Determinants of Sustainable Management of Natural Resources: The Case of Joint Forest Management (JFM) in India

A Research Proposal

May 2003

Bhagirath Behera
ZEFb

Center for Development Research (ZEF),
University of Bonn, Germany
Motivation

Since the mid 1980s devolution and decentralization of natural resource management has become a policy tool for many developing countries across the globe. Countries have devolved and decentralized their resource use and management system to the users. The apparent change in policy from the state-managed top down approach to the community level is fueled by the recognition of the limits of government agencies in managing resources at the local level, which has resulted in massive degradation of natural resources and of local people’s livelihood systems. A consensus has emerged among academics, policy makers and national and international donor agencies and NGOs that local communities should be involved in managing their resources. In fact, a large body of case studies has demonstrated that local user groups can devise institutions to manage resources sustainably (Baland and Platteau, 1996; Ostrom, 1990 and Bromley, 1992).

Nearly every country in the world is currently experimenting with some form of community resource management by devolving some of their power to the community to use and manage the resources (Edmonds, 2002). However, empirical outcomes of such devolution of resource use and management are mixed and the reasons for differences in performance of outcomes are still not fully understood.

India, where the proposed study area is located, has been at the forefront of devolving natural resource management to the local community, particularly in the forestry sector, since more than a decade. The 1988 forest policy was a landmark in the history of Indian forest policy which for the first time recognized the importance of community involvement in the forest management for improvements of their livelihood systems and protection of forest resources. In a follow up document issued in 1990, Central government issued guidelines to all the state governments to implement ‘Joint Forest Management Systems’ by devolving everyday forest use and management rights to the community (GOI, 1990). Accordingly, almost all the States have formally resolved to implement JFM, making it one of the largest of such programs in the world. As of March 31, 2001 there were 44,943 official JFM groups (Village Forest Councils) protecting over 11.63 million ha of government owned forest (15.5% of the recorded forest area of the country) (Kumar, 2002).
The overall empirical evidence on the outcomes of JFM is mixed. Some studies have shown improvements in outcomes such as increased yield of timber and non timber forest products (NTFPs), fuelwood, fodder, etc, across some regions in India (Joshi, 1999; Khare et al., 2000; Ballabh et al., 2002 and TERI, 2000). In terms of economic gain from JFM to a cross section of the community, a recent study has shown that poor section people are worse off compare to their wealthier counterpart (Kumar, 2002). The interest of this study, therefore, is to measure different possible outcomes of JFM and see how the outcomes are distributed across the households. Three outcomes to be considered for an in-depth assessment are: economic, distributional and ecological.

The proposed research intends to analyse the process and outcomes of the Joint Forest Management (JFM) program at the community level. Based on this analysis, it is expected to identify factors that are responsible for differential outcomes across communities as well as policy instruments that could contribute to the long-run sustainability of the program. Existing studies suggest that the structure of organizational and institutional arrangements of JFM is such that power is distributed unevenly among the stakeholders (Sarin, 1999 and Kumar, 2000). Hence the study will make an attempt to critically analyze the present institutional arrangements of JFM and its imbalances of power among stakeholders.

There are at least two principal stakeholders in the JFM regime: the state, as represented by functionaries of the Forest Department at the field level; and the community, usually grouped together in a collective decision making body (Forest Protection Committee (FPC)) (see Figure 1). However, communities delegate decision-making and negotiation to a subset of the community in form of an executive body. The FPC as a whole meets generally once or twice a year and the executive body twice a month in order to take decisions on use and management of forests. The community resource management problems in JFM, as indicated from the literature, arise in two ways. First, it arises when rules for the use and management of forests are set in the community (rule setting). Who sets the rules for access and management of forests within the communities? How
effective are these rules in addressing issues of equity and efficiency? To what extent do village elite groups influence these rules in their favor? The second problem pertaining to community resource management arises over monitoring and enforcement of rules in the community. How effectively are the rules monitored and enforced?

Figure 1: The Organizational Structure of Joint Forest Management

Note: FD = Forest Department  
NGOs = Nongovernmental organizations  
FPCs = Forest Protection Committees

Figure 1 depicts the involvement of actors and their roles in the JFM program. The graph is made based on the responsibilities provided to different actors in Andhra Pradesh JFM guidelines, where this research is proposed to carry out. Although there is no mention of any role of local government (panchayat) in JFM guidelines, we expect that there may have some influence of local government in the decision making processes in JFM given the nature of current politicization of rural India. A special reference can be made with respect to the social structure of Andhra Pradesh where the prevalence of the caste system
is pervasive. The upper caste people in the village are often found to be dominating in all aspects of rural life. Hence we put different influential groups in the community such as local government, upper caste groups, rich farmers and others in the category of ‘elite groups’ in the figure.

One major challenge of this research is to identify factors that influence outcomes across the communities. A large body of literature exists on this issue. However, most of the literature is descriptive in nature and lacks comprehension. Therefore, the study will contribute to this literature by collecting quantitative information from a cross section of communities, which will allow to test the empirical relevance of hypothesized influencing factors for JFM.

On the basis of the above backdrop, the research has the following objectives.

2 Overall Research Objectives
The overall objective of the proposed research is to analyze the process and outcomes (economic, distributional, and environmental and institutional) of Joint Forest Management (JFM) at the local level, and to find out the key factors that determine the effective participation of communities in JFM and its long run sustainability.

3 Specific Research Objectives
The following specific research objectives will be pursued. In doing so, the study will focus on one particular state, Andhra Pradesh.
   a. To examine the institutional and organizational mechanism of Joint Forest Management (JFM) and to critically analyze the underlining imbalances in decision making power among the various agents involved in JFM;
   b. To assess the economic, distributional, and ecological outcomes of the JFM program at the community level;
   c. To identify the key factors that determine differences in outcomes of JFM across communities;
d. To identify policies that will help in improving outcomes and sustaining the program in the long run.

4 Discussion of Objectives and Review of Related Literature

a. Institutional and organizational mechanism of JFM and power imbalances

One often stated purpose of devolution and community-based natural resource management is to create a space for local people to participate and benefit from new policies by asserting their local interest and livelihood needs. However, often rhetoric does not reflect the reality. Doubts have been raised on whether local resource users under JFM are really empowered to influence the outcomes for their benefit. It is often argued that the state provided benefits to local communities through devolution policies as an incentive to encourage people to support activities that meet government revenue and conservation interest rather than local livelihoods (Shackleton, 2002; Kumar, 2002).

The study would examine the extent to which devolution has transferred control over natural resource management decisions to the local people. The study would examine the key stakeholders in the JFM program—such as the Forest Department, NGOs, donor agencies, local level governments and village communities—and examine how they influence the outcomes. More importantly, it would investigate who is really controlling and making decisions in the whole process. Often unclear and overlapping jurisdictions and mandates lead to institutional conflict and struggles for power and revenues (Kumar, 2000). For instance, conflict between traditional village leaders (or elite groups in the village), local elected government and JFM communities is widely prevailing in many states (Saxena, 1999 and Sarin, 1996). In many cases the influence of government and local elites in the decision-making process is found to be very strong, which may severely dilute community representation. NGOs and donor agencies also shape the outcomes by allying themselves with a particular local group or government officials (Shackleton, 2002 and Kumar, 2000). In some instances donor agencies have caused damage to existing well functioning institutions due to a poor understanding of the local situation (Sarin, 2001). The study will contribute to this existing literature with more detailed analysis of institutional arrangements and imbalances of decision-making power among stakeholders.
b. Outcomes of JFM
The research will try to assess three types of outcomes of the JFM program: economic, distributional/social, and ecological and institutional. Economic outcomes are those related to income and poverty levels in the communities. Distributional outcomes relate to the distribution of benefits and costs within the community. Who are the people that actually benefit most from the JFM program within the communities? Are most forest dependent and marginalized people, for whom the JFM program is supposed to bring benefits, actually better off than before JFM was introduced? Recently a comparative study between JFM and non-JFM villages in the state of Jharkhand found that richer section people have benefited under JFM at the expense of poorer ones (Kumar, 2002). Similarly, many studies have documented that under the strict rules of JFM, poor people are deprived of their genuine rights to access non-timber forest produce (Sarin, 1996 and 1999; Agarwal, 2001). Social outcomes also relate to the issue of how much voice do the communities, especially the poorer sections, have in articulating their needs and priorities in forest management. Finally, the main aim of the JFM program as stated in the 1988 forest policy was to reduce forest degradation (Saxena, 1997 and 1999 and Khare et al., 2000). Hence the study would attempt to examine whether JFM results in a more sustainable use of the forest. A systematic study of these outcomes is rarely found in the existing literature on JFM. Therefore, the study will make an attempt to contribute a comprehensive and systematic assessment of these outcomes for a cross section of communities.

c. Key factors determining differences in outcomes of JFM
A large body of literature from different disciplines such as game theoretic, political and socio-anthropological case studies has put forward hypotheses on factors determining differential outcomes of community resource management (Wade, 1988; Ostrom, 1990 and Baland and Platteau, 1996). The study will make an attempt to identify the key factors that cause differences in equity, efficiency, and ecological and institutional outcomes of JFM across communities. This will be done through a detailed review of the existing literature on JFM and the empirical as well as theoretical literature on common
pool resources (CPRs)\textsuperscript{1} and collective action. The following types of factors should be included: socio-economic, ecological, policy and institutional. Agrawal (2001) has listed a total of 33 variables from the CPR literature hypothesized to be important for a sustainable governance of natural resources (see Table 1). The generalizability of case study evidence is generally not clear. In most of the existing empirical studies the analysis of the organizational and institutional variable is usually approached in a descriptive and qualitative way and suffers serious drawbacks of lack of rigorous indicators through which organization can be studied as a dependent variable. Moreover, theoretical models often yield ambiguities in the effects of particular factors, which can only be resolved through empirical analysis. Only few recent studies have attempted to test such hypotheses more rigorously using econometrics (e.g., Heltberg, 2001; Ahuja, 1998) and none of them has focused on the case of JFM. Agrawal (2001) stresses the need for more such ‘large n’ studies. The proposed research intends to conduct such a study for the case of JFM.

\textbf{d. Policy recommendations}

The study intends to identify suitable policies to support sustainable forest resource management by identifying the key factors conducive to a successful resource management under JFM and policies, which affect these key factors.

\textbf{5 Methodology}

The study will be carried out both at theoretical as well as empirical levels. An intensive review of studies dealing with JFM as well as the literature on CPRs and collective action will be carried out. The empirical study will be based on both primary and secondary data. Secondary data sources include the population census, Forest Department records, village \textit{patwar}\textsuperscript{2} and others. Primary data will be collected in form of both a community-level and a household-level survey in approx. 50 village communities in the state of Andhra Pradesh. Representative communities will be identified using the secondary data

\textsuperscript{1} Common pool resources (CPRs) are defined as the resources, which has characteristics of: (1) exclusion of individuals from use is costly, and (2) resource use by one individual diminishes resource available to others (Ostrom, 1990).

\textsuperscript{2} A person employed by the revenue departments who keeps detailed information on their respective villages.
available. At the community-level, detailed information will be gathered by administering a structured questionnaire to one or two key informants (most likely a community member knowledgeable of general community issues, and a member of the executive body of the FPCs). Around 10-15 households will be selected from each community for a household survey. Selection will be based on prior statistics on the proportion of relevant sections in the community (e.g., based on caste, land holding, and/or different forest uses), which will be computed based on the secondary data available.

The decision to focus the analysis on the state of Andhra Pradesh for the fieldwork is motivated by the following considerations. Andhra Pradesh adopted the JFM program in 1993 and has become one of the leading states in India in implementing JFM on a wide scale. This should permit to see the impact of JFM on various outcomes as well as the institutional sustainability. Moreover, the state started with a benefit share of 50% given to local communities, but then increased the share to 100% in 1996. This should permit gaining some insights on the effect of the benefit share on resource management decisions. What follows is a brief description of methodologies on how to operationalise each objective.

5.1 Methodology for Objective a
Existing literature on the legal setting and the political economy of JFM in Andhra Pradesh will be reviewed. In addition, the household and community questionnaires will include questions on processes under which various decisions on management and use of forests take place. Questions will be asked about the extent of involvement of Forest Department and the influence of local elites in the process of decision-making. Apart from that small focused group discussions will be held separately with different groups of users in a few selected communities to gain insights about their views, perceptions and problems on the whole process of management.
5.2 Methodology for Objective b

5.2.1. Indicators of JFM Outcomes

In general, the following indicators of JFM outcomes are relevant. Some of these are useful for comparisons across communities, while others are more suited for comparisons of pre-JFM vs. post-JFM outcomes within a community.

a. Economic Indicators
   1) Value and production of forest produce (timber, fuelwood, fodder and other NTFPs),
   2) Employment generation,
   3) Increase in agricultural land,
   4) Increase in agricultural yield,
   5) Livestock holding and its yields (milk productivity, cow dung and others),
   6) Income
   7) Consumption (food and non-food)
   8) Expenditure
   9) Schooling (decrease drop outs/increase enrolment)
   10) Access to health services
   11) Availability of drinking water
   12) Housing conditions
   13) Durable assets (bicycle, radio, fan, TV, bike, furniture etc.)

b. Distributional Indicators
   1) Transaction costs of participation in JFM across different sub-groups in the community:
      a) Information gathering (including communicating),
      b) Attending meetings (including conflict resolution and other meetings),
      c) Traveling,
      d) Monitoring (protection, watching, patrolling etc.), and
      e) Resource maintenance (planting, weeding, bush cutting, forest route maintenance etc.),
      f) User fees
2) Time spent and distance covered to collect firewood and fodder
3) Distribution of outputs from JFM among different groups:
   a) Share of timber revenues received
   b) Non timber forest products (NTFP)
4) Utilizations of FPCs funds on different activities:

   \textit{c. Ecological and Institutional Sustainability}
   
   The following indicators for ecological and institutional outcomes are being considered for assessment
   
   1. Ecological outcomes:
      a) Density of forest cover,
      b) Wild life,
      c) Changes in ground water level.
   
   2. Institutional outcomes:
      a) Procedural efficiency of FPCs (frequency of meetings held by FPCs, mode of forest patrolling, and rules in use for harvesting the forest)
      b) Activity efficiency of FPCs (the size of the common fund, fire prevention activities, detection of forest offences and sanctioning, conflict resolution mechanism, and forest regeneration activities such as planting, clearing up etc..)

Different data sets and techniques will be used for information gathering on the three outcomes. For economic outcomes data will be collected both from primary and secondary sources. Primary sources include both the community and the household questionnaire. For distributional outcomes primarily data will be elicited from through the household questionnaire. Data for ecological outcomes will be gathered mostly from secondary sources. In the event of non-availability of information data will be generated from elder people in the community using a ‘before and after’ approach that is based purely on recall survey.
5.2.2 Measurement of Economic indicators

Economic indicators will be solicited at the community level or as averages across households. The analysis should evaluate the quantity and value of extraction of different forest products such as firewood, tree, fodder, grass, medicinal plants and herbs, timbers and other direct and tangible benefits. However, valuing these forest products will be a challenge, as most of the products do not have a direct market price. In such cases, opportunity costs of labour will be used to estimate the total costs of resource extraction incurred by the user households. Few products like firewood collected by the households will be valued using local market prices. Taking into consideration the seasonal variations in the flow of forest products, the questionnaire will be designed to elucidate information for 12 months.

Information on other economic indicators such as livestock holdings and its yields (milk, cow dung etc.), employment (off farm and on farm), agricultural yield etc., will be gathered using the ‘before and after approach’ and also complemented by secondary information available at the community level. Information on income levels is difficult to measure. The study will attempt this through measurement of household expenditures. Also other proxies of living standards, such as housing quality and asset ownership will be measured.

5.2.3 Measurement of Distributional Outcomes

Distributional outcomes will be measured by comparing household-level data on costs, benefits, and living standards across different sub-groups of the community and by using both descriptive and inferential statistics.

The analysis of costs and benefits should include an assessment of transaction costs of participation in JFM across the various sub-groups in the community. Transaction costs\(^3\) associated with forest management at the community level have not been paid due attention in the literature, particularly in the case of JFM. Transaction costs of forest

\(^{3}\) For a detailed application of transaction costs in natural resource management see Mburu and Birner, 2002.
management by community members can be a significant part of resource management costs, which is ignored in existing economic analyses of JFM. Often efficient management of common property resources are challenged by various sources of uncertainty that result in high transaction costs of resource management. Activities like meetings, obligatory forestry activities and monitoring take up the bulk of time, as it is a continuous day-to-day activity for the maintenance of FPCs. For individual resource users, transaction costs of resource management are related to participation, opportunity costs of time involved in meetings, time required to acquire information and communication, direct monetary expenses for travel, communication and information. These costs are directly related to the management and efficiency of collective action and mostly these costs are borne by the poor users. Many studies on JFM have pointed out that poor tribal people are asked to work in the forest by Forest Department without any or little payment (Sarin, 1999; Poffenberger and McGean, 1996). When these costs are taken into account, a completely different picture may appear, in terms of benefits accruing to the users, especially poorer section people.

5.2.4 Measurement of Ecological and Institutional Sustainability
For measurement of forest cover, the study will seek the information from satellite imagery of forest cover, which is believed to be carried out by remote sensing agencies in the study region. Data on changes in ground water table will be collected from the Forest Department, which has been gathering data from JFM regions since 1998. Moreover, the Forest Department has asked all FPCs to maintain a database for few socio-economic, ecological and institutional indicators. The study will explore these data sets from the communities. Simplified measures of ecological sustainability also include the level of resource extraction (including timber concessions) and the extent of replanting (number of trees, financial and labour efforts) done in the community.

5.3 Methodology for Objective c
The hypotheses generated from various case studies on CPR management are rich. Based on existing descriptive studies of JFM, the proposed research will adopt these hypotheses to the JFM context. Econometric analysis will be used to test hypotheses and determine
the empirical significance of hypothesized factors. Most likely discrete choice models (logit or probit models) will be used to analyze JFM institutions. The econometric analysis will be conducted both at the community level (to explain differences in outcomes across communities) and at the household level (to test hypotheses on distributional inequalities).

In table 1, those variables that appear to be most relevant in the context of JFM are marked by an asterix. However, as pointed out by Agrawal (2001) there are several challenges in testing the empirical significance of these factors. First, several of the explanatory variables listed in table 1 are themselves endogenous (e.g., the factor ‘heterogeneity of endowments and interest’). In order to solve these endogeneity issues we will resort to simultaneous equation models. Second, many of the factors listed in the table are very closely correlated such as graduated sanctions, ease in enforcement of rules and availability of low cost adjudication etc. To deal with this problem an indices will be prepared for such closely related variables, e.g. using principal components analysis.

Moreover, the hypotheses put forth in the literature and summarized in table 1 relate to economic and sustainability outcomes. Often, institutional outcomes are even used as proxies for the performance of community resource management. The sustainability of resource use depends on the distribution of costs and benefits within the community, which is considered in table 1 as ‘heterogeneity of endowments and interest’. However, that distribution of costs and benefits itself is an outcome that the study is interested in. It is hypothesized that poor section users or less influential community members bear more costs and less benefits compare to richer section people and/or local elites.

5.3.1 Hypotheses
The following preliminary hypotheses can be formulated from the existing literature for the case of JFM. These are given here for illustrative purposes and are not intended to reflect a complete list of hypotheses to be tested.
1. In the literature on collective action, starting from Olson (1965), it has been hypothesized that small and homogenous user groups are more likely to cooperate, as free riding can more easily be overcome. However, in an interesting study on India by Heltberg (2001) it was found that larger villages are more likely to have active management institutions. However, the author could not give obvious explanations for this phenomenon. A study conducted in community forest management in Nepal also found that larger groups (of over 300 households) were no less effective than smaller groups (of fewer than 100 households) (Hobley and Shah, 1996). The authors argued that a highly factionalised but well represented and managed large group may be more effective than a non-factionalised but non-representative, poorly managed small group. From the above analysis it is hypothesized that group size is one of the key factors affecting resource management outcomes and that the effect is conceptually ambiguous.

2. The relationship between resource scarcity and collective resource management outcomes has been an issue of controversy in the recent CPR literature. Some scholars argue that villagers are likely to follow joint rules and arrangements to achieve intensely felt needs that could not be met by individual action, which implies a positive relationship between scarcity and community resource management outcomes (Wade, 1988). On the other hand, Bardhan (1993, as quoted in Heltberg, 2001) argues that community resource management outcomes are more likely at moderate levels of resource scarcity. At high levels of scarcity and ecological stress institutional arrangements often break down as people scramble for survival and discount rates increase.

3. It is argued both theoretically as well as empirically that the openness and stability of the community is a crucial determinant of community resource management outcomes. Hence the higher the rate of migration, mobility, and market integration, the lower the possibility of voluntary cooperation or organization (Ostrom, 1990). However, in the case of JFM, it is often argued that greater market integration for NTFP is necessary in order to bring more people’s cooperation in the JFM program, as middlemen and faulty government policies exploit the rural poor by undervaluing their NTFP (Bathla, 1999).
4. The role of heterogeneity in affecting the community resource management outcomes is strongly debated in both the theoretical and empirical literature. It is generally argued that heterogeneity based on identity (ethnic, political, gender, etc.) can create obstacles to performance of community resource management (Agrawal, 2001; Baland and Platteau, 1999) because it can make communication and cooperation difficult. The effect of economic heterogeneity (e.g., inequality in land holding or other endowments) is less clear. Empirical evidence on this aspect remains ambiguous (Baland and Platteau, 1999; Kanbur, 1992). One school of thought holds that inequality (based on endowments, e.g., wealth and land distribution) is good for performance of community-based resource management, as those with greater interests may decide to provide the common good even if the poorly endowed group chooses to free ride (Olson, 1965). In a recent study in Nepal from 18 forest communities it is found that heterogeneity is not a strong predictor of the level of community resource management outcomes (Varughese and Ostrom, 2001). Others argue that heterogeneity hampers community resource management outcomes (see for instance, Johnson and Libecap, 1982; Jayaraman, 1981, Easter and Palanisami, 1987).

5. Impact of community development on community resource management outcomes is another important aspect that is unexplored. It is found in one of the forest divisions that developmental activities (irrigation, drinking water, schools, health center etc.) have brought people’s immense response towards JFM program (Bathla, 1999). Thus, a hypothesis is that development needs of the people are positively related to performance of community-based resource management.

6. Communities with prior experiences in institutional cooperation are hypothesized to be significantly more likely to cooperate in forest management (Baland and Platteau, 1996).

7. The kind of tree species that are grown under the JFM areas will have a bearing on the unequal distribution of benefits among the participants, between poorer and richer sections of the community. A study on JFM shows that due to silviculture practices for
timber by the Forest Department in JFM areas with strong influence of large farmers in
the communities, the poor, who are mostly dependent on NTFP, are deprived from their
subsistence needs (Kumar, 2002).

8. Many NGO programs focus on changing attitudes towards and perceptions of the
resource through education and awareness building and on providing alternative income
sources as ways to reduce pressure on local resources. The actual effect of attitudes,
perceptions and alternative income on actual resource management outcomes is however
not clear (Sawhney and Engel, forthcoming). Thus, one hypothesis to be tested is whether
attitudes, perceptions and alternative income opportunities increase the likelihood of
successful resource management.

9. Household level benefits from JFM are inextricably associated with household
characteristics like land and livestock holdings, caste, gender, education, ethnicity,
political influence and other local influences, which influence the nature and extent of
resource appropriation and exploitation. In other words, it is hypothesized that poorer
households are currently benefiting less from the JFM than the relatively better off
households.

5.4 Methodology for Objective d
A policy analysis based on the findings from the objective c will be carried out which
will examine the feasibility of using the tested hypothesized factors as a policy tool to
improve the outcomes of JFM.

Table 1: Critical enabling conditions for sustainability on the commons

<table>
<thead>
<tr>
<th>1. Resource System Characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Small Size*</td>
</tr>
<tr>
<td>b. Well defined boundaries*</td>
</tr>
<tr>
<td>c. Low levels of mobility</td>
</tr>
<tr>
<td>d. Possibilities of storage of benefits from the resource*</td>
</tr>
<tr>
<td>e. Predictability*</td>
</tr>
<tr>
<td>2. Group Characteristics</td>
</tr>
<tr>
<td>a. Small size*</td>
</tr>
<tr>
<td>b. Clearly defined boundaries*</td>
</tr>
</tbody>
</table>
c. Shared norms*
d. Past successful experience – social capital*
e. Appropriate leadership – young familiar with changing external environment, 
connected to local traditional elite*
f. Interdependence among group members
g. Heterogeneity of endowments, homogeneity of identities and interest*
h. Low level of poverty*

1 & 2. Relationship between resource system characteristics and group characteristics
a. Overlap between user group residential location and resource location*
b. High levels of dependence by group members on resource system*
c. Fairness in allocation of benefits from common resources*
d. Low level of user demand
e. Gradual change in levels of demand*

3. Institutional arrangements
a. Rules are simple and easy to understand*
b. Locally devised access and management rules*
c. Ease in enforcement of rules*
d. Graduated sanctions*
e. Availability of low cost adjudication
f. Accountability of monitors and other officials to users*

1 & 3. Relation between resource system and institutional arrangements
a. match restrictions on the harvests to the regeneration of resources

4. External environment
a. Technologies:
   i. Low cost exclusion technologies
   ii. time for adaptation to new technologies related to the commons
b. Low levels of articulation with external markets
c. Gradual change in articulation with external markets
d. State:
   i. Central government should not undermine local authority*
   ii. Supportive external sanctioning institutions*
   iii. Appropriate levels of external aid to compensate local users for conservation 
      activities*
   iv. Nested levels of appropriation, provision, enforcement, governance.

Source: Agrawal, 2001
Note: * indicates factors that appear most relevant to the JFM context

6 Time Plan
Leave Bonn for fieldwork by mid-July 2003
Return to Bonn by May 2004
Finish data analysis by December 2004
Final write up of thesis by July 2005
References:


GoI (1990), Involving of village communities and voluntary agencies for regeneration of degraded forest lands (Letter no. 6-21/89-PP dated 1 June 1990), New Delhi, Government of India, Ministry of Environment and Forests.


Jarayaman, T.K. 1981. Farmers’ organizations in the surface irrigation project: Two empirical studies from Gujurat. Economics and Political weekly


Kumar, N (2000), All is not Green with JFM in India, in Forest Tress and People, No. 42, June.

Kumar, N (2000), All is not Green with JFM in India, in Forest Tress and People, No. 42, June.


Olson, M (1965), The logic of collective action: public goods and theory of groups, Harvard University Press, Cambridge, MA.


