANAND (5)				+			+								
NILGIRI (6)											+				
RANGJALI (7)											+				+
SARADAMONI ((8)						+			+				+	+	

- UNDER (1) TURTURIKHAND-SHANTI EDC, (2) PANA EDC, (3), DALBADAL FPC (4) NIMATI FPC, (5) CHECO-KALKUT FPC, (6) TEAMARI EDC, (7) BALAPARA FPC (8) VOLKA-SALBARI-LEPRAGURI FPC

Table 3: Various types of group and individual based activity of SHGs endorsed by FPC / EDC and financed by group loan directly to SHG or through FPC / EDC during last twoyears

** In case of forest patrolling member households freely contribute labour and for that no financing is done.

cases in our study area that BPL criteria has not been followed and only in one case as we observed that bank has rejected the formation of SHG on the ground that some members are non-BPL listed

Predominance of individual based activities in SHG may have some other serious consequences; viz., (i) concentration of group fund (originated from DRDC grant or from self rotated fund by member subscription and loan repayment) into the hands of group leaders, (ii) withdrawal of fund without group consent and (iii) fund transaction not through bank. All these dysfunctionalities have been detected in our study area .

(3) Concentration of loan into hands of group leaders in SHG

Dominance of individual based activity, which is not the objective of the entwined micro finance and conservation programmes indicates that peer monitoring activity in the whole process is lacking. On the basis of the availability of records using WESSA (2006) software, we have calculated various types of loan concentration index for the last 2 years for 9 SHGs (Table 4). Concentration ratio is very high and it ranges from 0.44 to 0.84. It is also reflected in the respective Lorenz curve of loan disbursement among members within each Self-Help Group, shown in 3 panels in Fig 4.

LOAN CONCENTRATION INDEX	SHIBANI	HIMALAYA	SAIPATRI	TALI LINE	LAKSHMI	ANAND	NILGIRI	RANGJALI	SARODA MONI
Entropy	1.311188	1.617963	1.710771	1.633495	2.236557	1.995029	2.127805	1.972453	2.050568
Maximum Entropy	2.639057	2.302585	2.397895	2.197225	2.772589	2.302585	2.484907	2.639057	2.302585
Normalized Entropy	0.496839	0.702672	0.713447	0.743436	0.806668	0.86643	0.856292	0.747408	0.890550
Exponential Index	0.2695	0.198302	0.180726	0.195246	0.106826	0.13601	0.119098	0.139115	0.128662
Herfindahl	0.385381	0.241797	0.237919	0.256596	0.119885	0.178704	0.153307	0.270372	0.149333
Normalized Herfindahl	0.338102	0.157552	0.161711	0.163671	0.061211	0.087449	0.076335	0.214247	0.054814
Gini Coefficient	0.779412	0.605	0.614499	0.540850	0.527172	0.405556	0.41721	0.429806	0.392896
Concentration Coefficient	0.839367	0.672222	0.675949	0.608456	0.562317	0.450617	0.455138	0.462868	0.436551
Number of SHG members	14	10	11	9	16	10	12	14	10

Table 4 Loan concentration among the members of SHG for last 2 years

Loan is concentrated mostly among the group leaders. Since group leaders have better knowledge of the repayment capacity of the members of the group to reduce the monitoring cost and enforcement cost micro finance institutions, (MFI) like DRDC, has to some extent passed over the responsibility of monitoring and enforcement to the group leaders. In many cases the group activity is being monitored by FPC /EDC. In case loan is concentrated among the group leaders monitoring and enforcement cost for the group
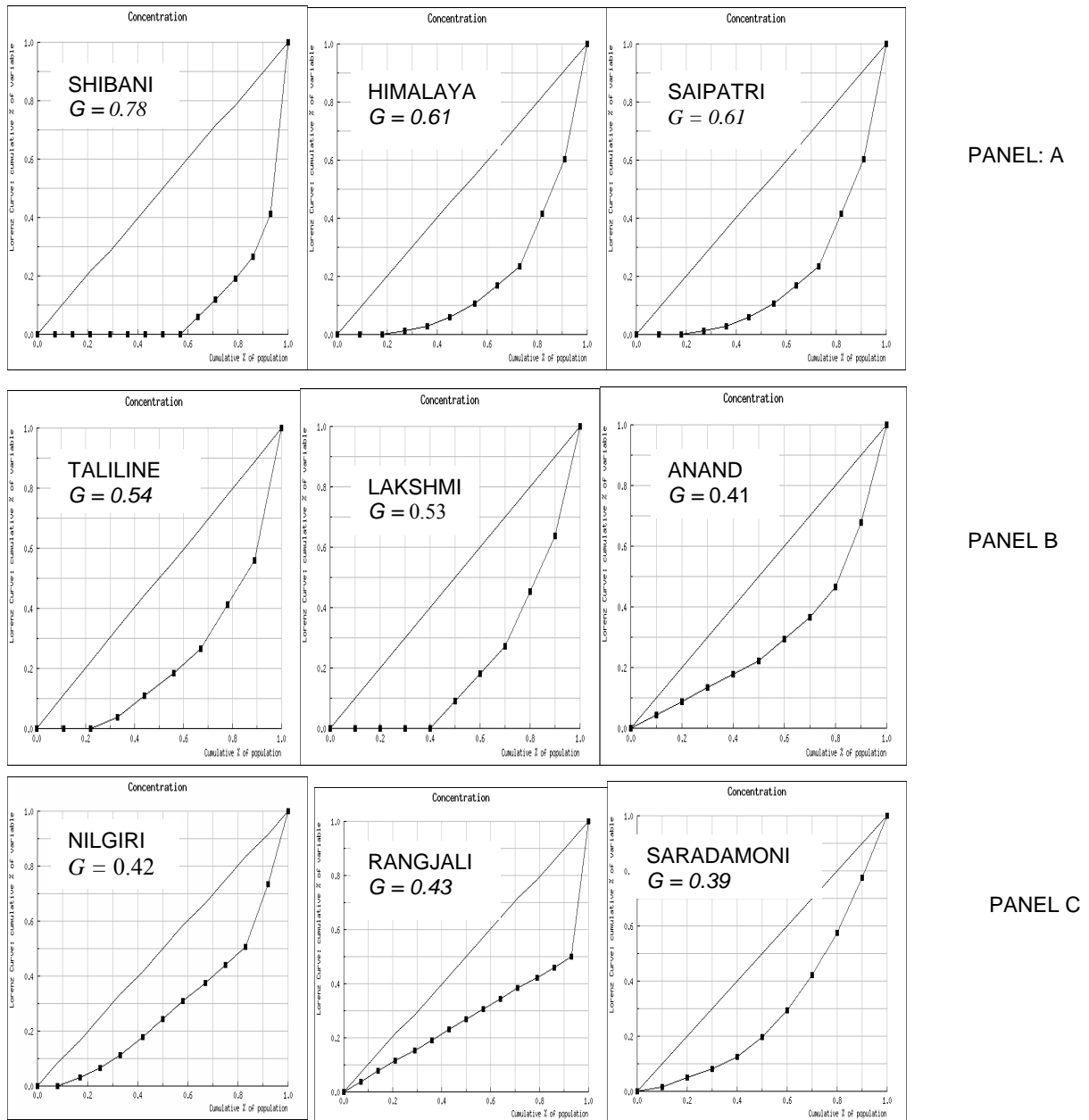

Fig 4: Lorenz curves for loan (or grant) disbursement among members in SHG

itself becomes lower than that could be predicted by the MFI, but objective of generating alternative source of income for the maximum number of people with the help of micro finance, to restrain illicit felling of timber, poaching etc fails. Group formation is based on joint liability principle, i.e., if any group member fails to repay loan group as a whole,
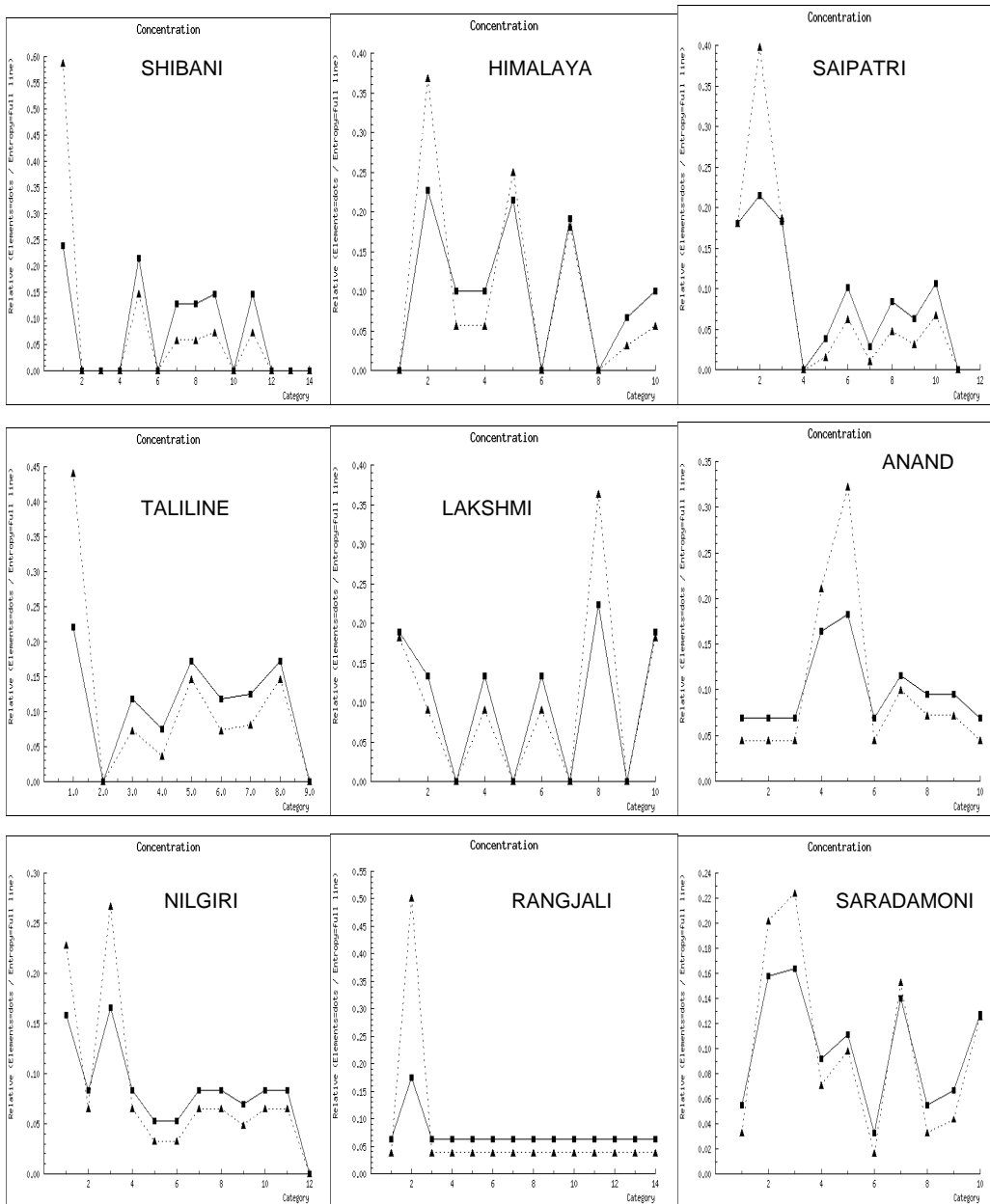

Fig 5: Membership category wise loan concentration (cumulative =dots and entropy = full line)

would be responsible for that repayment. In our particular context if failure in repayment occurs partly it is met by monthly subscription previously made by that particular member (In case a member fails to subscribe for a long time her membership gets cancelled and she got replaced by a new one who would pay all her dues). Under the circumstance, we find for most of the SHGs loan is concentrated into three category of group leaders with 3 important portfolios: Secretary (Category –1), President (Category – 2) and Treasurer (Category - 3). The concentration curves in Figure 5 diagrammatically establishes the fact that among those 9 selected SHGs (because for the remaining 2 SHGs the records were not available) loan is highly concentrated within Secretary, President and Treasurer in 7 SHGs.

(4) Withdrawal of group fund without taking majority consent of the group and significant percentage of transaction of group fund not through bank

Fund withdrawal without discussing the matter and taking resolution in a meeting where more than 50% percent of members being present and informal transaction of fund between the members without going through bank are recurrent phenomena in our study area. These may be the strongest possible reasons or results of loan concentration into the hands of a few group leaders. Subject to the availability of records we find that among

Name of SHG	Fund-proportion withdrawn without resolution taken in group meeting	Fund-proportion transacted not through bank (i.e., through rotating fund)	Fund-proportion for group activity	Proportion of loan from DRDC, FPC etc to that from group rotating fund
SHIBANI	0	0.10	0	0
HIMALAYA	0.36	0.15	0	0
SAIPATRI	0.79	0.29	0	0.19
TALILINE	0.68	0.16	0	0.32
LAKSHMI	0.13	0.13	0	0.43
ANAND	0.40	0.22	0.10	0.58
NILGIRI	Not found	Not found	Not found	0.7
RANGJALI	0	0.46	0.55	0
SARADAMON I	0	0.77	0.17	0

Table 5: Institutional character of group fund In terms of (i) fund withdrawal without group consent, (ii) informal fund transaction (iii) financing individual based activity and (iv) proportion of loan from micro finance institution

8 selected SHGs under different FPCs / EDCs fund has been withdrawn without group consent and the maximum proportion of fund without taking resolution in the group meeting took place in Saipatri SHG under Balapara FPC. (Table 5) In all SHGs (other than that in Nilgiri where no record was found) transaction of group fund (like disbursement of loan, distribution of profit from group activity etc) took place informally without making deposit in and withdrawal from bank account. This is a very common phenomenon in all most all SHGs in all FPCs / EDCs. Since banks are located very far from the villages, the transaction costs through banks are very high, so that many transactions occur informally through group leaders. In the absence of any monitoring authority, this causes misappropriation of fund and mistrust among group members. It is because of mistrust among group members created from informal transaction in our study area, many SHGs have found to be dissolved after a few years operation. It is also important to mention that only a meager percentage of SHG fund (either generated from micro finance or by themselves) has been utilized for group-based activity. Among those 8 SHgs shown in Table 5 only in 3 SHGs group activities have been financed by group fund. In order to get access to loan from micro finance institutions (MFI) certain conditions to establish their viability are to be satisfied by the SHG. In our context many SHGs fail to do that. Among those 9 SHGs 3 SHGs have not received any MFI grant so far.

2.2.2 Overall implication of institutional dysfunctionality on forest conservation programme

In the whole process of financing forest management activities where a few group leaders dominate, proper screening and monitoring doesn't occur and also, characteristically subtractable private benefit from public goods dominate in all the projects on forest management - a research question comes out: what may be its implication on conservation programme? On the one hand, there are forest conservation programmes, which Government wants to execute through its Forest Department. Some collaborating donor institutions through Micro Finance Institutions (MFI) in coordination with Forest Department want to finance it and thus are devising mechanism for the choice of the project. At the community level Self Help Groups, directly or through Forest Protection Committee and Eco Development Committee submit the project proposal, and, this is

done by group leaders. Now there may arise moral Hazard problem. In the principal-agent framework Government's Forest Department /donor institution/ MFI works as the principal and group leaders of SHG are agents to them. Principal i.e., MFI etc cannot observe group leaders' behaviour / action and decision without incurring additional cost. Genesis of this cost lies in institutional dysfunctionality. At the group level again group as an entity (may be represented by the majority of group members), is a principal that (because of failure of participatory mechanism) may fail to observe it's group leader's (agent) action. In our study area it is observed that if any SHG lends money to its members (or any outsider) its rate of interest is exorbitantly high compared to the money lent from MFI. Every SHG that is in existence at least for a period of six months and have qualified as a viable group receive a revolving fund of Rs. 25,000 from banks as cash credit facility. Banks may charge interest only on the sum exceeding Rs. 10,000, which is given to the bank by the DRDC as subsidy grant but to the group it is a cash credit. In our study area it is found that whenever bank charges interest to SHG for DRDC subsidy grant the interest rate is 12% per annum. The interest rates charged by SHG for its rotated fund varies between 24% to 36% per annum for its members and greater than that for non-members (Table 6).

SHG Rt/ interest	SHIBANI	EKTA	HIMALAYA	SAIPTRI	TALILINE	LAKSHMI	ANAND	NILGIRI	RANGJALI	SARADA MONI
SHG fund for member	24%	24%	24%	24%	24%	24%	Not available	24%	36%	36%
SHG fund for non-member	Not given	Not given	60% - 120%	60%		120%	Not given	60%	Not given	Not given
DRDC fund	Not received	Not available	Not available	5%	Not available	Not available	Not available	12%	Not received	Not received
FPC / EDC fund	Not received	Not received	Not received	Not received	Not received	Not received	24%	Not received	Not received	Not received

Table 6: Variation in interest rate charged by different SHGs for loan to members and non-members from different sources of fund

Under the circumstance, moral hazard problem mar arise at two levels: (1) at the level of sending information to donor institutions / MFI/ Forest Department by the group leaders; and (2) at the level of sending information to majority group members by the group leaders.

Individualistic group leaders may have an incentive to hide the information to MFI regarding the viability of the group by not depositing into the bank account and keeping cash in hand. MFI will not sanction grant if not satisfied with group's fund position in the bank. SHGs will still be sustainable because of its rotating fund and income from interest payment. And rotating fund can be easily utilized to finance individual based activity - which is uncorrelated with forest conservation. Group leaders will hide information to MFI if by withdrawing from rotated fund (even at higher interest rate) and investing in the individual based activity the expected profit becomes larger than that could be, otherwise, if they had to share with others in the group the profit generated from group action financed by loan from MFI at cheaper interest rate. Alternatively if MFI is satisfied with fund position and ready to provide grant, group leaders may hide information regarding group's choice for the individualistic project with greater expected return than that from group project.

At the group level, group leaders, also may like to hide information regarding fund withdrawal from the majority of the group (a principal) while withdrawing fund without taking resolution in the group meeting attended by majority members. They will opt for that if there exist a number of prospective borrowers and if they can gain by reducing the competition.

All these issues are handled in a theoretical construct in the following section, to find out its possible implication on forest conservation.

3 Entwined institutional dysfunctionality in MFI and participatory forest management: a model

The model we are going to propose has 2 parts: first part in 3.1 and 3.2 in principal-agent framework, elaborately consider the consequences of institutional dysfunctionality at the level of micro finance institution, where MFI organizers in coordination with forest department with the objective of forest conservation are interacting with group leaders of SHG. It also considers consequences in 3.2, within group level, where group leaders are interacting with majority group members of SHG. Finally in the second part in a descriptive way both the games in 3.1 and 3.2 have been taken together as two parallel prisoner dilemma games, textured in distributed game model.

3.1 Part I game

Let, micro finance institution (MFI) like DRDC etc (principal) is assumed to be able to (unilaterally) choose the interest rate schedule with that foreknowledge of the SHG group leaders' (agent) response, so as to maximize their expected return, which is tagged with the objective of forest conservation. The solution to the principal's problem is then to impose the interest rate schedule or contract that maximizes the principal's expected return given the agent's maximizing response to the incentives in the imposed contract.

MFI (the principal) owns a fund that will generate one of two values ($R_H > R_L > 0$). Let R_H be the value of asset that takes care not only recovered value of the principal amount with interest payment but also some value of conservation of forest resources). R_L on the other hand is the only recovered value of the principal amount with interest payment. If R_L at least is not realized, lending will not be sustainable. Value of the asset however depends on a random variable and SHG group leaders' (agent) action. The agent's strategy set consists of three actions: HI, LO and $EXIT$. HI is the action of stopping of withdrawal of rotating fund (without group consent) for own interest and mobilizing MFI fund (like DRDC) for group activity based project. LO is the action of withdrawal of rotating fund (without group consent) for individual activity based project. If SHG leaders choose $EXIT$ that would imply that they would not take any effort for financing any activity in the group, by the group fund. If HI is chosen, the probability of generating R_H, the successful outcome, is given by p; otherwise the outcome is R_L. If the agent chooses LO, then the probability of R_H is given by q ($p > q$). If $EXIT$ is chosen, then the asset is worth zero for sure.

At the backdrop of high concentration of loan into the hands of group leaders, it is presumed that group leaders generally prefer to carry on individual based activity by group rotating fund, not by MFI fund. Because in order to avail MFI fund one has to go through screening and monitoring so that fund withdrawal without group consent and loan concentration among leaders on behalf of their personal interests may not be possible. If group leaders can carry on individual based activity by MFI loan, still there will remain some possibility of creating individualistic benefit by the group leaders. Therefore by restraining individual based activity by the group leader and performing

HI , *LO* and *EXIT* action will experience different cost for choosing different action. $C_{HI} > C_{LO} \geq C_{EXIT} = 0.$

If MFI collaborating forest conservation wants to offer some bonus *B* * to SHG leaders so that, SHG group leader prefers action *HI* over *LO* . In that case satisfying SHG leader's individual rationality constraint MFI will determine *B* * in such a way, that:

$$pB* - C_{HI} \geq qB* - C_{LO}$$

Solving which we get:

$$B* \geq \frac{C_{HI} - C_{LO}}{p - q} \quad \ldots\ldots\ldots(1)$$

In our context, this cost however is derived from some production, based on common property resources (CPR) here forest. Let us consider one particular type of such production, say inter-cropping in the new plantation area in the forest which can be carried over as individual based and group based activity.[1] Following standard theoretical framework (Baland and Platteau, 2003) if that CPR production is individual based so that benefit is sub tractable benefit is defined as: $M_i G(\sum e_i)$. M_i is ith individual's investment of monetary capital. e_i is ith individual's effort in CPR production. If otherwise production is group-based individual's share in fund is not sub tractable whatever profit is earned would be distributed equally among the members. In that case individual's benefit would be: $\frac{\sum M_i G(\sum e_i)}{n}$, where n is the number of group members

In our particular context if a member (may be SHG group leader) borrows money from group rotating fund, which can be used to finance individual based activity (shirking MFI's priority for financing group based activity), rate of interest will be higher than that for loan from MFI (Table 6). Le r^{GR} be the interest rate for loan from group rotating fund and r^{MFI} be the interest rate for loan from MFI. In our context, $r^{MFI} \geq 0$ If group leaders withdraw money as loan from rotating group fund and use for their own individual

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[1]Since intercropping production occurs in forest land (a CPR) production depends on collective action One's production depends on all others' effort. If it is an individual based benefit can be subtractable by each individual investing different amount of capital (and thus fertilizer, seeds etc). In case it is group based capital will be non-separable. .

activity based project[2] (i.e., choose action LO) individually net return will be:

$M_i G(\sum e_i) - M_i r^{GR} = M_i (G(\sum e_i) - r^{GR})$. If on the other hand, there is a group activity based project and for that MFI fund is invested each member (including group leader) will equally share the return which is:

$\dfrac{\sum M_i G(\sum e_i) - r^{MFI} \sum M_i}{n} = \overline{M}(G(\sum e_i) - r^{MFI})$. Therefore, for the group leader, who is interested in borrowing from rotating group fund, rather than that from MFI fund, for their individualistic viewpoint:

$$M_i(G(\sum e_i) - r^{GR}) > \overline{M}(G(\sum e_i) - r^{MFI}) \ldots\ldots(2)$$

Therefore, for the group leader, who is interested in borrowing from rotating group fund, rather than that from MFI fund, for their individualistic view point:

Already we know that, $(G(\sum e_i) - r^{GR}) < (G(\sum e_i) - r^{MFI})$, therefore, (1) will hold if $M_i \gg \overline{M}$ which means high concentration of loan.

Under the circumstance, MFI is devising the policy measures by introducing some bonus to SHG leaders to motivate them to mobilize MFI grant for group based project where all members of the group would be equally benefited in terms of generating income and there by reducing dependence on forest. In response to that, if SHG group member chooses the strategy HI, she will have to forego a certain amount of income that she could other wise enjoy if instead she could take loan from group rotating fund. In this particular context difference in cost of taking action HI over LO will be given by the amount she foregoes for switching over to group based activity financed by MFI from individual based activity financed by group rotating fund. From equation (2) thus we have:

$$C_{HI} - C_{LO} = M_i(G(\sum e_i) - r^{GR}) - \overline{M}(G(\sum e_i) - r^{MFI})$$

$$= G(\sum e_i)(M_i - \overline{M}) - (M_i r^{GR} - \overline{M} r^{MFI}) \ldots\ldots\ldots(3)$$

[2]In our empirical study considering 7 SHGs we found cumulative concentration of loan among 3 SHG group leaders, (namely, Secretary, President and Treasurer) and allotment of MFI loan is negatively significantly correlated. Correlation coefficient is –0.63. This cumulative concentration of loan is also negatively correlated with fund utilization for group activity

Plugging this value into (1), we get:

$$B^* \geq \frac{G(\sum e_i)(M_i - \overline{M}) - (M_i r^{GR} - \overline{M} r^{MFI})}{p - q} \quad \dots(4)$$

Equation (4) establishes the fact that B^* will be increasing with $(M_i - \overline{M})$. In other words, greater the loan concentration of rotating fund greater amount will have to be spent by MFI. This B^* is actually the enforcement cost MFI will have to incur.

3.2 Part II game

Part II game in the principal-agent framework starts at the group level. With in SHG what majority of group member can do is to create peer pressure on the group leaders to restrain them from fund withdrawal without group consent. Since the majority of the members (principal) do not know a priori whether group leaders (agent) will withdraw group rotated fund without their consent or not (consent is taken in the group meeting convened by Secretary (group leader) by taking resolution for fund withdrawal), whether they will exert peer pressure on the group leader or not, depends on the probability of fund withdrawal. The peer pressure function that we will consider is adopted from Agarwal (2000). In the context of community management of group owned wells in Southern India, in one of two alternative ways as Agarwal defined, peer pressure on individual member of the group is proportional to the extent by which her action falls short of group norm. And this peer pressure imposes some additional cost on that particular member's action (here the group leader) if that action violates group norm.

In part I game we found that the net benefit that a group leader gets by withdrawing fund from group rotated fund and using it for their own individual based activity and thus not taking any attempt to MFI fund was given by: $G(\sum e_i)(M_i - \overline{M}) - (M_i r^{GR} - \overline{M} r^{MFI})$. If peer pressure exists let it be: $\rho_i = \theta_i(\overline{M} - M_i)$ θ_i is a non-negative constant to show the intensity of the peer pressure. $\overline{M}$ represents group norm i.e equal share of group fund for any activity. $\rho_i = 0$, when $M_i = \overline{M}$ Let, $\dfrac{\partial \rho_i}{\partial(\overline{M} - M_i)} > 0$ and $\dfrac{\partial^2 \rho_i}{\partial(\overline{M} - M_i)^2} > 0$ i.e., peer pressure increases with greater the deviation from group norm and it increases with the increasing rate. Now in the presence of peer pressure function the net benefit would be:

$$\beta_i = G(\sum e_i)(M_i - \overline{M}) - (M_i r^{GR} - \overline{M} r^{MFI}) - \theta_i(M_i - \overline{M}) \dots(5)$$

Let, $r^{GR} = r^{MFI} + \alpha$; where, $\alpha > 0$, then (5) becomes:

$$\beta_i = G(\sum e_i)(M_i - \overline{M}) - \{(M_i - \overline{M})r^{MFI} - \theta_i(M_i - \overline{M}) - \alpha M_i]\ldots(5.1)$$

This net benefit β_i is the function of $(M_i - \overline{M})$ and the maximum net benefit β_i^* would be obtained at a point where $G'(.) + G'_{M_i - \overline{M}}(.) = (\alpha + r^{MFI}) + \theta'_{i,(M_i - \overline{M})}$

In other words, β_i^* will be located at

$$G(.) + (M_i - \overline{M})G'_{M_i - \overline{M}}(.) = r^{GR} + \theta'_{i,(M_i - \overline{M})}, \text{ since } r^{GR} = r^{MFI} + \alpha$$

As functions are specified, β_i^* is shown diagrammatically in figure 6. Greater the intensity[3] of peer pressure $(\theta_i^2 > \theta_i^1)$, lesser is the net benefit $(\beta_i^2 > \beta_i^1)$ from violating group norm $(M_i - \overline{M})$. Peer pressure will be maximum i.e., $\theta'_{i,(M_i - \overline{M})} = 0$, if majority of group members can set group rate of interest (r^{GR}) for those member (including group leaders) who would be found to withdraw group fund without group
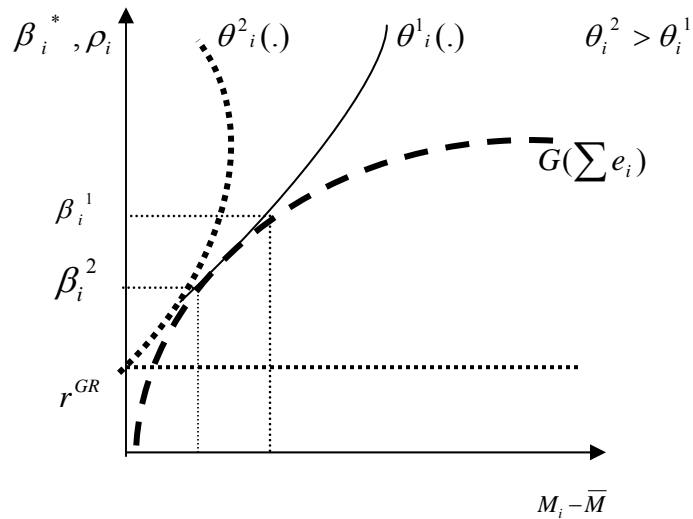

Fig 6: Benefit of the group leader in withdrawal of group fund without group consent in the presence of peer pressure of the group

consent at $\hat{r}^{GR} = G(.) + (M_i - \overline{M})G'_{M_i - \overline{M}}(.)$

The majority of group members however don't know whether group leaders will withdraw group fund without group consent or not. They only know the probability (π_1) of the group leader of withdrawal of group fund without group consent and the

probability (π_2) of fund withdrawal with group consent. They have an instrument of potential threat (τ) through exerting peer pressure (ρ) on group member (including group leaders) that will generate one of two values (S, F), respectively for success and failure. As it has been specified in part -I game, group leaders have three possible sets of actions: HI, LO and $EXIT$. If HI is chosen, i.e., in the presence of peer pressure, group leaders stop withdrawal of group rotating fund only for their own purpose, and mobilize MFI fund for group based activity- the probability of generating S, the successful outcome, is given by (π_1); otherwise the outcome is F. If in the presence of peer pressure the group leaders (agent) choose LO, i.e., withdraw group-rotating fund solely for their own activity then the probability of R_H is given by (π_2) $((\pi_1) > \pi_2)$. In the similar way group leader in the presence of peer pressure has to face cost $C^\rho{}_{HI}$ and $C^\rho{}_{LO}$ respectively, for taking action HI and LO where $C^\rho{}_{HI} > C^\rho{}_{LO}$. The majority of group member may offer some threat (or punishment) τ^* to SHG leaders so that, SHG group leader prefers action HI over LO. In the similar way satisfying the individual rationality constraint of the SHG leaders (minimizing cost of peer pressure for a given level of benefit) τ^* would be obtained by solving:

$$\pi_1 \tau^* - C^\rho{}_{HI} \leq \pi_2 \tau^* - C^\rho{}_{LO}$$

$$\rightarrow \tau^* \leq \frac{C^\rho{}_{HI} - C^\rho{}_{LO}}{\pi_1 - \pi_2}$$

The difference in cost of actions $(C^\rho{}_{HI} - C^\rho{}_{LO})$ is the benefit $\beta_i{}^*$ in the presence of peer pressure that has to be foregone. Comparing $(C_{HI} - C_{LO})$ in part-I game with $(C^\rho{}_{HI} - C^\rho{}_{LO})$ of part –II game we find that:

$$(C^\rho{}_{HI} - C^\rho{}_{LO}) = (C_{HI} - C_{LO}) - \theta(.)$$

$$\rightarrow (C^\rho{}_{HI} - C^\rho{}_{LO}) < (C_{HI} - C_{LO})$$

These differences in costs of actions show enforcement costs of MFI and SHG respectively for enforcing the group leaders to comply with the rules for carrying out group based activity in favour of conservation, financed by MFI and also to comply with group norm of equal share of group fund and withdrawal of fund with the group consent. This will happen if there is no asymmetry in information. In the presence of asymmetric

information, whether, $B^* \geq or \leq \tau^*$, will depend upon whether $\pi_1 - \pi_2 \geq$ or $\leq p - q$.
The difference in probabilities $(\pi_1 - \pi_2)$ and $(p - q)$ actually reflect respectively the probability of success of stopping violation of group norm by majority of SHG members and probability of success of stopping individual based activity financed by group fund that goes against forest conservation, which is attempted by MFI in collaboration with Forest Department. These are to be determined by the strength of institutional factors. In our particular context, greater the institutional dysfunctionality in SHG and MFI, lesser will be the values of $(\pi_1 - \pi_2)$ and $(p - q)$ respectively, implying lesser value of τ^* and B^*. If $\dfrac{\pi_1 - \pi_2}{p - q} > 1$ that would imply that participatory management at the group level within SHG is more dysfunctional compared to that of MFI. If we assume equal probability of success across these two institutions, i.e., $\dfrac{\pi_1 - \pi_2}{p - q} = 1$, $\tau^* < B^*$ i.e., value of potential threat τ^* for violation of group norm by majority members will be lesser than that of the value of potential bonus by the MFI institution to be given to those members, who want to use group fund undemocratically to foster the individual based production, going against rule for conservation. This has also significant policy implications, which will be highlighted, in the final concluding section.

3.3 Distributed game in participatory management of forest clubbing Part I and Part II games together

Part I and Part II games as described above are actually two parts of the same game and played in the participatory forest management simultaneously which can be handled in terms of distributed game DG (Osborne and Rubinstein, 1994; Monderer and Tennenholtz, 1999). Following Monderer et. al (1999) we are modeling the game. In our particular context, DG is defined in terms of

1) A set of 3 players: (MFI, SHG leader, and majority members of SHG other than leader)

(2) A set of 2 locations: MFI and SHG

(3) A set of agents for each of 3 players (MFI, SHG leader, and majority members of SHG other than leader), and one agent for each of 2 locations.

(4) A set of games (Part-I and Part-II) in strategic form with the given set of 3 players, one, for each 2 locations.

(5) A set of messages for each 3 players, and

(6) A probability distribution over the set of permutations of locations (i.e., 2!), for studying simultaneous parallel interactions between the players.

As it is specified, game can start at any location, i.e., at MFI or at SHG level according to the order prescribed by permutation. (Let Nature chooses a permutation according to the given probability distribution). After a game at a location (MFI/SHG) is played, the agents of the player (i.e., concerned agents of MFI, SHG leader, and majority members of SHG other than leader) at this location can send messages.

Following Monderer and Tennenholtz (1999) model, DG is a two stage game for two locations: MFI and SHG. Each stage is divided into two sub-stages: action stage and message stage followed by action stage. For the message stage there is a message game other than the action game at the action stage.

For action stage, at location MFI interactions are made between MFI organizers and agent of SHG leader. MFI organizer has two strategic action (i) C_M: to grant loan to SHG if group leaders mobilize this fund for group based activity, or (ii) D_M: not to grant loan if it is used for individual based activity. At this location SHG leader on the other hand two strategies: (i) C_L: to mobilize fund for group based activity and (ii) D_L: to use group fund for own individual based activity.

Corresponding to that action game there is a message transmission / signaling game, which is a priori to action game. MFI organizer has a set of possible feasible messages regarding bonus B, it will go on offering to SHG until it reaches (C^{MFI}_M, C^{MFI}_L), the cooperative equilibrium. For that there is a signaling function for MFI: $(p^{MFI} \mid \pi^{SHG})$ conditioned upon probability set by majority members of SHG π^{SHG} set, against their action of threat, This signaling function is a probability mapping from message space containing feasible bonuses, to the action space containing (C^{MFI}_M, D^{MFI}_M) at MFI stage. Similarly agent of SHG leader will send messages regarding cost against the

actions $(C^{MFI}{}_L, D^{MFI}{}_L)$, which have been previously considered as (HI, LO). It is presumed that agents will stop sending message to others as soon as game results cooperative equilibrium.

Simultaneously at SHG game between group leaders and majority members – agent of leaders have two possible actions: (i) $C^{SHG}{}_L$ - to convene the meeting for taking resolution for withdrawal of group fund and for taking resolution on the mode of utilization of fund, and (ii) $(D^{SHG}{}_L)$ - not to convene the meeting for taking resolution and withdraw fund for their personal matter. For agent of majority members other than leaders there are two possible actions: (i) $C^{SHG}{}_G$ - to cooperate with group leaders in collective action, and (ii) $D^{SHG}{}_G$ - not to cooperate with group leaders. Before taking these actions they enter the message transmission/ signaling game.   Until it reaches cooperative equilibrium $(C^{SHG}{}_G, C^{SHG}{}_{MG})$, majority of group members go on sending messages regarding the potential threat, i.e., peer pressure ρ (e.g., dissolving the group, withdrawing membership and so on), which will constitute the signaling function $(\pi^{SHG} | p^{MFI})$, a probability function conditioned by the probability: p^{MFI}, a probability mapping from message space on all feasible peer pressure to the action space of cooperation and non-cooperation $(C^{SHG}{}_G, D^{SHG}{}_G)$ Group leader at the stage of SHG however send the message to all members regarding probable net benefit after they meet the cost for peer pressure.

Whole analysis can be structured in terms of two parallel prisoners dilemma game, constituting DG :

	$C_M{}^{MFI}$	$D_M{}^{MFI}$			$C_G{}^{SHG}$	$D_G{}^{SHG}$
$C_L{}^{M}$	a^{MFI}, a^{MFI}	$b^{MFI}, 0$		$C_L{}^{SHG}$	a^{SHG}, a^{SHG}	$b^{SHG}, 0$
$D_L{}^{MFI}$	$0, b^{MFI}$	C^{MFI}, C^{MFI}		$D_L{}^{SHG}$	$0, b^{SHG}$	$C^{SHG}, C^{SHG},$

Cooperative equilibrium will exist in all locations if for each location the following inequality holds (Monderer et..al; 1999):

$$b \leq c + \frac{1}{2}(c - a) \dots\dots \ (CE)$$

Set of payoffs at location l, i.e., $\left((a,a)^l;(b,0)^l;(0,b)^l;(c,c)^l\right)$ are resulting from the set of actions $A^l = \left((C,C)^l;(C,D)^l;(D,C)^l,(D,D)^l\right)$. As it has been specified in DG game at each location there is a signaling function (either, $\pi(..|p)$ or $p(..|\pi)$) that maps from message space into action space: $M \xrightarrow{\ \pi\ } A$. It therefore follows that, whether (CE) will be satisfied or not depends on the probability components of signaling function, which in (3.1) and (3.2) are shown to be institutionally determined. If institutions in our participatory management of forest don't work properly the probability of success of transmitting the required messages (may be 'bonus' or 'peer pressure') for the actions leading to the desired cooperative equilibrium for forest conservation will be lower.

Summery and Conclusion

In Buxa Tiger Reserve (BTR) and its fringe area in North Bengal, India participatory forest management programme is carried over in an entwined fashion involving forest department of the government with forest management committee (FPC/EDC) constituted by community members on the one hand, and micro finance institutions (MFI) promoting self-organized self-employment generating community groups, namely Self Help Groups (SHGs), on the other. A large number of forest conservation and forest management related activities entrusted upon FPC/EDC are being passed over to SHGs and getting financed by MFI. FPC / EDC. Institutionally FPCs and EDCs along with Forest Department are not working in a desirable way. It is reflected in terms of their failure to maintain officially records of their activities including utilization of fund and also in terms of poor attendance of members in general meeting. Passing over their activities to the SHGs (small community groups being a subset of the whole community) however is not a solution to the problem. Institutional dysfunctionalities in SHG also have been detected. They are interlocked with the functioning of MFI. A significant amount of loan grant from group fund is found to be concentrated into hands of group leaders, viz., Secretary, President and Treasurer of SHG. A significant amount of group fund is being withdrawn without any resolution in the group meeting to approve the fund-

withdrawal. Shirking the objectives of MFI a significant amount of group fund is utilized to finance individual activity rather, the group activity. Most of the financial transactions between group members are being made in an informal way (not through bank, a formal institution) so that there is no proper measure for check and balance. This causes misunderstanding and mistrust among the members that also in many cases leads to dissolving the group. Institutional dysfunctionality as it has been characterized in the paper creates barrier to participatory management for conservation of forest resources. This dysfunctionality blocks message transmission among the agents of participatory management, creating moral hazard problem. It makes the enforcement cost very high. For developing an analytical framework for this kind of empirical problems, this paper further attempts to explore a theoretical juncture in terms of distributed game model. The game of message transmission is antecedent to the game of participatory actions that may or may not lead to cooperative equilibrium in favour of a collective action programme like forest conservation. The instruments for message transmission differ: at the layer of SHG it may contain the intensity of social pressure that is exerted against action violating group norm, where as at the layer of interaction between MFI and SHG leader it may be some reward or bonus, motivating the leader towards group based action for conservation. In terms of 2 parallel prisoner's dilemma game in distributed game model it has been shown that possibility of cooperative equilibrium in this particular case is sensitive to institutional factors. If institutions do not function properly, probability of reaching cooperative equilibrium becomes low.

At the backdrop of the empirical observations this paper has made an attempt to establish the logical coherence of the theoretical propositions that come out from the proposed model. Rigorous statistical testing of those propositions will be done soon in the future research work after entering data on all 30 randomly selected SHGs from each of 26 villages from 5 EDCs and 8 FPCs in BTR East and West division selected in stratified random sampling.

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