

# **COMPLEMENTARITY OF INSTITUTIONS: A PREREQUISITE FOR THE SUCCESS OF JOINT FOREST MANAGEMENT. A COMPARATIVE CASE OF FOUR VILLAGES FROM INDIA**

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## **INTRODUCTION**

India's forests have played an integral role in sustaining its people over many millennia. In addition to an abundance of nutritional, medicinal and subsistence goods, wilderness areas have provided the environment for spiritual and cultural expression of the Indian people. In the pre-British period, the ownership of forests was with the Kings, but the forest regimes were aimed at fair distribution of returns to all sections of society. In the Maurayan period (324 to 180 B.C.) forests were classified in three classes: (i) Reserve forests; (ii) Forests donated to eminent Brahmans; and, (iii) Forests for the public. The reserve forest were of two categories - reserve forests for the king and reserve forests for the state (Dwivedi 1980: 9). Hence, the Maurayan-empire aimed to match the requirements of each section of society through a classification of forests. There are no records of classification-based forest management in the post-Maurayan period. With a few exceptions, access to forests were largely unrestricted. However, ultimate control over forest lands lay in the hands of the ruler of the territory (Stebbing 1922). The focus of forest 'management' continued to be geared towards the fair distribution of returns, and had characteristics of communal forest regimes.

During the British period, the administrators dismantled prevailing concepts of social utility and social welfare, including those that ensured a fair distribution of returns from forest resources. The sole purpose of forest management sought to redistribute economic gains in favor of the empire. This was achieved by large-scale deforestation, commercialization of timber and through the restriction of the rights of local people. The restrictions on people's access rights to forests was accompanied by an increase in Reserve Forest areas, which reduced the extent of forest lands for common use (Guha and Gadgil 1989). The British period was a landmark in the history of forest management, and marked the beginning of the breakdown of a symbiotic relationship between forest dweller and forests. In the process, traditional communal systems of forest management began to disintegrate (Shah 1996). Thus, forest management was converted from a community-based regime to one of central control.

After independence, in the period of 1947-1987, the Government of India tried to redefine the social-utility and social-welfare functions, but the emphasis of forest management regimes continued to be on commercial timber exploitation and exclusion of local people from forests. This continuation of forest regimes can be termed as path dependent that resulted due to inertia in the attitude of forest managers trained in colonial period, expected increasing returns, learning effects on the attitude of new forest incumbents, and the adaptive expectations of the government (Kant 1998). The continuation of forest regimes based on commercialization and exclusion of local people led to the alteration of forest ecosystems and to the denudation of vast tracts of forestlands (Biswas 1988, ch.1; Palit 1996; Poffenberger et al. 1996). In addition, increasing population pressures contributed to deforestation as forests were converted for agriculture. In the late 1970s and early 1980s, across India, there was a sudden emergence of forest protection initiatives in response to a growing scarcity of forest products and threats of exploitation by outside groups. These community actions indicated the conflicts between formal and

informal institutions, and inefficiencies in the existing forest regimes. In isolated cases, some innovative and risk-loving forest officers attempted to involve local people in forest management, violating normal practices and legislative policies of the Forest Department (FD). The Government of India realized the failure of forest regimes based on exclusion of local people in the *National Forest Policy 1988*, and sought people's participation as a means for conserving existing forestlands and regenerating wastelands. On 1 June 1990 the Ministry of Environment and Forests issued a circular requesting that all states adopt Joint Forest Management (JFM): joint management of forest resources by both the FD and by the people living adjacent to forests (SPWD 1993). The most crucial aspect of this circular was the decision to place people's needs above those of commercial interests (SPWD 1993). As of mid-1996, with varied degrees of success, 16 of the 25 states in India had adopted JFM (Saigal et al. 1996).

JFM is an attempt to forge a partnership between the FD and local communities, based on joint management objectives, in which communities share both responsibilities and proceeds. The critical factors for the success of JFM are: (i) The complementarity among formal institutions and between formal and informal institutions; (ii) Transparency of institutions; (iii) Accountability of change agents, (iv) Shift in custodial paradigm of forest managers; (v) Absence of uncertainties; and, (vi) Inter-gender equity. In this case study, institutions of JFM in four villages located in Jabalpur district in Madhya Pradesh are examined, outcomes analyzed, and the lessons learned are discussed. First, a background of JFM in Madhya Pradesh is presented, and thereafter the case study is discussed.

## **BACKGROUND OF JFM IN MADHYA PRADESH**

In 1991, the Government of Madhya Pradesh (GOMP) issued a Government Order (GO) specifying how JFM would be established in the state. The 1991 order stipulated that Forest Protection Committees (FPCs) should be constituted in 'sensitive areas' that have a forest cover above 40 percent, and that the FPCs should obtain 20 percent of the net income derived from forest areas so protected. In degraded lands, where the canopy cover is less than 40 percent, Village Forest Protection Committees (VFPCs, heretofore referred to as VFCs) should be established, and forest regeneration activities should be taken up. VFCs were allocated 30 percent of the final timber produce, 30 percent of income obtained from nationalized Non-Timber Forest Products (NTFPs) and unrestricted access to non-nationalized NTFPs. In addition, VFCs were entitled to 100 percent of revenues from intermediate yields such as from thinning and clearing (SPWD 1993). In 1995, the GOMP amended many provisions of the 1991 order. The main changes are: FPCs are not entitled to a percentage of the final timber harvest - only guarantees access to traditional (*nistar*) rights; in relation to VFCs, the provision guaranteeing 30 percent of income from nationalized forest products has been revoked, and the FD's Working Plans have been suspended, to be replaced with a 10 year micro-plan developed in consultation with the villages; all FPC/VFCs are to be constituted in villages or clusters of villages located within 5 km of the forest boundary; and provisions have been made to engage *Gram Panchayats* (local governing institutions), women and the landless in the JFM process (GOMP 1995). Although the 1995 amendment clarifies and further develops several components of JFM, the revocation of financial and other benefits narrows the scope of the program.

## **IDENTIFICATION OF THE CASE**

Four villages – Kundwara, Tikaria, Roriya and Jamuniya in the Kundwara area of Kundam Development Block in Madhya Pradesh – comprise the study area. The Kundwara area is located approximately 60 km east of Jabalpur city. Kundwara, a Forest Village (established by the FD in the early 1900s for meeting labor needs) and the smallest of the four, is comprised primarily of Gond tribals. The total population is 248, and only 7 people are non-tribal. The total forest and agriculture areas are 303 and 88 ha respectively. Tikaria, the largest village, has a population of 624. It is primarily composed of Baigas

tribals, and has a significant population (125) of caste groups. Several houses have TVs, and a tower has been built to install a telephone line to the village. Of the four villages, Tikaria is the only village that has a small store-cum-tea stand. The total forest and agriculture areas are 300 and 383 ha respectively. Roriya is the second largest village with a population of 312, however, it has the smallest forest area under its control (70 ha). Except for 9 individuals who belong to different castes, Roriya is inhabited by Gond tribals. Its agricultural area is 182 ha. Jamuniya's total population is 286 of which approximately 80 percent are Kol tribals; the remaining 20 percent is divided between an array of caste and other tribal groups. Its forest and agriculture areas are 303 and 93 ha respectively. Jamuniya is located a few kilometers away from Bagaraji, the largest town and commercial center in the area. The proximity to Bagaraji is the cause of many of the problems faced in the four villages. The distance between two villages furthest apart is approximately 15 km. The four villages come under one Gram Panchayat with the head of the Panchayat (*Sarpanch*) and 5 other councilors (*Panchs*) residing in Tikaria.

## THE INITIAL SITUATION

As the city limits of Jabalpur expanded, and its population increased, nearby villages became the suppliers of fuelwood and timber to meet the growing needs of the city. The Kundwara area, being relatively close to Jabalpur, became a primary supplier of these products. This situation was compounded by population increases in the villages themselves. Thus, throughout the 1970s-1980s illicit felling for timber as well as for commercial fuelwood was common. The forests in the Kundwara area were to undergo significant deforestation and degradation. Furthermore, in the late 1980s a fire swept through the Roriya forest leaving it devastated.

The forest resources, although under state control, were by de-facto being used as an open access resource. There were no considerations of economic efficiency, equity, or sustainability in resource use. The problem was apparent to the villagers as well as to the FD officials since about the middle 1980s. If the rate of timber and fuelwood extraction had continued at the same intensity, a total loss of forest cover and probably conversion of forestland to other uses would have ensued. It may have even caused shortages of fuelwood and other forest products as experienced by villages located closer to Jabalpur city.

## THE CHANGE PROCESS

In Roriya, acute resource shortages caused by fire, led the village-elders to confer on the problem, and out of this process a 'self initiated' forest protection committee was started in 1989. Due to a forest guesthouse in Kundwara, many visiting forest officers were aware of Roriya's protection activities. After the GOMP order of 1991, the existence of an informal protection committee in Roriya worked as a catalyst for initiating JFM process in this area. The first officially constituted VFC was established in Tikaria in 1992 as a result of its severely degraded forest condition. However, Tikaria's VFC was dissolved a year later by the FD on the grounds that the villagers were not conducting forest protection activities adequately. The villagers, however, contest this assertion, and state that they did not see the necessity of conducting protection activities when the FD still had a Forest Guard in its service. Influenced by the World Environment Day activities held in Tikaria, the villagers requested the FD to reconstitute their VFC, which the FD fulfilled in February 1994. Concurrently, an FPC was constituted in Jamuniya that same year. Funded by the World Bank and other bilateral donor agencies, the establishment of the Madhya Pradesh Forestry Project in 1995 motivated the FD to constitute other forest protection committees in the area. As a result, discussions were initiated with the local people of Kundwara and Roriya, and in 1995 the self-initiated committee of Roriya was formalized as a VFC, and a FPC was constituted in Kundwara.

Although the initial initiative for protecting forests in this area was taken by the village-elders of Roriya, the responsibility of bringing about change has been shared by people of all the four villages and local forest officials. The main interest of the local people was to assure the sustained supply of forest products, mainly NTFPs and fuelwood. The interest of forest officials, on the other hand, was to launch the JFM program.

## **THE OUTCOME**

### **Institutional Changes**

The establishment of JFM shifted the management of forests from the sole domain of the FD, to joint management by the FD in partnership with local communities. This in turn facilitated the emergence of new local institutions (protection committees – FPCs and VFCs) that were constituted by the FD in conjunction with the villagers. The organizational structure of local organizations is governed by the GOMP order. The protection committees have an ‘executive committee’ comprised of a president, vice-president, secretary (the Beat Officer), a minimum of 2 women and landless persons, all elected Panchayat officials, and a resident teacher. The office bearers and members of the executive committee are to be elected annually. The executive committee and general membership is expected to meet monthly to carry out its responsibilities. The executive committee of a FPC/VFC is responsible for enforcing all rules and implementation of decisions taken at the monthly meetings. The local institutions comprise several rules, such as those of exclusion, management, protection, penalty, and finances.

A FPC/VFC has the power to exclude access to their forest patch by people from neighboring communities. While outsiders’ access is being restricted in relation to the ban on timber felling, grazing and commercial fuelwood extraction, access to NTFP harvesting is still open. However, the FPC/VFC can limit NTFP collectors, including its own members, from collecting certain types of NTFPs within specific areas in the forest, and can enforce that all collection activities are conducted sustainably.

The main management rules are: that there be no timber felling; forests have to be protected from fire; extraction of fuelwood for commercial sale has to be terminated (only one headload per family for domestic use); discontinue grazing livestock in the forest; and that NTFPs be harvested sustainably. For realizing these management objectives, the villagers are required to patrol the forest for contravention of any of the rules, as well as for monitoring for fire. Initially, two male members from different families conducted daily forest protection activities on a rotational basis. This system ran into several problems, mainly because villagers could not patrol during busy periods of the farming cycle. Currently, patrolling is conducted by watchmen hired by the FPC/VFC. These watchmen are paid a monthly salary of between Rs. 500-600 from the FPC/VFC collective fund. Other management rules require that degraded areas be reforested and that resources engendered through forest protection be distributed equitably among village members.

The FPC/VFC has been granted the authority to levy financial penalties against any person in contravention of the rules. Financial penalties for illegal timber felling are determined by the Beat Officer (local forest officer), in consultation with the protection committee and the offender. The penalty is calculated according to the species, size, shape and volume of the felled tree. Offenders have been eager to find a settlement through this process rather than be taken to court, which could be a time consuming and costly affair. At the discretion of the Beat Officer, part of this penalty is deposited in the collective fund and the remainder in the FD account. A penalty against grazing has been fixed at Rs. 10.00 per head of cattle for village residents, and Rs. 20.00 per head for outsiders. As yet, no financial penalties have been assigned for the harvest of fuelwood for commercial purposes.

Financial rules are related to use of collective funds of the FPC/VFCs. The financial sources that make up the collective fund are membership fees, contributions by the FD for the practice of protection activities, fines collected, and interest from loans provided from the fund. Also, two other sources of funding were developed by innovations of FPC/VFCs through NTFP value-addition schemes. Previously NTFP collectors were at the mercy of visiting traders for selling their produce, usually at rates far below market prices. Currently, the protection committees facilitate the transaction between the traders and collectors, and thus, furnish higher returns. For every Rs. 10 that a collector receives, Rs. 2 is deducted as a commission and deposited in the collective fund. The other initiative is the purchase of mahua (*Madhuca indica*) flowers by the FPC/VFCs, which are stored for sale during the off-season at a higher price. The profits accrued through this scheme are deposited in the fund. The collective fund is banked as a joint account with the FD. The President of the committee and the Beat Officer have authority for signing checks. Use of the collective fund is determined by the general membership.

## **IMPACTS AT THE VILLAGE LEVEL**

### **State of the Forests**

Since the initiation of forest protection activities, the quality of the forests has improved significantly in all the villages. Natural seedling regeneration and other ecological processes are responding remarkably to reduced pressure on the forests. Afforestation activities conducted in 1993-1994 in Tikaria, and in 1995 in Roriya have reclaimed wasteland areas. Due to the special relationship between Kundwara and the FD, Kundwara has become a model village for forestry activities. This village has many new projects such as the establishment of a corral (*kanji-house*); research project on NTFP value-addition and the establishment of a medicinal plant research plot (Roriya is also part of this project). Also, the FD has trained the FPC members in Participatory Rural Appraisal (PRA) methodology. While the initiatives launched by the FD are praiseworthy, there is a sentiment in the neighboring villages that the FD is neglecting them in favor of Kundwara. In Kundwara, a grazing allowance at the end of summer and the sale of grass to the Lucknow army have created a dynamics that contributes to forest degradation. The situation in Jamuniya is different from other FPC/VFCs. Jamuniya is the only FPC that does not officially ban the sale of fuelwood; approximately 65 percent of the families engage in the sale of fuelwood. Nevertheless, due to a reduction in illicit timber harvesting the rate of deforestation has decreased.

### **Community Development**

In June 1997, the bank balances of the four collective funds were: Kundwara - Rs 37,495; Tikaria - Rs 10,280; Roriya - Rs 19,582; and Jamuniya - Rs 8,420. Since the fund is community controlled, its use is determined by the villagers. In all the four villages, first, musical instruments were purchased. Villagers take pride in the fact that they own their own harmonium, *dholak* and *tabla* (drums), *majiras* (shakers) and in the case of Kundwara, microphones and amplifiers. Also to further enliven the atmosphere of community gatherings, cooking utensils, a mat for the community gathering area, and petromax lamps have been purchased. The villagers feel that the money was well spent, and it appears that these purchases are fostering better community relations. The collective fund is also used for other development activities. For example, a 3 HP electric motor was purchased for irrigation purposes in Kundwara, and electric grain milling machines were purchased in Kundwara and Roriya. Also, a religious shrine was constructed in Jamuniya.

### **Financial Assistance**

The collective fund has become a source of credit for members of the village, and small loans at interest rates of 2-5 percent that are lower than that offered by village moneylenders (10 percent) are provided. These loans are usually made available for emergencies, marriages, medical treatment, and purchase of agricultural inputs etc. The amount of the loan is determined by the earning capacity, and the ability of the person to repay the loan. These terms put poorer members of the community at a disadvantage as their earning capacity and ability to repay loans are significantly less. However, this service is being used extensively.

### **Welfare of the Poor**

Many of the NTFP collectors belong to the lowest economic group in the village. The NTFP value-addition schemes have substantially enhanced their economic status. Collectors of mahua flowers in Tikaria have been selling their produce at higher prices to the Kundwara FPC, where the FPC is storing it for sale during the off-season. The Roriya VFC has devised an innovative scheme for reducing competition among NTFP collectors and for distributing resources equitably. Each family, depending on its size, has been assigned 2-4 mahua trees for harvesting flowers. Also, group collection is encouraged, so that no family's allocated resources are infringed upon. However, due to the ban on the commercial sale of fuelwood, an important source of income for many families has been denied. These families are now shifting towards collection of other products.

### **Community Health**

The purchase of community assets from the collective fund is fostering better community relations in all villages. In many ways, the collective fund has become a source of pride and has helped galvanize the communities. Furthermore, since the inception of the VFC in Tikaria, drunken disorderliness and fighting among villagers has reduced somewhat, as the VFC has begun playing the role of a 'social controlling' force. This however is leading to a conflict with the Panchayat, as traditionally it was the role of the Panchayat to mediate in village disputes.

## **INTER-VILLAGE COMPARISON OF OUTCOMES**

When comparing the four villages and assessing their activities, it is clear that Kundwara and Roriya are functioning comparatively better than Tikaria and Jamuniya. The accomplishments of Kundwara illustrate the level of success that can be achieved if provided with the proper guidance and the resources available to the FD. Their ability to capitalize on the NTFP value-addition initiatives organized by the FD has benefited individual collectors and the community as a whole. The homogenous composition of Roriya and Kundwara has allowed them to pursue forest protection activities with far less impediments than that of the other two villages. Furthermore, Roriya and Kundwara are inhabited by Gond tribals; who have traditionally depended on farming, and who are aware of the natural inputs that forests provide for maintaining agricultural productivity. Roriya's successes are linked to the community's resolute capacity to respond to circumstances of resource scarcity. In Roriya there is an enthusiasm for, and a keener knowledge of, JFM. The age composition of the executive committee is drastically different from other FPC/VFCs in that most members are in their twenties. VFC meetings are held fairly regularly, and are well attended. In Tikaria and Jamuniya, the dominant tribal groups are Baigas and Kol; tribes that have traditionally sustained themselves through the harvest and sale of forest products. Regulations restricting their access to forest products are thus met with greater resistance. Also, the presence of an appreciable number of caste groups in these two villages tends to confound forest protection efforts. Furthermore, the high population pressures in Tikaria, and the proximity of Jamuniya to Bagaraji, pose additional obstacles.

## **THE LESSONS LEARNED**

Considering the short period in which JFM has been practiced in the 4 villages, although faced with many challenges, the successes achieved illustrates the abilities of the rural populace to be partners in conservation. Their dependence and proximity to the forest make them ideally suited for managing and conserving forest resources. However, attention must be directed to the barriers observed during this short phase for assuring the long-term sustainability of JFM institutions.

### **Lack of Complementarity of Institutions**

Forest regimes are the rules that shape human interaction with respect to forest management. The total structure of a forest regime is an aggregate of informal and formal institutions. Informal institutions are endogenous to user groups, and these institutions cannot be changed rapidly due to inertia and integration in the hierarchical structure of institutions. Hence, formal institutions should be designed to be complementary to existing informal institutions. At the same time, if formal institutions of forest regimes are also inter-linked with other formal institutions, either horizontally or vertically, all the formal institutions should be complementary to each other. In the case of the JFM institutions in this area, a number of conflicts can be observed among formal institutions, as well as between formal and informal institutions.

According to the JFM amendment 1995, the executive committee should include all Panchayat members, a resident teacher and at least two landless persons. All members to the executive committee must be elected annually by the general membership. However, the elections of Panchayats are held every 5 years, so Panchayat members remain on the FPC/VFC committee for five years. This indicates that these two formal institutions are not complementary. Also, in a village where there is only 1 teacher, as is the case in Kundwara, he becomes a semi-permanent member. Hence, annual elections will not change the major composition of the executive committee. Furthermore, overlapping jurisdictions of the FPC/VFC and Panchayats put them in a competitive state rather than in a complementary state. This could lead to tension between the two institutions that would be counter-productive to advancing the goals of JFM. Similarly, the ban on the sale of fuelwood required by JFM institutions is against the practice adopted by many families in Jamuniya for many years. The change in the practices of these households cannot be brought about abruptly by imposing new institutions. A mechanism has to be developed to amend informal institutions gradually. In the case of financial penalties levied for illegal timber felling, the division of the penalty at the discretion of the Beat Officer lacks the complementarity with informal institutions of villagers that are based on returns proportionate to the efforts.

The Watershed Development Program (WDP) is another program that is operative in this area. The objectives of JFM and WDP are similar in that they both attempt to restore the ecological functions of the watershed. But, different local institutions and organizations have been created for JFM and WDP. In several areas in the Jabalpur district both these programs are functioning independently of each other, and in many cases one program has come to overshadow the other. However, inter-linking and complementarity of the institutions of JFM and WDP will enhance the efficiency of both programs.

### **Transparency of Institutions**

When protection committees were formulated, future shortage of forest products was emphasized, but essential details contained in the JFM order 1995 such as the provision of a share in the final timber harvest were not disclosed. No documentation such as a Memorandum of Understanding that specifies the formal and informal details of the agreement between the FD and FPC/VFCs exists. However, inaccurate details of the JFM order have filtered down to the communities, and as a result, the ensuing confusion among the villagers is acting as a barrier to the proper functioning and implementation of JFM.

For example, the Tikaria VFC believes it is entitled to 50 percent of the final timber harvest, while unaware of its entitlement to 100 percent of intermediate timber yields.

### **Accountability of Change Agents**

It seems that change agents are not accountable either to the government or to the public for their actions. The Beat Officer, by-passing the democratic processes stipulated in the JFM order appointed the Panch who is one of the richest individuals in the village, Mr. Sawal Singh Tahkur, as president of the Jamuniya FPC. In February 1997, Mr. Tahkur appointed himself and a Kol tribal as watchman. Many irregularities have been experienced in Jamuniya, to name a few: the misappropriation of finances by the president; and collusion between the Deputy Ranger, the Beat Officer and the President for providing illegal timber to carpenters in Bagaraji. As a result, the villagers in Jamuniya are dissatisfied with the *status-quo*. Similarly, Panchs in the other villages have used their position to become either the president, or have captured the position of watchman of their respective FPC/VFCs. Thus, they have snared the only financially remunerated job related to forest protection. Similarly, FPC/VFC executive committee meetings are held irregularly, and the Beat Officer seldom attends them. According to the JFM order 1995, the Working Plan for the forest must be suspended where a VFC has been constituted, and instead, a 10 year micro-plan should be developed in consultation with the VFC. Tikaria villagers assert that the FD continues to harvest mature trees annually, and also thinning operations have been carried out since the inception of the VFC. The VFC has not been provided with a percentage share of these annual timber harvests, nor have they been granted the 100 percent of intermediate yields. There are many other similar examples of non-accountability. Hence, there is a need for stronger accountability of forest officials as well as for Panchayat members.

### **Paradigm Shift**

Many of the higher-ranking FD officials have made a paradigm shift from management by exclusion to management by partnership with local people. The unwillingness of the lower-rank FD personnel to give up power and its corollary benefits places a major obstacle for achieving the goals of JFM. Many of the problems observed are indicative of the inertia of the Forest Department as an institution to engage in a participatory process.

### **Uncertainties**

One of the objectives of institutions and forest regimes, is to reduce uncertainty and provide stability by offering a structure to all stakeholders of the resource. However, quick changes in formal institutions (amendment of 1991 GOMP order by 1995 order), and failure to implement formal institutions in totality, such as the lack of specifying benefits, and non-replacement of Working Plans by micro-plans creates an environment of uncertainty. The frequent transfers of the forest officers and different degrees of inertia in the attitude of forest officers towards JFM also create an environment of uncertainty. Such an environment discourages the community from embracing the program.

### **Inter-gender Equity**

An equitable distribution of resources and benefits engendered from forest protection activities should be geared towards improving the socio-economic standing of the poorest elements among the community. Even though FPC/VFCs have taken initiatives for household equity and for increasing returns to the poor, inter-gender equity is still a low priority. The related outcome is the lack of participation of women in JFM activities.

## CONCLUSIONS

Due to a lack of resources, communities cannot manage large areas of forests independently. Hence, for large-scale community-based resource management, partnerships like JFM are critical. Local institutions of JFM are in the process of evolution all across India and in other parts of the world. The communities of the four villages have demonstrated ingenuity in designing innovative local institutions for the welfare of local people. The knowledge of these innovations will contribute to the evolution of JFM. The study demonstrates that even in the presence of many barriers, the successes achieved in relation to forest quality and the welfare of local people are remarkable. Therefore, it is evident that there is great potential for establishing JFM on a large scale. But for the long-term sustainability of JFM, complementarity of institutions, transparency of institutions, accountability of change agents, equitable distribution and uncertainties should be dealt with in the early phase of the program. Similarly, community specificity should be considered when designing informal institutions.

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