

## Incentive and Community Forest

Sukumar Sarkar

*Department of Economics, University of Calcutta, 56-A, B.T. Road, Kolkata 700 050,  
West Bengal, India*

*Telephone: (+91) 9432346649, E-mail: sukumar97@gmail.com*

**KEYWORDS** Attitudes. Conflicts. Free Rider. Group Maturity Index. Institutional Effectiveness. Punishment and Reward

**ABSTRACT** Incentives (reward, punishment or both) matter in collective action for the provision of public goods which are community forest, fishery, irrigation. While reward increases cooperation directly, punishment serves as an indirect incentive that decrease free riding to increase contributions to public goods like community forest. The researchers find that punishment and a combination of both punishment and reward are effective in promoting cooperation by reducing conflicts. The effectiveness of incentives also depends on cost/benefit and sources of incentives. People's attitude and location of public goods are also affecting the incidence of conflicts. Researchers have also seen that combination of reward and punishment is applicable to the forest community with high group maturity and it is more institutionally effective in conflict resolution. Hence, in Joint Forest Management (JFM) the combination of reward and punishment leads to the most cooperative outcome.

### INTRODUCTION

Common pool resources (CPRs) such as fishery, community forest, canal water are natural or man-made. The characteristics of CPRs are non-excludability and subtractability (Ostrom 1990). The value of a common-pool resource can be reduced through overuse which can lead to the tragedy of the commons (Hardin 1968). Therefore, common-pool resources are often managed by government authority and markets. But, failures attributed to the government management and market-based policies have made community involvement on an incentive basis, an alternative actor to govern the commons. This management model is known as community-based natural resource management (CBNRM).

CBNRM was introduced to reduce conflicts at the multiple-level of interactions between the local resource users and the government. However, a new set of conflicts has ultimately emerged in co-management of natural resources (Saigal 2000). Conflict can be defined for present purposes as "any relationship between opposing

forces whether marked by violence or not" (Desloges and Gauthier 1997). The CPR literature does not rigorously examine the role of natural resource conflicts on sustaining commons. Rather, this literature proceeds on the easy assumption that conflicts are detrimental to collective action and thus successful management of the commons requires robust mechanism for conflict resolution. Majority of the CPR literature (Ostrom 1990; Baland and Plateau 1996) have shown that successful management of CPR is nothing but the community-based natural resource conflict management (CBNRCM) strategies because these studies view that conflict undermine trust, which, in turn, makes cooperation costly for sustainable resource management. An important issue to consider when dealing with cooperation or collective action is what type of institution would be responsible for such action. In many cases the outcomes of the collective action are highly dependent on the type of institution mixed up. In Ostrom's (1990) 'Governing The Commons: The Evolution of Institutions For Collective Action', a set of eight general design principles appeared to characterize the efficacy of multiple types of rules and sets of rules. While the formulation of principles associated with successful collective action in CPR governance is a challenging endeavor, it is equally important to understand the mechanisms underlying these associations. A substantial vol-

---

*Address for correspondence:*

Sukumar Sarkar  
Village- Chalkramroy, P.O. Gopal ganj,  
Dist. Dakshin Dinajpur 733141,  
West Bengal, India  
*Telephone:* (+91) 9432346649  
*E-mail:* sukumar97@gmail.com

ume of literature has amassed concerning the usefulness and validity of design principles, and the reactions have been mixed.

Institutional approaches mainly emphasize on group size and heterogeneity (income and caste) as community characteristics. But, it has largely unexplored the role of the behavioral dimension of a community and its households. One such dimension is attitude of community people. Non-cooperative attitude can be reduced through punishment (Ostrom 1990). The reactions of the community people to different incentives (rewards and punishment) are different. It indicates that design can contribute substantially to effectiveness, sustainability (Stefen and Oliver 2016). Social reward is a remarkable instrument for managing conflicts. Both theoretically and experimentally, it has attracted considerable recognition (Yu'e et al. 2017). Governance networks supply longer lasting and prospectively more rewarding solutions for collaborative conservation of commons (Jedd 2015). The work on public goods game designates that both institutional reward and institutional punishment are effective to curb free-riding. The punishment effect is stronger than the reward effect (Yali et al. 2016). As per the study of Gebara and Agrawal (2017) the multidimensional and complex behavioral context of small managers and small land owners has in many cases been reduced to a linear and rational simplicity. They say and instead of the linear and rational simplicity if the heterogeneous attitude of the community people in CPRs management is addressed by a multidimensional approach the incentives (reward and punishment etc.) can bring better results. Community people have several attitudes other than the non-cooperative attitude. Anthropocentric (more free-riding) -who believe in mankind not the forest that is these people think people first forest conservation later. Pro-environmentalist (more cooperating) is just the opposite of the anthropocentric. Communitarians are attaching importance to both people and forest conservation (increase in forest biomass and the level of community income). Therefore, the effectiveness of incentives depends on the attitude of the forest community people. Consequently, not only punishments but rewards are also important scheme to ensure cooperation of forest dependent people. One important feature of collective action is the use of selective incentives to reward those who co-

operate in the program and/or punish those who do not. These selective incentives, rewards and punishments generate different dynamics in collective action. Much of this difference is due to the different ways costs and sources are related to the number who cooperates in collective action (Oliver 1980). "The incentive must be 'selective' so that those who do not join the organization working for the group's interest, or in other ways contribute to the attainment of the group's interest, can be treated differently from those who do" (Olson 1965). There are two types of incentives: punishments (costs) and rewards (benefits). These are directly measurable in terms of their economic implications (monetary/pecuniary/fine/reward) and indirectly constraining in terms of their social implication (social sanctioning/jail/social seclusion/social recognition/trophy). These can again be segregated as material and non-material.

The discussion in this paper is presented on the basis of a field investigation and it has been found in the survey that maximum amount of monetary punishment is in the case of FPC (EC)<sup>1</sup> members, forest guard, beat officer and range officer up to Rs. 1150.00. The Additional District Forest Officer (ADFO) is able to charge punishment up to Rs. 2500.00 but the Divisional Forest Officer (DFO) may charge up to Rs. 10000.00<sup>2</sup>. Forest Department offers assistance to community members as rewards (benefits) in group level such as tube-well, culvert, power-tiller for cultivation, waiting-room, bath room, roads, marshall/sub-marshall pump for irrigation, trophy and so on. The assistances are in individual level social recognition (monetary and non-monetary), paddy thresher, help them to get driving license after completion of the required training, tailoring, van, machine for making sal-leaf plate/dish (sal-pata in local vocabulary) and so on. Trophy generally given to the community for the best performances of plantation (percentage of alive plant) on the second (after one year of plantation) or third monitoring (after second year of plantation) by the Forest Department all over the Division. The sources of incentives are: centralized (forest department apply the incentives) and decentralized (Community members apply the incentives). At this backdrop, the objectives of the paper are to find ways to improve the quality of life of the CPR dependent community and make the CPR sustainable simultaneously. Therefore, the research questions are: (i) To what

extent cost-benefit and sources of incentives promote cooperation in CBNRM? (ii) What types of incentives matter more in cooperation? (iii) Does the effect of incentives depend on the attitude of the commons dependent households?

Community forestry must be incentive compatible at the household level and for both equity and efficiency reasons, the distribution of benefit needs to be addressed more carefully (Shyamsundar and Ghate 2014). Incentives to improve management often assumes that problems are self-evident, but careful and transparent consideration of the ways different stakeholders understand management problems is essential to initiate effective dialogue (Adams et al. 2003). Therefore, both incentives, and people's attitude matter in resolving conflicts and promoting cooperation. Depending upon the research questions, our broad set of hypotheses are: (i) Relative effectiveness of incentives in promoting cooperation depend on the net benefit and on different sources of incentives. (ii) A combination of reward and punishment is more effective instrument than a pure instrument of reward or punishment. (iii) Centralized approach is more effective than the decentralized approach for the anthropocentric targets whereas the opposite is the case for the pro-environmentalist school, which implies that attitude of the community people matters.

## METHODOLOGY

The researchers have selected seven Joint Forest Management Committees (JFMCs) purposively from *Alipurduar*, *Bardhaman* and *West Midnapore* districts of West Bengal, India. The time period of the survey was from September 2015 to December 2016 (major data collection) and from January 2017 to May 2017 (supplementary data collection). Agriculture is the main activity of the villagers of these study sites. Poverty, illiteracy, unemployment and unequal earning opportunities have fostered social disparity and, at some places, constrained the social integration necessary for successful community participation in natural resource conservation. The disparity in topological condition, development opportunity, rich biodiversity, high economic dependency, human-wildlife (elephant) conflicts, area under forest cover, differences in collective action, household characteristic, existence of different types of incentives, differ-

ent types of conflicts and institutional setup and persistent institution-people conflicts characterize the paper sites which also fulfill the objectives of our study. The researchers have surveyed every fifth household randomly and taken a total of 129 households from the seven JFMCs. They have taken a minimum of 6 to a maximum of 32 household from any particular JFMCs. The survey district wise distribution of the attitude of forest people not significantly different (chi-square= 1.41; p value = 0.494; df= 4). The researchers have captured perception in two phases. There is no significantly difference in the weights of the attitudes of people (chi-square= 0.61; p value = 0.737; df= 2) and the test-retest result is highly correlated ( $r = 0.951$ ;  $n = 6$  and  $p$  value= 0.003) between two phases of data collections.

## Conflicts

In this study the researchers measure conflict in terms of lack of cooperation.

## Incentives

The centralized incentives are centralized reward, centralized punishment and a combination of centralized reward and punishment. On the other hand, decentralized incentives are decentralized reward, decentralized punishment and a combination of decentralized reward and punishment. Therefore, there are six types of incentives. The researchers have collected the perception of the households on the ranking basis—that is, which one is highest and which one is lowest to increase cooperation. Hence, the ranking is from 1 to 6, where 1 implies lowest and 6 implies the highest incentive for conflict reduction or, cooperation enhancement for successful management of the forest. The researchers have collected the ranking in the two phases—monetary cost-benefit phase and non-monetary cost-benefit phase across the three types of attitudes. Overall 9 percent rating was incomplete.

## Group Maturity Index

Group maturity is defined as a group's potential for self-defining and self-sustaining activity (Pretty and Ward 2001). In CPRs management, the index has operationalized the concept

based on some criteria that can be found at three stages of organizational development termed *reactive dependence*, *realization independence*, and *awareness interdependence*. Westermann et al. (2005) consider seven criteria to measure group maturity. The researchers consider ten group maturity criteria such as external links and networks, group formation, group objective, future planning and testing, conflict resolution, recognition of group value, resilience, rules and norms, self-analysis and views of change for the sampled JFMCs. There are three stages in each criterion. The researchers award FPCs a score of 1, 2 and 3 for first, second and third stage respectively. Thus, the maturity score varies from 10 to 30. The higher score of JFMCs reflects greater maturity of the organization in cooperation.

#### **Forest Condition**

To specify the state of forest biomass of the local forest, foresters generally use a crown density index. The stock of local forest is defined as above-average/average/ below-average if the value of that index exceeds/equals/falls below 50 (Varughese and Ostrom 2001; Ray and Bhattacharya 2011). To assess the stock of local forests, the researchers utilize this classification obtained from the foresters. In this regard they also consider the perceptions of the locals and based on the histories narrated by them.

#### **Institutional Effectiveness**

The researchers have constructed a quantitative index based on qualitative and quantitative information to evaluate institutional effectiveness of the local FPCs using 5 types of practice of the community and forest department for conflict management. The information based on (1) Coalition between community and forest department for conflict resolutions, (2) Success rate of the forest department for conflict resolutions (a forest departmental hierarchy from Beat officer at the base to Divisional officer to the top), (3) Physical infrastructure (no. of forest police presence in the Beat office against the sanctioned post)<sup>3</sup> (4) Patrolling of the forest police (forest guard). In this case the scoring rules are: every day is 10; 2-3 times in a week is 5 and no patrolling or a single day per week is 0. (5) Types of

punishment and reward. A combination of monetary and non-monetary is 10, either monetary or non-monetary is 5 and otherwise the score is 0. The researchers have calculated mean difference of the incentives (standard error, t statistic and p value) to compare the mean incentive of rating and the corresponding level of significance.

### **RESULTS**

Table 1 presents the general information about the households of the surveyed JFMCs. Group size refers to the number of member households of an FPC. It ranges from 55 to 326 members comprising the males (M) and the females (F). Caste is a socio-culturally important factor in India. There are mainly two types of caste. General caste, considered as the higher caste in India, refers to those that lie at the top of the power and social prestige hierarchy (Adhikari and Di Falco 2009), while the lower caste comprises scheduled castes (SC), scheduled tribes (ST), OBC - other backward class category was considered later on. Initially they were included in general category. The table shows the existing practice of some reward and punishment in monetary and non-monetary terms across the surveyed JFMCs villages in the last five years. In this paper, area of forest is shown in hectare. The lowest forest area is in the FPC, Pachami (40.00Ha) while the largest forest area is in the Gadadhar FV (1433.86 Ha). The dates of registrations as FPCs are listed in the final column of the table.

Table 2 shows in general centralized punishment appears as a most effective incentive to reduce conflicts in community forest management. The perception about incentive to increase cooperation varies across the attitude of the forest people. Anthropocentric perceives centralized punishment, Communitarian perceives decentralized punishment and Pro-environmentalist perceives centralized reward and punishment are the superior incentive to increase cooperation. The table also shows the selection of rating in monetary and non-monetary cost/benefit conditions.

Table 3 shows the mean difference between two different types of attitudes of people is significantly different even in the same types of incentive. Only the perception about decentralized reward between anthropocentric and communitarian are not significantly different. This

**Table 1: General characteristics of households and presence of incentives in JFMCs**

Name of the villages	Composition of households					Incentives (reward and punishment)									
	Gender		Caste		Jail	Non-monetary		Monetary		Forest areas (Ha)	Date of registration (JFMCs)				
	Male	Female	General caste and OBC	Schedule caste tribes		Social exclusion	No punishment	Social recognition	Reward as a fine JFMCs			Intra community			
ChowkirBoss <sup>a</sup>	173	03	33	81	62	2	0	3	0	4	2	2	4	509.00	1997
Suat <sup>b</sup>	75	251	106	117	103	0	0	0	3	6	0	0	0	191.00	1995
Salboni <sup>w</sup>	116	19	90	20	25	0	1	0	5	2	0	0	0	21.00	1992
Lakshmiganj <sup>b</sup>	3	174	83	53	41	0	0	4	3	5	1	2	2	176.31	1995
Pachami <sup>w</sup>	95	1	23	44	29	1	0	0	5	2	0	0	0	40.00	1992
Chhoto Chandabilla	53	02	53	02	0	3	0	0	7	6	0	0	0	77.29	1992
Gadadhar FVs <sup>a</sup>	300	14	0	54	260	4	0	0	9	11	0	0	0	1433.86	1997

(N.B. - a stands for the villages of Alipurduar; b stands for the villages of Bardhaman and w stands for the villages of West Midnapure)

**Table 2: Overall and attitude specific rating, mean and standard deviation of incentives**

Incentives	Overall attitudes	Anthropocentric (48)		Communitarian (35)			Pro-environmentalist (46)			
	M(SD)	M(SD)	M(SD) <sup>1</sup>	M(SD) <sup>2</sup>	M(SD)	M(SD) <sup>1</sup>	M(SD) <sup>2</sup>	M(SD)	M(SD) <sup>1</sup>	M(SD) <sup>2</sup>
Centralized punishment	4.03 (1.32)	5.33 (0.83)	5.77 (0.78)	4.9 (0.63)	2.99 (1.03)	3.94 (0.42)	2.03 (0.3)	3.47 (0.67)	2.96 (0.36)	3.98 (0.49)
Decentralized punishment	3.87 (1.43)	2.58 (0.8)	3.08 (0.61)	2.08 (0.65)	5.46 (0.56)	5.94 (0.24)	4.97 (0.3)	4 (1.08)	4.93 (0.49)	3.07 (-0.57)
Centralized reward	3.1 (1.95)	5.32 (0.92)	4.77 (0.9)	5.88 (0.53)	1.99 (1.07)	2.94 (0.64)	1.03 (0.17)	1.62 (0.74)	1.13 (0.54)	2.11 (0.57)
Decentralized reward	2.08 (1.24)	2.53 (1.53)	1.13 (0.61)	3.94 (0.56)	2.1 (1.11)	1.14 (0.49)	3.06 (0.59)	1.59 (0.7)	2.11 (0.57)	1.07 (0.33)
Centralized reward and punishment	3.94 (1.69)	2.67 (0.85)	2.27 (0.92)	3.06 (0.56)	3.04 (1.06)	2.06 (0.42)	4.03 (0.3)	5.96 (0.25)	5.98 (0.15)	5.93 (0.33)
Decentralized reward and punishment	3.98 (1.6)	2.56 (1.51)	3.98 (0.48)	1.15 (0.55)	5.43 (0.67)	4.97 (0.45)	5.89 (0.53)	4.37 (0.77)	3.89 (0.57)	4.85 (0.63)

(N.B. - In Table 2 M and SD stand for mean and standard deviation respectively. Superscripts 1 and 2 indicate ranking of incentive in monetary and non-monetary cost-benefit scenario of incentive respectively. Rest rankings of incentives are for overall attitudes and across the attitude.)

**Table 3: Attitude of the forest people matters in cooperation**

Attitude	Incentives					
	Centralized punishment	Decentralized punishment	Centralized reward	Decentralized reward	Centralized reward and punishment	Decentralized reward and punishment
(Anthropocentric-Communitarian)	-2.34 <sup>***</sup> (0.20)	2.88 <sup>***</sup> (0.16)	-3.33 <sup>***</sup> (0.22)	-0.42(0.30)	0.37 <sup>**</sup> (0.21)	2.87 <sup>***</sup> (0.27)
(Communitarian-Pro-Environmentalist)	-0.48 <sup>**</sup> (0.20)	-0.146 <sup>***</sup> (0.20)	-0.37 <sup>*</sup> (0.21)	-0.51 <sup>**</sup> (0.20)	2.92 <sup>***</sup> (0.16)	-1.06 <sup>***</sup> (0.16)
(Anthropocentric-Pro-Environmentalist)	-1.86 <sup>***</sup> (0.16)	1.42 <sup>***</sup> (0.20)	-3.7 <sup>***</sup> (0.17)	-0.94 <sup>***</sup> (0.25)	3.29 <sup>***</sup> (0.13)	1.81 <sup>***</sup> (0.25)

(N.B. - The figures show the mean difference. The figures in parentheses indicate standard error. \*, \*\* and \*\*\* shows the level of significance at 10%, 5% and 1% respectively)

means that attitude of the community people matter in choosing the incentive for reducing conflict to sustain forest resource. Thus the researchers can say attitude matter in resolving conflict.

Table 4, in all attitude scenarios, a given incentive shows significantly different (mean difference) level of cooperation in two cost/benefit phases (non-material cost/benefit and material

**Table 4: Costs associated with incentive affect cooperation**

Incentives	Anthropocentric	Communitarian	Pro-environmentalist
	(Non-material cost/benefit - Material cost/benefit)	(Non-material cost/benefit - Material cost/benefit)	(Non-material cost/benefit - Material cost/benefit)
Centralized punishment	0.87 <sup>***</sup> (0.15)	1.91 <sup>***</sup> (0.08)	-1.02 <sup>***</sup> (0.09)
Decentralized punishment	1 <sup>***</sup> (0.13)	0.97 <sup>***</sup> (0.07)	1.86 <sup>***</sup> (0.11)
Centralized reward	-1.11 <sup>***</sup> (0.15)	1.91 <sup>***</sup> (0.11)	-0.98 <sup>***</sup> (0.12)
Decentralized reward	-2.81 <sup>***</sup> (0.12)	-1.92 <sup>***</sup> (0.13)	1.04 <sup>***</sup> (0.10)
Centralized reward and punishment	-0.79 <sup>***</sup> (0.16)	-1.97 <sup>***</sup> (0.09)	0.05 (0.05)
Decentralized reward and punishment	2.83 <sup>***</sup> (0.11)	-0.92 <sup>***</sup> (0.12)	-0.96 <sup>***</sup> (0.13)

(N.B. - The figures show the mean difference. The figures in parentheses indicate standard error. \*, \*\* and \*\*\* shows the level of significance at 10%, 5% and 1% respectively.)

cost/benefit). In case of pro-environmental people only there is no significant difference in mean rating in centralized reward and punishment under the two cost/benefit phases (material and non-material cost/benefit). Hence, cost/benefit of incentive is affecting the level of cooperation.

Table 5 shows in the same cost/benefit condition, people of same attitude perceive significantly different (mean difference) sources of incentive for sustaining the commons. For example, given the same cost/benefit condition anthropocentric people perceive significantly different sources of incentive for conflict management. Other two attitudes also follow the same pattern. Therefore, sources of incentive matter in cooperation. Institutional effectiveness index has a strong relation ( $r = 0.809$ ;  $p$  value = 0.0275) with the group maturity. The researchers have collected data on conflicts related to resource, community, external user and forest department. The higher level of group maturity significantly resolving conflicts ( $r = -0.969$ ;  $p$  value = 0.0003). If the researchers consider Tables 1 and 6, they notice that the villages with both reward and punishment such as Choukir Boss and Laksmiganj have more group maturity, low level of conflicts and high level of institutional effectiveness while the villages such as Suata, Pachami, Chhota Chandabilla and Gadhahar FV with the only punishment are less in group maturity, institutional effectiveness and high level of conflicts.

Table 6 also indicates group maturity index has no significant relation with the years after the registration as a JFMCs ( $r = -0.192$ ;  $p$  value = 0.680) but, it has a strong relation ( $r = 0.968$ ;  $p$  value = 0.0003) with the presence of pro-environmental people in the Executive Committee (EC). In the EC, there are ten members, of which

five members (at least two will be women and at least one should be schedule tribes). The other five members are: member of parliamentary assembly or his representative, self-government leader (*Panchayat Pradhan*), block development officer or representative, range officer and beat officer as secretary.

Districts and attitude wise distribution of conflicts: The presence of conflicts in *Alipurduar*, *Bardhaman* and *West Midnapore* are 31.50, 21.00 and 47.49 percent respectively. On the other hand, anthropocentric, communitarian and pro-environmentalist people are responding conflict 25.11, 30.14 and 44.75 percent respectively. This shows conflicts vary across attitude and location.

## DISCUSSION

CBNRM management is a shift from conflict to collaboration (Sarin 1996). CBRNM is nothing but the community based natural resource conflict management (Baland and Plateau (1996). This paper observes that village communities are following the art of cooperation for the management of their natural resources in a harmonious manner through local institutions (group maturity index). Maturity of groups is positively related to performance and management of natural resource (Pretty and Ward 2001). This research paper also found that presence of conflicts are low in the community with high group maturity. A combination of both reward and punishment is present only in two villages with high group maturity out of seven. Incentives can be seen as structural solutions to resolve conflicts of interest (Lange and Joireman 2008). This paper views that decentralised incentive is more effective than the centralized one and the combination of both reward and punishment is more

**Table 5: Sources of incentive are responsible for cooperation**

Attitude	Punishment		Reward		Reward and Punishment	
	Material cost/benefit	Non-material cost/benefit	Material cost/benefit	Non-material cost/benefit	Material cost/benefit	Non-material cost/benefit
	(Centralized – Decentralized)	(Centralized – Decentralized)	(Centralized – Decentralized)	(Centralized – Decentralized)	(Centralized – Decentralized)	(Centralized – Decentralized)
Anthropocentric	-2.69*** (0.14)	-2.82*** (0.13)	-3.64*** (0.16)	-1.94*** (0.11)	1.71*** (0.15)	-1.91*** (0.11)
Communitarian	2*** (0.08)	2.94*** (0.07)	-1.8*** (0.14)	2.03*** (0.10)	2.91*** (0.10)	1.86*** (0.10)
Pro-Environmentalist	1.97*** (0.09)	-0.91*** (0.11)	0.98*** (0.17)	-1.04*** (0.10)	-2.09*** (0.09)	-1.08*** (0.11)

N.B. - The figures show the mean differences. The figures in parentheses indicate standard error. \*, \*\* and \*\*\* shows the level of significance at 10%, 5% and 1% respectively.)

**Table 6: Group maturity, institutions, incentive and pro-environmental people in EC**

<i>Name of the villagers</i>	<i>No. of years after registration as FPC</i>	<i>Institutional effectiveness</i>	<i>Presence of conflict (%)</i>	<i>Type and effectiveness of incentives</i>	<i>Group Maturity index</i>	<i>Pro-environmentalist households in the EC (%)</i>	<i>Forest conditions</i>
Choukir Boss	20	50	7	Dual enforcement of <b>P</b> and <b>R</b> , strongly effective	26	70	Improving
Suata	22	50	13	Forest-department-led <b>P</b> , strongly effective	19	60	Improving
Salboni	24	30	14	Forest-department-led <b>P</b> , moderately effective	19	50	Improving
Lakshmiganj	22	50	8	Dual enforcement of <b>P</b> and <b>R</b> , strongly effective	24	70	Stable
Pachami	24	20	16	Forest-department-led <b>P</b> , moderately effective	18	50	Stable
Chhoto Chandabilla	24	10	17	Forest-department-led <b>P</b> , weekly effective	15	40	Declining
Gadhadhar FV	20	20	25	Forest-department-led <b>P</b> , strongly ineffective	12	30	Declining

(N.B. - P: Punishment, R: Reward)

effective than either reward or punishment. Again, punishment is effective more than reward to increase cooperation. The effectiveness of incentive also depends on the cost and sources of incentive. Fragile institutions tend to be characterized by only some of the design principles (Ostrom 1990). Failed institutions are characterized by very few of these principles (Ostrom 2002). The research also shows institutional effectiveness index inversely associated with the number of the rules. It has a positive links to group maturity. Again proper application of incentive needs a precondition of ideal attitude (mixture of anthropocentric, communitarian and pro-environmental) of community people. The conflicts are addressed rather easily in a community with a large number of pro-environmental people. Again, geographical location is an important factor in conflict generation. Among three sample districts the one from north Bengal shows less conflict mainly due to the existence of pro-environmental people in large number there. We also found that punishments were more effective than rewards.

## CONCLUSION

From the field evidence, the researcher noticed that the existing joint forest management setup is an incentive-based management model, where punishment on the defector is executed often at the decentralized local level, while reward as incentive is yet to have any formal provision in the forest policy. Rewards are not executed properly at the individual level (due to absence of proper distributional rules). This often generates conflicts. Whatever evidence of rewards are found in the study sites, they are scanty and not uniform in practice, and are provided informally to the forest protection groups (individuals) in a centralized manner rather than decentralized manner. More importantly, the imposition of penalties or fines in the study villages is found to be driven more by the socio-economic and political status (connection with the ruling party) of the defecting stakeholders. The implications are that the existing co-management policy is far from optimal in the sense of cost-effective cooperation. The level of conflicts also varies across locations and attitude.



Policy or incentives are satisfactory in most of the cases; where it is not satisfactory new policies can be made for effective implementation by replacing the older ones. But, the problem necessarily does not lie with the policies. Implementation of the same is actually, the important matter. Implementation through the hierarchy from policy maker at the top to community members at the base often faces difficulties. Costs will be high (higher than the centralized system) in adopting several measures to reduce conflicts over a comparatively larger area with larger size of community members. Another more crucial aspect is to be considered: while intending to increase the level of cooperation by reporting the cases of free riding one may have to encounter the costs of life threat.

Conflict can be generally defined as lack of cooperation among members. This is subject to some limitation because the definition of conflict may vary in different socio-economic scenario. This study opens up some aspects which may be studied more intensively with a large sample size. The researcher tried to throw some light on the very crucial aspect of cooperation leading to ultimate goal of sustainability of natural and human resources.

### RECOMMENDATIONS

Government officials need to study these diversities (attitude of the community people, location of the resource) before setting up community institutional arrangements because a system which works in one situation may not necessarily be useful in another.

### ACKNOWLEDGEMENT

Thanks are due to the seven Forest Protection Committees of West Bengal for their participation in this paper. Special thanks to my PhD supervisor Dr. Biswajit Ray for offering valuable suggestions and also for providing some financial support from RTCHDS research grant, IDSK Kolkata.

### NOTES

- 1 FPC (EC): Forest Protection Committee (Executive Committee)
- 2 At the time of survey Re 1.00= US\$0.015.

- 3 The scoring procedures for (1-3) are: more than 50 percent is 10; less than 50 percent is 5 and in case of absence the scoring value is 0.

### REFERENCES

- Adams WM, Brockington D, Dyson J, Vira B 2003. Common pool resources managing tragedies: Understanding conflict over common pool resources. *Science*, 302(5652): 1915-1916.
- Adhikari B, Di Falco S 2009. Social inequality, local leadership and collective action: An empirical study of forest commons. *European Journal of Development Research*, 21(2): 179-194.
- Baland J, Platteau JP 1996. *Halting Degradation of Natural Resources: Is There a Role of Rural Communities?* Oxford: Oxford University Press; FAO, Rome.
- Deslozes C, Gauthier M 1997. Community Forestry and Forest Resource Conflicts: An Overview. *Paper prepared for the XI World Forestry Congress*, Antalya, FAO Forestry Department, Turkey.
- Gebara MF, Agrawal A 2017. Beyond rewards and punishments in the Brazilian Amazon: Practical implications of the REDD+ Discourse. *Forests*, 8(3): 66.
- Hardin G 1968. Tragedy of commons. *Science*, 162: 1243-1248.
- Jedd T 2015. *Accountability and Legitimacy in Transboundary Networked Forest Governance: A Case Study of the Roundtable on the Crown of the Continent*. USA: Colorado State University, Pro Quest Dissertations Publishing.
- Oliver 1980. Rewards and punishments as selective incentives for collective action: Theoretical investigations. *American Journal of Sociology*, 85(6): 1356-1375.
- Olson M 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Harvard University Press.
- Ostrom E 1990. *Governing the Commons*. Cambridge: Cambridge University Press.
- Ostrom E 2002. Common pool resource and institution: Toward a revised theory. In: B Gardner, G Rauser (Eds.): *Handbook of Agricultural Economics*. Volume 2. Amsterdam: Elsevier Science B.V., pp. 1315-1339.
- Pretty J, Ward H 2001. Social capital and the environment. *World Development*, 29(2): 209-227.
- Ray B, Bhattacharya RN 2011. Transaction costs, collective action and survival of heterogeneous co-management institutions: Case study of forest management organizations in West Bengal, India. *Journal of Development Studies*, 47(2): 253-273.
- Saigal S 2000. Beyond experimentation: Emerging issues in the institutionalization of Joint Forest Management in India. *Environmental Management*, 26(3): 269-281.
- Sarin M 1996. From conflict to collaboration: Institutional issues in community management. In: M Poffenberger, B McGean (Eds.): *Village Voices, Forest Choices: Joint Forest Management in India*. New Delhi: Oxford, pp. 165-209.
- Shyamsundar P, Ghate R 2014. Rights, rewards and resources: Lessons from community forestry in South Asia. *Review of Environmental Economics and Policy*, 8(1): 80-102.

- Stefan M, Oliver M 2016. *Ex-ante* evaluation of policy measures: Effects of reward and punishment for fertilizer reduction in palm oil production. *Journal of Agricultural Economics*, 67(1): 84–104.
- Van Lange PAM, Joireman JA 2008. How we can promote behavior that serves all of us in the future. *Social Issues and Policy Review*, 2: 127–157.
- Varughese G, Ostrom E 2001. The contested role of heterogeneity in collective action: Some evidence from community forestry in Nepal. *World Development*, 29(5): 747–765.
- Westermann O, Ashby J, Pretty J 2005. Gender and social capital: The importance of gender differences for the maturity and effectiveness of natural resource management groups. *World Development*, 33(11): 1783–1799.
- Yali D, Boyu Z, Yi T 2016. The dynamics of human behavior in the public goods game with institutional incentives. *Scientific Reports*, 6: 28809.
- Yu'e W, Shuhua C, Zhipeng Z, Zhenghong D 2017. Impact of social reward on the evolution of the cooperation behavior in complex networks. *Scientific Report*, 7: 41076.

---

**Paper received for publication on September 2017**  
**Paper accepted for publication on November 2017**