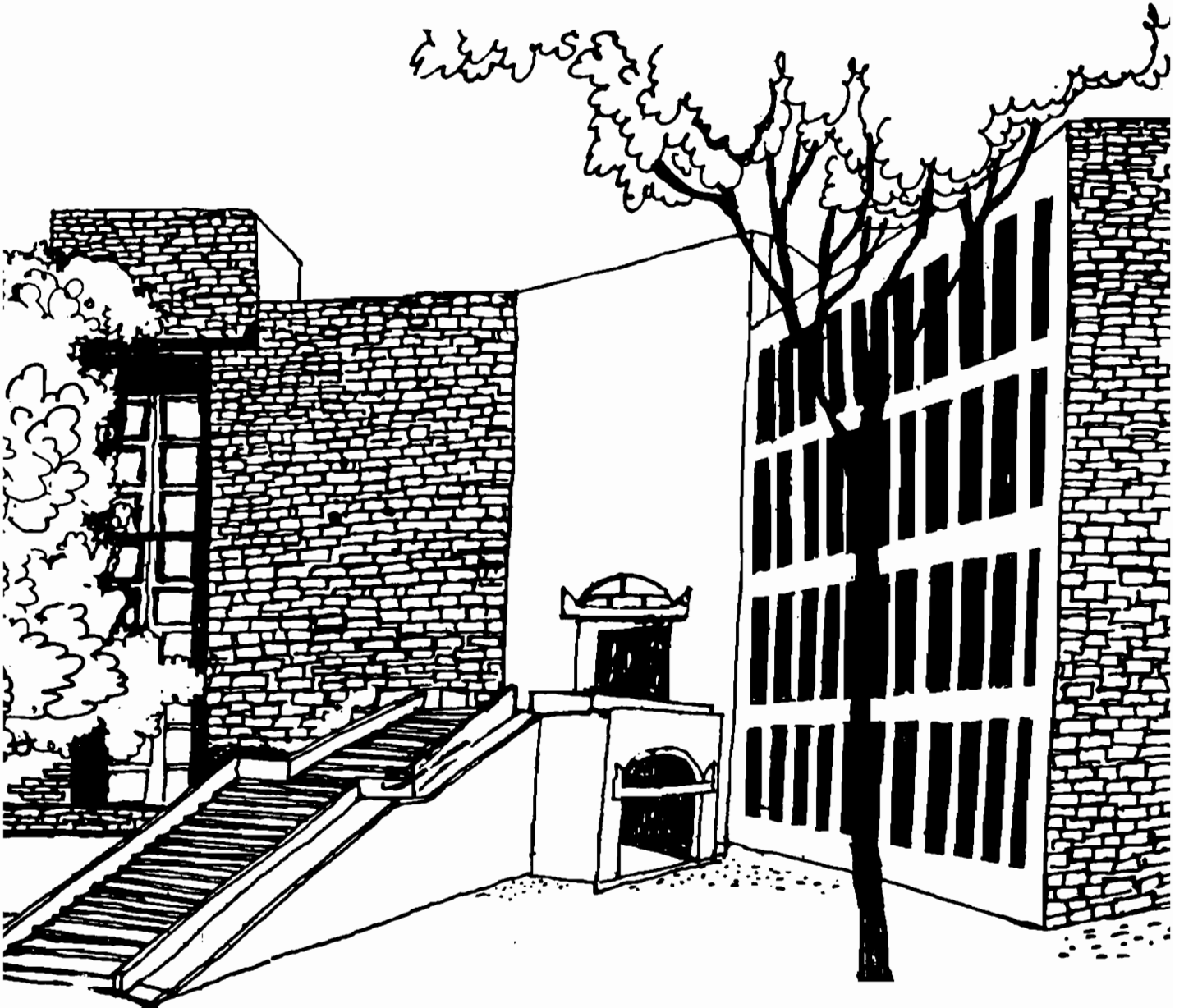




Working Paper



WHY COLLECTIVE ACTION: A CASE OF JOINT
FOREST MANAGEMENT IN GUJARAT, INDIA

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INTRODUCTION

The first Forest Policy of 1894 AD, initiated by the then British regime, controlled villagers' access to forests and pursued extractivism to meet timber demand in England. The coercive power of Forest Department feared local people as they were not allowed to extract anything without prior permission of the Forest Department. This was the beginning of relationship of mutual distrust/mistrust between the Forest Department and local populace and this existed for more than a century or so. Under this framework, each doubted each other's intentions and motives and people felt as if forests did not belong to them. This very psychology of forests not belonging to them demotivated people to protect forests and use them judiciously. It happened particularly in the forest areas which were in the vicinity of populated areas. Extension of agricultural frontiers further led to the problem of encroachments.

The worst impacts of the colonial forest policy, and its continuation in the post-independence era resulted into the continuous degradation of forest resources. As a result, more than half of India's forest are degraded today and very large areas, about 15 million hectares, remain completely deforested (Forest Survey of India 1989, Hadden 1986). Thus, having paid the high cost of extractive forest policy in terms of increased degradation of forest and deforestation of large areas, the Government of India in 1988 passed a new Forest Policy which noted that forests should not be looked upon as a source of revenue but as a national asset to be protected and enhanced for the well-being of the people and the country. One of the mandates of the new Forest Policy is to actively involve people in programs of

protection, conservation, and management of forests.

In June 1990, the Government of India further passed a resolution which provided more specific guidelines for involving people in forest management, i.e., regarding the formation, functioning, rights and responsibilities of community forest management. Thereafter some 10 state orders (Government Orders or GOs) endorsing participatory/joint forest management (JFM) have been passed. The JFM has thus appeared an alternative institutional framework to regenerate India's degraded forests. It is estimated that some 35 to 50 million hectares of disturbed natural forests in India can rapidly regenerate and experience significant increases in biomass production and biodiversity if people living in or surrounding these are involved in protection of natural forests (Poffenberger et al, 1992). The JFM thus aims at rejuvenating the old community forest management systems for managing state forestry resources which surround the village communities.

Under the JFM program, the legal ownership of land remains with the government but village communities become co-manager in the management of forest resources and are entitled to free usufruct benefits and some share in the intermediate and final harvests. The major achievement of the JFM program has been in terms of organizing voluntary protection of forests by local people. Village communities, by and large, have subscribed to the idea of providing protection. The protection efforts by and large determine the success of Forest Protection Committees (FPCs) in general. The obvious question then arises is: why people do engage in collective protection in some village communities and do not do so in other village communities? It is important to understand this paradox. An understanding of factors which affect collective protection efforts should facilitate policymakers and forestry

economists to amend the joint forest management program in order to make it more effective.

Although various models of collective action have been proposed in the literature, empirical testing has been rarely done. The present study is a modest attempt in this direction. It aims at exploring the causes of successful collective protection, based on a survey of 33 villages under the JFM program in Bharuch district of Gujarat, India. More specifically, the study aims at: (1) highlighting the JFM as an institutional innovation which underpins the collective action efforts; (2) econometrically testing the factors which ensure the collective action.

Salient features of JFM program as an institutional innovation in the study area are discussed in the next section, followed by a review of models of collective action and forest common property resources, tentative hypotheses of collective protection, and econometric models of collective protection are discussed in the subsequent section. Summary and conclusions are described in the last.

JOINT FOREST MANAGEMENT: AN INSTITUTIONAL INNOVATION

The JFM program in Gujarat was formally initiated in 1986. An estimate by the Principal Conservator of Forest (PCCF), Forest Department, Gujarat, is that some 1000 villages are under or in the process of adopting JFM program in the state. The JFM program in Gujarat is going on in the districts of Bharuch, Surat, Panchmahal, and Junagadh. But, the intensive and concentrated efforts are made specifically in the districts of Bharuch and Surat in the south Gujarat. A state level Working Group (WG) has been set up to help coordinate the activities of Forest Department and participating Non-Governmental

Organization (NGOs) and research institutions. The Working Group meets frequently to facilitate the participating agencies including the Forest Department. Participating NGOs are the Agha Khan Rural Support Program (AKRSP), Sadguru Foundation (SF), Viksat under Nehru Foundation. The AKRSP has primarily concentrated its efforts in Bharuch district and partially in Junagadh. Sadguru Foundation's work is in Panchmahal district. While Viksat has focussed more on north Gujarat areas such as Himmatnagar, Bhiloda, etc. The Forest Department has been very active in mobilizing JFM program in parts of Bharuch and Surat districts. In Bharuch, both Forest Department and AKRSP are operating. The JFM program in Bharuch district is primarily concentrated in three talukas, viz., Nandod, Valia, and Dediapada, covering approximately 50 to 60 villages¹. covering approximately 50 to 60 villages. There is an ample scope for JFM activities here as large land areas are available for afforestation; for example, some 31.5% and 55.6% of the total area under Nandod and Dediapada are respectively under community ownership as opposed only 5.4% in Valia Taluka. The population inhabiting these talukas is primarily tribal belonging to forest dwelling communities. The literacy rate in three talukas falls around 20 to 35%--that is well below the national literacy rate of 52%.

Village communities in these talukas are highly dependent upon forest resources. Their fuelwood and fodder requirements are mainly met from the nearby reserve forests. However, with the increasing pressure on reserve forests, villagers now have to invent internal sources: the JFM is one such program which meets the objectives of village self-reliance. To this end, crop residues and biogas as alternative source of energy are also becoming popular. There are some 4680 households in the study area. About 31% of total households are fully dependent upon fuelwood from forests for meeting their energy needs;

some 60% households also use crop residues for four months; the rest 9% use both crop residues for four months and biogas for the whole year. Their annual total fuelwood requirement comes to about 10287 tonnes and their actual consumption of fuelwood is 9064.87 tonnes--resulting into savings of 1185.13 tonnes through substitution of crop residues and biogas (Tewari 1994). It is estimated that about 4% of annual total fuelwood requirement and about 28% of the annual fodder requirement would be met by the JFM program (Table 1).

[Insert Table 1 here]

Both Forest Department and AKRSP have adopted villages for mobilizing the JFM program. The distribution of JFM villages across three talukas in between the Forest Department and AKRSP is shown in Table 2. There are a total of 53 villages in three talukas, of which 40% are adopted by the AKRSP and the rest by the Forest Department. The major objective of these agencies is to mobilize public opinion in favor of JFM and develop a self-managing organizational framework and related capabilities in the village communities.

[Insert Table 2 around here]

The first thing that agencies (AKRSP and FD) have done is to develop some kind of village level organizations which look after and be responsible for organizing collective protection from its members. The AKRSP calls it "Gram Vikas Mandal" (GVM) or Village Development Council while Forest Department has named it "Van Kalyan Samiti

(VKS)" or **Forest Protection Committee**. This is quite a task which requires convincing a sizeable numbers of villagers to join the JFM program. This requires in the first place frequent meetings and discussions with village opinion leaders and sharing of perceptions and opinions and declarations of values and interests in the preparatory phase. Discussions revealed that this could take from a few weeks to 6 to 8 months, depending upon the number and nature of interactions between agency and villagers.

The next phase involves the intensive consultation between the villagers and agency people for assessment of village resources using the **participatory rapid appraisal technique (PRA)**--this is "**appraisal**" phase. Under PRA, villagers gather at one place, discuss with one another and assess the village resources, prepare various charts, and take down various types of information which are very useful for future planning. Once the PRA exercise is over, the agency people closely examine the data and discuss the results with village people and try to build consensus. Villagers are then asked to identify current and expected problems that they may face and suggest alternate ways to solve them and find out a place for the JFM program in the scheme of things that can be done to thwart their fuelwood and fodder scarcity problems and problems of liquidity to meet various transaction needs of the community in general.

Having assessed the natural and human resource situation of the village, the agency's next task is to mobilize the village leadership and organize people to form Gram Vikas Mandal or Van Kalyan Samiti. This can be termed as **organization phase**. Both organizations--Van Kalyan Samiti and Gram Vikas Mandal-- are basically the same and their sole objective is to organize forest protection with the help of villagers. However, the GVM

has a broader functional base in that it meets several other needs of villagers in addition to organizing forest protection services. The GVM performs three other functions in addition to protection: (1) generating individual and GVM savings through its collective efforts thus providing banking facilities to villagers; (2) providing loans to its members for buying agricultural inputs and medicines; and (3) supplying agricultural inputs to villagers.

All those who work in afforestation program are paid through GVM. Further, GVM makes two types of deductions at the source: (1) GVM commission Deduction (GCD); (2) Individual Savings Deduction (ISD). The GVM commission is used for mainly GVM office, for buying implements and other agricultural inputs. The GVM deductions form the community savings. The individual's savings deductions are kept by the GVM in the individual's account with GVM. Members can take loan against these savings. Loans are generally given to buy agricultural inputs such as high yielding variety seeds, chemicals, etc., and also to buy medicine. Since access to agricultural input in the village is not easy, the GVM buys these inputs in bulk from nearby markets and retails it to villagers. Since timely supply of these input is necessary lest yield may go down, the GVM supplies of inputs with loan facility come in handy to villagers. The other noble thing that GVMs do is to provide medical finance. Many people who fall sick and have no money find this help a boon to them. This is in fact a biggest incentive to join the GVM for many members.

In the organization phase, the real action takes place and thus fruits of collective action begin to be reaped. It is also the time when resiliency of collaborative arrangement gets tested and adjustments get made. Following this phase comes the evaluation. In the evaluation phase each individual villager evaluates the program in his/her criteria and decides

whether or not to participate in the second cycle of participation or collective protection. The role of AKRSP or Forest Department hence is very critical for it shapes to the great extent whether the villagers will join the second cycle of participation or not. The success of the program depends upon repeated participation resulting into increased collective protection efforts by villagers. The major task of GVM/VKS in this respect is to organize and schedule patrolling by villagers on turns basis and to form rules for punishment of offenders. The offenders can be member and non-member individuals. In villages where 24 hour patrolling for 365 days of the year is done, the results are fabulous and villagers are happy too with what they have got in return. Thus, JFM has now appeared as an institutional information to mobilize collective action efforts by rural masses.

MODELS OF COLLECTIVE ACTION AND FOREST CPRs

The collective action refers to joint and concerted efforts by one or several groups of people achieving a common goal. Primarily the theory of collective action deals with the commodities which are either pure public good (which are jointly consumable with no congestion and have infinite exclusion cost) and common property resources or CPRs (which are jointly consumable with some congestion but have infinite cost of exclusion) (Nabli and Nugent, 1988). In the past, several models of collective action have been developed towards management of CPRs. Of these, models by Hardin (1968), Dawes (1973), and Olsen (1965, 1972) are very popular. Hardin (1968) envisioned an "open to all" pasture in order to explain the collective behavior of people towards using and maintaining the pasture. Here, every rational herder wants to enjoy benefits but does not want to share costs; the result is overgrazing leading to final ruin of pasture. Hardin's model is later formalized as a prisoner's dilemma game (Dawes 1973, 1975), showing that how individually rational

strategies lead to collectively irrational outcomes.

Olson (1965) challenged the generally held view that individuals with common interests would voluntarily act collectively (Bentley, 1949; Truman, 1958). He argued that simple common interests of participants in a group will not cause them to act collectively; rather it would depend upon a number of other factors too. According to him, the collective action is more likely to be feasible under the following circumstances: (1) When the group is smaller so that communication between members is quick and more personal and chances for free-riding are very much reduced. (2) When the group members are homogenous in their origin; there is a close social and physical proximity among members; (3) differing subgroups in the group have more differentiated goals. (4) When the group members are sensitive to a threatened loss due to inaction resulting from any misconduct of any member or so. (5) When the group has more unequal distribution of wealth and power among members, some powerful members may choose to free-ride without inviting any threatening response from other members. The first two things help members to agree on common methods and objectives and the third condition makes objectives of subgroups additive rather than competitive so as to ensure cooperation within subgroups. The fourth condition makes the non-cooperation strategy difficult and costlier.

Buchanan and Tullock's (1965) model of collective action states that a group comprising free and utility maximizing individuals choose to formulate and abide by a rule or set of rules for restrained use of CPRs if each individual finds it profitable to act collectively rather than individually. In other words, when individual's perceived benefits from joining the group exceed the perceived costs (external as well as internal). This model

is an improvement over Olson's model because it endogenizes the size of group unlike Olson's model. Hence it can explain the success of CPRs managed by groups of large members.

Hirschman (1970, 1981) and Olson (1971) have also discussed the role of political entrepreneur in promoting collective action. A political entrepreneur provides leadership and have communication and organization skills and assures that benefits of collective action would accrue to the participants. The other interesting work on collective action is the theory of Margin (McClusky, 1970 and Lupanga, 1988). The margin is defined as a ratio of load (L) to power (P) or L/P ; where L or load refers to the "self-and-social demands by a person to maintain a minimum level of autonomy" and P or power denotes "resources such as abilities, possessions, position, allies, etc., which person can command in coping with the load". Higher the ratio, the lesser the meaningful participation of individuals in the group activities. This theory can explain why collective action efforts in subsistence economies are difficult to come by as everybody is preoccupied with mere survival. But this model cannot explain why people choose to participate in one program and do not do so in other program. Korten (1983, pp.181-200) has argued that there are various other factors, other than load and power, which affect people's choices towards participation. These factors are expected returns and expected costs of participation in the group activities, attitudes, values, skills of people, design and other technological aspects the project, political and institutional environments, and the joint experience of people in working with groups.

As a matter of fact, all the above models are models of failure of collective action; and, nor do they lay down the conditions for its success. The major policy prescription that

comes out from these models is that other alternatives to collective actions need to be evolved. The protagonists of these models have suggested two alternatives: (1) an outright privatization of CPRs; and (2) state control of CPRs. Both solutions however are not appropriate for conserving and developing common pool forest resources. Wholesale privatization is expected to reduce the biodiversity of community-managed forest areas and also increase extraction rate which may lead to unsustainable production (Arnold, 1992). State policing mechanism have also proven costly and ineffective in monitoring. The choice then is to revive these CPRs with some kind of self-organizing and self-governing mechanisms. Thus understanding how individuals and groups design such self-governing systems of community forest management, and factors that affect their collective action efforts, are crucial for policy analysis.

Recently Ostrom (1991) has proposed an alternative model of collective action which calls for self-governance and self-organization of CPRs. Ostrom lays down conditions under which individuals would formulate and agree to abide by the rules of restrained use of common pool resources. Having formulated such arrangements, the next task is to ensure that they are sustainable for which, a framework for getting external support and for developing internal institutions is needed. Thus, both internal (internal to the group) and external (external to the group) environmental factors play significant role in making collective action successful (Ostrom, 1991, pp. 188.189). The internal environmental variables include: total number of decision makers, the number of participants minimally necessary to achieve collective benefits, the discount rate or risk perceptions of the group, similarities of interest, and presence of participants with substantial leadership or other assets, information about expected benefits, expected costs, shared norms and opportunities.

The external environmental variables refer to the activities of the external political regimes in particular. That is how the strategies of external actors affect the costs and benefits of CPR appropriators.

Cemea (1991, p.344) states that collective actions have the highest chance to occur and be effective in social forestry when people belong to organized groups, when they are informed and consciously perceive that it is their best interests to act purposively in a coordinated manner, and when the group has developed leadership structures and internal norms and procedures suitable to organize and manage its members and to overcome conflicts and deviant behaviors. Ostrom et al (1990) have developed an Institutional Analysis and Development (IAD) framework for analysis of forest CPRs in particular. This framework is nothing but a method for analyzing how attributes of the physical world interact with those of the general cultural setting and specific rules-in-use that affect the incentives facing individuals in specific situations. The major objective of this framework is to assist and predict the types of self-governing institutional arrangements which would most likely lead to the establishment of sustainable institutions.

It is therefore essential to understand how individuals of a group govern local common property forest. All around the globe, there are lessons of successful management of common property forests. For example, indigenous people in Brazil regulate the use of forest resources through ritual and customs which stem from a belief system (G'mez-Pompa and Kaus, 1992). In South Kenya, the Ngisonyika have developed a pastoral life style consistent with local ecosystem (Ellis 1984). Similarly, villagers in Uttar Pradesh, India, organize their own rules of extraction of fodder from forests, fix extraction levels, and

ensure rule-compliance through collective monitoring and sanctioning activities (Agrawal 1992).

The Joint Forest Management (JFM) is a new institutional innovation which seems to revive the spirit of collective action across the Indian countryside. Currently the program is running in some 10 states of India and other states are likely to follow suit. The major objective of this program is to enable villagers to manage their own and state forestry resources by organizing collective voluntary protection. In areas where people have been successful to arrange voluntary protection by groups, the success has been one hundred per cent.

COLLECTIVE PROTECTION UNDER JFM: SOME TENTATIVE HYPOTHESES

As we know, the success of JFM program hinges upon effective collective protection organized by village communities. The obvious question is that what makes some village communities so successful in organizing collective protection while others not. This however is difficult to attribute success to a particular factor *per se*; rather a set of factors or variables cause people to respond collectively to provide protection and to abide by a common set of rules and regulation. The successful collective protection is based upon four postulates:

Postulate One (P1): The village community subscribes to the principle of labor contribution towards protection.

Postulate Two (P2): The community subscribes to and abides by a set of rules for regulation of activities of its members towards using forest resources under JFM program.

Postulate Three (P3): The community decides punishment rules and approves of them being applied to its members and nonmembers (outsider) if found committing forest offence.

Postulate Four (P4): The community believes that its members would reap benefits of protection and members in general subscribe to a principle of distribution of benefits among themselves in a manner voluntarily acceptable to one and all. It need not be based on equity alone. These premises form the backbone of collective protection under the JFM program.

What makes collective protection efforts successful depends upon a number of factors which vary from one village to other. Some tentative hypotheses towards understanding the factors determining the success of collective protection are formed here based upon field surveys and discussions with village communities, forest officers, and Nongovernmental Organization (NGO) officials. Out of several possible reasons, village communities identified the perceived economic benefits as the major incentive to them to unite for providing collective protection. In the very first year of the program, villagers get wage employment in the digging and planting operations. At the going wage rate of Rs.32 per day, the total earning per year per household in different villages varies from Rs.500 to Rs.1000 per annum. This is considered relatively a good earning. In the very next year, the planted patch starts giving grass--an important input for livestock population in the village. This grass is available up to 5 to 7 years of age of forest. Thereafter, on and off, fuelwood becomes available in terms of fallen and dried twigs. Of both fuelwood and fodder, villagers value fuelwood supplies very highly as this is a really scarce resource to them. Had bamboo been planted, the cash returns start flowing in from 5th year onwards. Along with above, various commercial and non-commercial nontimber forest products are other economic attractions to village communities. These include commercial items like timru and Khakara leaves and non-commercial items like berries, fruits, etc. In addition, villagers also expect large economic gains when timber trees approach to harvestable age.

The size of village seems to have a negative relation with collective protection. A small village is most likely to have a homogenous population as differences, both economically and socially, among its members are minimum. The homogeneity of members leads to greater unity and trust among fellow villagers.

Other attributes of village such as amount of cultivable and other wastelands in the village, livestock population of the village, human population or number of households or decision-makers may also affect collective protection behavior (Olson, 1965). Besides village characteristics, the specific attributes of JFM forest may be considered important variables in explaining the collective action behavior of village communities. These may include variables like JFM area in the village, distance of JFM patch from village habitat, survival rate, density and number of sapling planted, etc.

Various sociological variables are also hypothesized to influence the collection protection behavior. The basic logic of including sociological variables as explanatory variables in the collective protection model stems from the fact that these capture the general awareness and alertness of the village communities about the new social programs and receptivity to them. Sociological variables basically refer to the quantity and quality of infrastructural and human capital in the village. Infrastructural capital refers to the type of new developments in the village such as electrification, drinking water facilities, etc. The human capital variables refer to the quantities and qualities of skills that local population possesses; these may include literacy rate, unemployed graduates in the village, etc.

Besides infrastructural and human capital variables, other variables which capture political and caste loyalties and cultural traits play important role in organization of Gram Vikas Mandals (GVM) or Van Kalyan Samitis (VKS). It has been observed that loyalty on political lines do not matter much when it comes to JFM program. Villagers do not seem to trust political parties as they feel that politicians only make empty promises. Village politics and JFM do not seem to go together hand in hand as in many villages the members of Gram Panchayat (GP) were not members of GVM/VKS. Lack of frequent interactions between villagers and elected representatives (MLAs, and MPs) further adds to the credibility to the above hypothesis. But, loyalty on castelines is considered to be from mild to strong. Since most of the villagers are inhabited by tribals, the tribal culture and faith are important parameter in engineering any program which involves people.

The organizational capabilities of village communities vary and depend on various factors. One of the important factor that is hypothesized tentatively to influence collective protection is the frequency of interaction among members of GVM/VKS and with agency people. More frequent interactions are expected to strengthen the collective protection behavior. The other interesting factor is the leadership. Where leaders have been enthusiastic and fair and honest in their approach to dealing with villagers, the collective protection seems to be doing well. Good leaders win the trust of villagers and in return people follow them unhesitatingly. For example, people of Pingot village reposed a greater trust in the village leader. The leader in return brought various benefits to the community. The GVM, Pingot has even won the prestigious Indira Priyadarshini Vriksharopan Award. It is felt that the revival of traditional leadership is important for making JFM a sustainable institution. The actions of traditional leaders are more governed by values than mere power

and money; the new generation is more attracted by power and money and their value systems seems to be elastic with respect to personal economic opportunities.

Besides trust in leader, the trust among fellow villagers is very important variable in facilitating various organizational and operating activities of GVM/VKS. For example, villagers of Motajambuda were found to have a greater trust among fellow-villagers and JFM here is very successful. On the other hand, villagers in Nanajambuda have very little trust among themselves and consequently the very poor collective protection.

Area under protection in the neighboring villages plays important role in making collective protection successful. Since the presence of JFM program in neighboring villages prevents stealing, it strengthens the collective protection efforts and lessens motives for members for stealing or committing any forest offence. The effects may occur also other way round; that is, the presence of JFM in any village may induce similar activities in the neighboring villages through demonstration.

Other psychological factors also influence the collective protection efforts such as community enthusiasm or motivation, visits of very important persons (VIPs) and agency officials to the village etc., expectation building by agency people, level of trust of villagers in the agency that looks after the JFM program. The community enthusiasm or motivation positively affects the collective protection efforts. Communities which do not show enthusiasm do not put their heart and soul into making it a success. Leadership of the village and general awareness and exposure to outside world plays important role in shaping the motivation of the community. Villages where motivation among villagers was very high had

no problem of protection; for example, the villages of Soliya, Pingot, Kabripathar, Samarbada, etc., Members of GVM/VKS in villages where enthusiasm is at its low ebb find excuses to avoid protection duties. Examples are villages of Nanajambuda, Chuli, Singalwan, etc. Regarding VIP visits, it is difficult to say how it affects the collective protection behavior; but it enthuses villagers². Peoples in villages like Soliya, Pingot, etc., take pride in what they are doing; VIP visits confirm their faith that whatever they have done is good and exemplary. People also assume in some quarters that impressing upon VIPs would bring more investment in the village in terms of more grants, awards, better wages, etc.

Visits by the agency officials, be it Forest Department or AKRSP, play important role in strengthening the people's determination towards collective protection. Villagers however treat both differently. Dealing with the Forest Department to villagers is like dealing with government. They shower more faith and trust in Forest Department officials and expect them to solve their many other problems which are not related to forest per se. Tribal village communities in general take pride in associating with Forest Department as they consider the Forest Department as representative of government. People expect that they may gain from this association in the long run. The gains that villagers have in mind is good jobs for his/her sons; if not for all, then at least for their eldest son. A good job to them is a permanent position of peon or like. In addition, Range Forest Officers (RFOs) of different ranges expressed that they are besieged with various complaints and requests which do not come under the purview of the Forest Department. However, RFOs do pass their requests or complaints on to respective government departments such as police, revenue, etc. But problem comes when no action is taken by these departments and village communities blame

on forest officials for not helping them. However, this is not the impression forest officials would like to create. But, at the same time they do not want to destroy their image of do-gooder. Forest officials do not commit themselves to villagers' demands nor do they reject it in an outright manner for fear of alienating villagers. Villagers do discuss their complaints and requests with AKRSP but do not expect them to do something as they know that AKRSP is a non-governmental organization and it does not have much say in governmental matters. The other benefits that villagers expect from these agencies are in terms of infrastructural developments such as good roads, good health facilities, and sale of their produce at a good price, etc. But again most of these things fall out of the purview of Forest Department or AKRSP.

It is hypothesized that increased numbers of visits by agency officials tend to convince villagers about the utility of program and convey the good intentions of the agency as such in helping them. For example, people from Garada village seemed very enthusiastic about the JFM perhaps because of regular visits by forest officials while people from Bhooshbeheda village were not excited about the program as forest officials rarely visited this village.

Further, based on the discussions with villagers in different village communities, it is evident that current impressions of benefit sharing arrangements are going to play most important role in influencing the sustainability of JFM as an institution. In most villages surveyed, villagers were not very sure about benefit sharing arrangements with Forest Department. But people have some expectations and faith in Forest Department that it will honor the oral agreements which have taken place between communities and the Forest Department. Roughly, the Forest Department has agreed to share the economic benefits in

the ratio 75:25, i.e., 75% to the Forest Department and 25% to the villagers. In addition, villagers will have the right to use usufruct benefits in terms of non-timber forest products such as fuelwood, fodder, etc. Thus, a psychological contract between village communities and Forest Department has been signed; but this is an intangible document, which is very unreliable, and not challengeable in the court of law, involving uncertainty in the people's mind. As soon as there are indications of not honoring this contract by Forest Department, the things change over night. A very good case is of Kabripathar village. The JFM work in Kabripathar village started with the above psychological contract in the mind. But before arrival of any economic benefits, the dispute arose between Forest Department and village community on the sharing of benefits. The Forest Department had agreed to 75:25 sharing arrangement in 1986. In 1993, when the first crop of bamboo was ready for harvest, the Forest Department made clear that this year no benefits would be shared with villagers. The reason for this is not known and needs to be investigated further. Repeated pleas by villagers to Forest Department fell on deaf ears. The result was horrendous; people cut the left-over forest overnight and stopped protection altogether. The sensitivity of this psychological agreement is thus very important which must be borne in mind when thinking of making JFM a sustainable institution.

Based on the above discussion, we can now prepare a summary of possible factors or explanatory variables which would possibly affect the collective protection behavior of village communities *per se*. For convenience of description and understanding, we can classify the factors into six broad categories: (1) physical variables representing the characteristics of forest area, denoted by CJFM; (2) physical variables reflecting on characteristics of the village communities in general, denoted by CVLG; (3) economic

variables reflecting, in particular, the expected economic benefits- and cost-streams from the joint forest management activity that may attract village community in general, denoted by ECBC; (4) sociological variables relating to the structure, conduct, and functioning rules of the village community at large within which people have to operate and evaluate each others' performances or acts of the society; denoted by SVLG; (5) organizational variables reflecting upon the organizational capabilities of village communities with respect to making and enforcing rules regarding collective protection, denoted by OJFM; (6) psychological variables that reflect upon the psyche of society and its individuals at large in founding a sustainable institution denoted by PVLC; Psychological variables include intangible variables such as trust in leadership and among fellow-villagers, some specific acts of forest or AKRSP officials which are visualized by village community as source of motivation; (7) other miscellaneous variables which may affect collective protection behavior but not included in above (U). An exhaustive list of explanatory variable under the seven broad categories are summarized in Appendix A. We can now write the following conceptual model to explain the collective protection behavior (PMDS) which can be proxied through the protection mandays per annum:

$$PDMS_i = f(CJFM_{ij}, CVLG_{ij}, ECBC_{ij}, SVLG_{ij}, OJFM_{ij}, PVLC_{ij}, U_i) \quad (1)$$

where i is the village and j represents the number of variables or characteristics in the particular set of variables.

ECONOMETRIC MODEL

Data for the estimation of above conceptual were obtained primarily from village surveys. Some 41 villages from these talukas were surveyed and finally a set of 33 villages was chosen for analysis as it had the complete data points for all possible variables. The list of 33 villages is given in Appendix B. The above-specified conceptual equation was estimated for three sets of data: (1) JFM villages under AKRSP; (2) JFM villages under the Forest Department, and (3) an aggregate of the above two sets of JFM villages. In all, we had some 56 empirically tractable explanatory variables. The Time Series Processor (TSP) was used for estimation.

The estimated collective protection regression results for three sets of data are given in Table 3. Notations used to denote variables are presented in Appendix C. In over all, regression results appear very robust and interesting. The adjusted R^2 values for all three models hover around 95 to 98%. Large F-values indicate that all models are significant at 1% level of significance. There is no problem of autocorrelation in all models. Most explanatory variables--some 50 to 60% of the total numbers of variables--are significant at 5% level significance and appear with expected right signs.

[Insert Table 3 around here]

An examination of collective protection regression results suggests that the success of collective protection efforts depends upon some key variables. For example, the membership strength of the GVM/VKS (TMS) comes very significant in all three models, suggesting that an unit increase in membership would increase the protection mandays on an

average by 5.32, 8.00, and 7.02 mandays respectively in the AKRSP, FD, and aggregate sample JFM villages. In other words, addition of one extra member to the GVM/VKS, on the averages, contributes about one week of extra-protection.

The other important variable that affects the collective protection is the size of village which was proxied by the total numbers of households (TNHH) or total population of the village (TPOP). In the AKRSP sample villages, the variable TNHH appears with expected negative sign and is significant at 10% level of significance; while in the case of FD sample villages the TPOP appeared significant at 10% level of significance and with right sign. As opposed to this, size of village does not seem to be an important variable at the aggregate level. Rather, the ratio of landless to total households (RLSH) appeared very significant and with positive sign, indicating that the landless household population contributes significantly to the collective protection efforts.

In contrast to the total size of village, the areas under the JFM is positively related to the collective protection. This variable, JFMA, comes significant at 5% level of significance in both AKRSP and FD equations, but not in the aggregate one. A one hectare increase in the JFM area would likely to add 1.6 and 10.1 mandays of protection in the JFM villages coordinated by respectively the AKRSP and the Forest Department.

As opposed to general belief, the total illiterate population of the village (IPOP) comes significant at 5% level of significance with positive sign in AKRSP and FD sample villages. On the other hand the total population of unemployed graduates (UGAD) contributes negatively to the collective protection in both AKRSP and FD sample villages.

However, both variables, IPOP and UGAD, appeared non-significant in the aggregate equation. The seemingly illogical relation that the illiterate population contributes positively while the educated youth, though unemployed, effect the collective protection efforts negatively, becomes explicit as soon as we look into the opportunity costs and level of expectation of these two groups of people in the village. The opportunity costs of illiterate population is lower than that of the unemployed graduates while their expectations about the possible income that they can earn are other way around. Illiterate population of the village has also got little exposure to the outside world and are more mature in terms of life-experiences; this makes them more cooperative towards attaining a common objective. On the other hand, unemployed graduates are an unsatisfied lot and take more interest in getting out of the village. But this argument should not be construed to claim that adult literacy is undesirable. Rather, we find that the adult literacy (LRAP) positively contributed to collective protection as shown by the aggregate equation. This suggests a non-linear relationship between education and collective protection. In other words, as the literacy is increased to the point of graduation, it contributes positively to the collective protection. But beyond graduation, the relationship between the two turns negative.

The number of visits made by the coordinating agency (VAG) appear significant and with positive sign, suggesting very high impacts on the collective protection efforts of the village. An extra-visit to a village on an average results into an increase of 21 mandays of collective protection. The importance of visit is perhaps more in JFM villages coordinated by the Forest Department wherein one extra visit results into an increase of 118 mandays gone in collective protection. In the case of AKRSP villages, this variable did not appear significant and distorted signs of other variables.

As opposed to the general belief, the total number of meetings or average number of meetings per annum (TNM and ANM) did not appear significantly in all models. One probable reason for this is that the numbers of meetings become irrelevant in a closed village environment wherein all village members happen to meet frequently and informal oral communication plays more important role. Numbers of formal communication contacts hence do not matter as most of the communication of ideas and opinions is through the non-formal casual contacts.

Of the expected benefits from JFM to villagers, fuelwood and fodder supplies are primary ones. Regression results suggest that fuelwood matters more to villagers than fodder since the former is relatively more scarce than the latter. Both ratio variables (FDR and FWR) have appeared significant at 5% level of significance in the aggregate collective protection equation. Fuelwood ratio (FWR) appears more important than fodder ratio (FDR) as evident from the size of regression coefficient. For example an unit increase in the fuelwood would increase collective protection efforts by 2102 mandays. The FDR is significant but not rightly signed. Fodder from JFM is available for initial years, beginning from third year until 10th year. After that grass yield is almost nil or negligible.

The relationship between livestock population of the village and collective protection efforts seem to appear negative on the aggregate. For example, the number of buffaloes (NBUF) comes significant and negatively signed in the aggregate equation but fails to appear significant in the FD and AKRSP equations. The dummy variable DVR (1 = FD, 0 = AKRSP) used for capturing the impacts of the coordinating agencies does not appear significant, suggesting that the influence of two agencies on collective protection, other things

remaining the same, is almost the same. They are not drastically different.

The elasticities of collective protection at mean levels with respect to different explanatory variables are given in Table 4. One interesting thing to note is that most of them appear inelastic. This would suggest that a mix of policy variables would be required to bring a large change in the collective protection efforts, rather than concentrating on one or two variables as may be the general impression.

[Insert Table 4 around here]

SUMMARY AND CONCLUSIONS

This study, based on Bharuch district in Gujarat, throws light on the collective protection of jointly managed forest areas and tries to explain that what makes the collective protection successful. Based upon primary survey data, the study builds upon some hypotheses and tests them using econometric approach. Results suggest that the following factors contribute to the success of collective protection: (1) size of membership of GVM/VKS; (2) size of total illiterate population; (3) size of expected economic benefits from JFM, (4) numbers of visits by the coordinating agency; (5) years of interaction with the coordinating agency. The following factors contribute negatively: (1) the size of village; (2) unemployed graduates in the village; (3) livestock population of the village.

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Table 1: Expected Fuelwood and Fodder Benefits from JFM in the Study Area

Particulars	Annual total requirement	Expected annual supply from JFM	Share of JFM supply
Tonnes.....		..%..
Fuelwood	10287	378	3.67
Fodder	120440	34100	28.31

Source: Author's Estimation

Table 2: Distribution of JFM Villages between Agha Khan Rural Support Program (AKRSP) and Forest Department (FD) in Bharuch District, Gujarat

Taluka	Agency		Total
	AKRSP	FD	
Nandod	00	7	7 (13.2)a
Dediapada	10	18	28 (52.8)
Valia	11	7	18 (34.0)
Total	21 (39.6) ^a	32 (60.3)	53 (100)

^a Figure in parentheses are percentage to total.

Source: Based on Survey

Table 3: Collective Protection Regression Results for JFM Villages Adopted by AKRSP and FD and for the Aggregate Sample in Bharuch District, Gujarat (Dependent Variable = PMDS)

Particulars	Coefficients and t-Values		
	AKRSP	FD	Aggregate (AKRSP + FD)
Constant	268.27 (2.39)	-4719.45 (-4.11)	-1853.74 (-2.01)
Independent Variables			
TNHH	-8.89 (-3.03)@	-	-
TPOP	-	-1.06 (1.71)@	-
IPOP	2.17 (3.93)*	2.57 (2.68)*	0.25 (1.93)@
AMWF	1.26 (4.17)*	2.95 (1.70)\$	0.35 (1.06)
UGAD	-270.13 (4.63)*	-212.00 (3.18)*	3.17 (0.16)
TMS	4.06 (4.83)*	8.00 (9.54)*	7.11 (14.29)*
TNM	-	-	-
ANM	-	-	-
FDR	-92.96 (0.66)	-621.34 (1.95)@	-547.93 (3.37)*
FWR	1462.09 (1.19)@	3438.68 (4.17)*	2082.09 (3.90)*
JFMA	1.11 (2.62)*	10.17 (2.86)*	-
NBUF	4.22 (1.60)\$	-	-1.95 (2.91)*
TLSU	-	-0.41 (1.12)	-
RLSH	-	-	6360.08 (2.15)*
LRAP	-	-	7.75 (2.31)*
VAG	-	118.54 (4.33)*	24.17 (2.72)*
IAG	42.92 (1.86)	268.26 (2.92)*	14.82 (0.59)
MOT	136.41 (1.99)*	296.86 (2.08)*	133.52 (1.95)@
DPS	-	1.20 (3.39)*	-
DVR	-	-	-18.20 (0.28)
Test Statistics			
N	15	18	33
R ²	0.9983	0.9713	0.9513
F	169.50**	45.34**	49.10**
DW	1.4216	2.16	2.0265
SER	51.88	105.70	133.56

** Significant at 1% level of significance
 * Significant at 5% level of significance
 @ Significant at 10% level of significance
 \$ Significant at 20% level of significance

Source: Estimation

Table 4: Estimates of Elasticities of Collective Protection With respect to Different Explanatory Variables, for AKRSP, FD, and Aggregate Sample Sizes, Gujarat.

Variables	AKRSP	FD	Aggregate (AKRSP + FD)
Independent Variables			
TNHH	-0.96	-	-
TPOP	-	-0.53	-
IPOP	1.05	0.94	0.10
AMWF	0.21	0.38	0.05
UGAD	0.21	-0.23	0.003
TMS	0.32	0.63	0.56
TNM	-	-	-
ANM	-	-	-
FDR	-0.02	-0.17	-0.14
FWR	0.04	0.18	0.09
JFMA	0.05	0.26	-
NBUF	0.16	-	-0.08
TLSU	-	-0.16	-
RLSH	-	-	1.33
LRAP	-	-	0.13
VAG	-	0.77	0.15
IAG	0.12	0.44	0.03
MOT	0.04	0.11	0.02
DPS	-	1.69	-
DVR	-	-	-0.006

Source: Constructed from Table 3

APPENDIX A: LIST OF VARIABLES**Table A-1: An Exhaustive List of Variables Affecting Collective Protection Behavior, Bharuch, Gujarat**

A Physical Variables (JFM Attributes):

- 1) Area under jointly managed forest areas.
- 2) Distance of village habitat from the JFM patch.
- 3) Number of trees species planted.
- 4) Total number of saplings planted.
- 5) Density of planted saplings.
- 6) Average survival rate of planted saplings.
- 7) Wage employment generated through afforestation program.
- 8) Quality of land afforested.

B Physical Variables (Village Attributes):

- 1) Total area of the village.
- 2) Net cultivated area.
- 3) Cultivable wasteland.
- 4) Permanent pasture land.
- 5) Barren and uncultivable land.
- 6) Total area under forest.
- 7) Land under non-agricultural uses.
- 8) Number of cows and bullocks.
- 9) Number of buffaloes.
- 10) Number of goats.
- 11) Number of sheep.
- 12) Total livestock population.
- 13) Total population of village.
- 14) Total adult male population of village.
- 15) Total adult female population of village.
- 16) Total children population of village.

C Economic Variables:

- 1) Amount of grass from JFM.
 - 2) Years of grass availability from JFM.
 - 3) Fuelwood from JFM.
 - 4) Expected timber benefits from JFM.
 - 5) Adult male work force.
 - 6) Adult female work force.
 - 7) Fuelwood requirement.
 - 8) Fodder requirement.
-

Table A-1: An Exhaustive List of Variables Affecting Collective Protection Behavior, Bharuch, Gujarat (contd..)

D Sociological Variables:

- 1) Total Numbers of households.
- 2) Average family size.
- 3) Adult male literacy rate.
- 4) Adult female literacy rate.

- 5) Children literacy rate.
- 6) Total number of graduates in the village.
- 7) Total number of unemployed graduates in the village.
- 8) Number of drinking water sources.
- 9) Number of electrified households.
- 10) Proportion of majority caste in the village (Homogeneity of the society).
- 11) Villagers employed outside the village.
- 12) Nonlocal educated people living in the village.

E Organizational Variables:

- 1) Number of GVM members.
- 2) Growth in GVM membership.
- 3) Number of years JFM has been going on.
- 4) Number of women GVM members.
- 5) Average number of GVM meetings per year.
- 6) Total number of GVM meetings until now.
- 7) Leadership (traditional versus new).

F Psychological Variables:

- 1) Awareness about JFM.
- 2) Community enthusiasm or motivation.
- 3) Trust in the leadership.
- 4) Level of trust among villagers.
- 5) Community expectations about economic benefits and benefit sharing.

G Other Miscellaneous Variables:

- 1) Implementation efficiency (time taken between initiation and starting of actual JFM work).
 - 2) Frequency of visits by Forest Department or AKRSP officials.
 - 3) Number of visits by VIPs.
 - 4) Interaction mandays/years with Forest Department/AKRSP.
-

**APPENDIX B: LIST OF VILLAGES CHOSEN
FOR ECONOMETRIC ANALYSIS (AGENCYWISE)**

Sl. No.	Name of village	Agency
1.	Gajargota	FD
2.	Kabirpathar	AKRSP
3.	Navagam	FD
4.	Zarnawadi	FD
5.	Bandisherwan	FD
6.	Khunbar	FD
7.	Dhankethar	FD
8.	Khokhraumar	FD
9.	Panplapada	AKRSP
10.	Khaidipada	AKRSP
11.	Babda	AKRSP
12.	Nigat	FD
13.	Magardeo	FD
14.	Bhatpur	FD
15.	Ambakhadi	AKRSP
16.	Chuli	FD
17.	Bhoothbaheda	FD
18.	Samarpuda	AKRSP
19.	Garada	FD
20.	Pingot	AKRSP
21.	Soliya	AKRSP
22.	Nanajambuda	AKRSP
23.	Kakadkui	AKRSP
24.	Motajambuda	AKRSP
25.	Rajgat	AKRSP
26.	Sakwa	AKRSP
27.	Kavachiya	AKRSP
28.	Motia	AKRSP
29.	Singalvan	FD
30.	Koylivao	FD
31.	Vanji	FD
32.	Nagatpur	FD
33.	Gora	FD

FD : Forest Department; AKRSP : Agha Khan Rural Support Program (India)

Source: Based on Survey

APPENDIX C: DESCRIPTION OF VARIABLES AND THEIR NOTATION

Variable Notation	Variable Description
VAG	Number of visits per annum by NGO/FD personnel
FWR	Fuelwood ratio (expected fuelwood from JFM/total fuelwood requirement of the village)
TMS	Total members of GVM or VKS
AMWF	Adult male work force in the village
LTH	Ratio of landless to total numbers of households
VGAD	Total unemployed graduates
IPOP	Total illiterate population
PIM	Percentage increase in members of GVM/VKS
MOT	Motivation
FDR	Fodder ratio (annual grass from JFM/total fodder requirement of village)
DVR	Dummy variable (FD-1 & AKRSP-0)
NBUF	Number of buffaloes
TNM	Total number of meetings held up to now by GVM/VKS
ANM	Number of meeting per annum held by GVM/VKS
IAG	Number of years interacted with NGO/FD
LRAP	Literacy rate among adult population
FWRF	Fuelwood ratio (expected fuelwood from JFM/total fuelwood requirement of the village)
TNHH	Total number of households in the village
TPOP	Total population of village
AJF	JFM Area
DPS	Density of planted saplings per ha.
NCOW	No of cows
TLSU	Total livestock units in the village

ENDNOTES

1. Bharuch is the eighth largest district in Gujarat, having total geographical area of the district is about 9038 square kilometers. The entire district comprises some 11 talukas, covering 7600 square kilometers and some 1123 villages. The total population of the district was about 15.4 lacs in 1991, more than 80% of it lived in rural areas.
2. VIPs may include high ranking Forest Department or AKRSP officials, people from other reputed institutes such as IIMA, etc.