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JOINT FOREST MANAGEMENT: A CASE STUDY OF VILLAGE KOTEKOPPA IN UTTARA KANNADA DISTRICT OF KARNATAKA

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Abstract

This is a paper based on a field study to evaluate an ongoing joint forest management project (JFM). The methodology of the evaluation is a straightforward cost-benefit analysis, while reference to other alternative methods is made in passing. Attempts are made to incorporate all the major views of the people of the village or the beneficiaries in the analysis. In doing so, an approach of "with and without" JFM in a social accounting framework has been adopted. The findings reveal that the project can yield some net benefits to the people of the village, but not without uncertainties or sensitiveness of outcomes.

Introduction

Joint forest management, as a community-based participatory forest management was launched in Karnataka in 1993. By the end of 2003 as many as 3,799 village committees have been formed covering about 253,000 hectares of forest area, which amounts to about 33 per cent of open forests in the state. The average area of a JFM project is about 67 hectares. The joint forest management Act in Karnataka provides ample scope for participation of local communities in the programme, starting from formation of village protection committees and their involvement in specie selection, nursery development, forest protection, and sharing of benefits. This paper is based on a field study to evaluate an ongoing joint forest management (JFM) project in Karnataka. The methodology of evaluation is a straightforward cost-benefit analysis, while reference to

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other alternative methods is also made in passing. Attempts are made to incorporate all the major views of the people of the village or the beneficiaries. In doing so, an approach of "with and without" JFM in a social accounting framework has been adopted. The project is treated as a model of village transformation rather than a purely biomass-based forest protection project. This section gives some details of the village settings. The next section is sketched on the details of forming the JFM group in the village, and also about the other developmental tasks undertaken in the village. Section three develops the methodology of evaluating the programme using a cost-benefit framework. This is followed by section four on a benefit cost appraisal of the project. The final section is devoted to summarise major lessons.

Socio-Economic Status in the Village

Kotekoppa is a small village about 27 kilometres from Sirsi town in Uttara Kannada district[1]. The village is situated on very gently sloping lands, surrounded by natural forests. It receives an annual rainfall of about 200 cm during the Southwest Monsoon. The total geographical area of the village is 163 ha of which 107.75 ha comprise forest areas constituting about 66 per cent of the geographical area. Forest lands include 89 ha of reserve forest and 18.5 ha of minor forests. The forests are of moist deciduous type, mainly consisting of species of *Terminalia, Lagerstroemia, Artocarpus, Emblica, Eugenia, Bassia, Diospyros, Xylia, Semecarpus, Cieba sp., Buchanania, Careya,* bamboo etc. The cultivated lands are located in the valley, consisting mainly of paddy fields of about 44.8 ha.

Households are clustered in only one hamlet in the village. At present there are 17 households (with 23 families) in the village, of which 13 households have agricultural lands. The remaining households are landless, of which three families have encroached lands, and brought them under cultivation. The total population of the village is 130 of which 60 are women. The major caste communities are *gouda*, and *kurabar*. There is no schedule caste or tribe population in the village. The literacy rate among the villagers is low (only 15 per cent). The main occupation of the people is rain-fed agriculture. The majority of the families have incomes below the poverty line. The major crops are paddy, sugarcane in *kharif* and a variety of pulses like groundnut, black gram, horse gram etc., in the *rabi* season. In recent years, the farmers have started growing ginger, cowpea etc. The villagers also cultivate arecanut, coconut, mango, cashewnut, jackfruit, banana etc., on a very small scale. The village has

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Joint Forest Planning and Management (JFPM) in Kotekoppa

JFPM was introduced in Kotekoppa in 1993 mainly for two reasons. First, to develop the degraded forest land of the village by raising plantations and managing them for the benefit of the communities, and second, to protect the remaining forest area in the village. A Village Forest Committee (VFC) was formed in early 1994 and all the households became members of the VFC. The VFC has a Chairman and a Managing Committee with eight members. The Section Forester has been nominated as the Secretary of the Managing Committee.

Under JFPM, forest plantations were raised in two phases. In 1993, the first plantation in an area of 34 hectares of reserved forest area was carried out. In this phase 44,000 seedlings were planted mainly with species such as *Tectona grandis, Acacia auriculiformis,* bamboo, *Terminalia tomentosa, Terminalia paniculata, Lagerstroemia lanceolata, Sapindus emargianta, Emblica officinalis,* jackfruit, mango etc. Subsequently, a second plantation was raised in an area of 25 ha in 1997. In this phase 20,000 seedlings mainly of *Acacia auriculiformis, Vitex altissima, Terminalia paniculata, Eugenia jambolana, Artocarpus lakoocha* were planted. See annexure for the details of species-wise plantations.

As part of the joint forest management strategy, training was extended to all members of the VFC in the first phase of the programme, especially the Chairman and women members on different aspects of JFPM (on plantation raising, de-weeding, protection etc.,) (Bhat et al, 2000). The women of the village with the help of an NGO have formed a self-help group (SHG). The VFC members participated and volunteered their labour in the protection of plantations from grazing, fire, and illicit cutting of trees[2] . Several developmental activities in addition to plantations were implemented in the village under the JFPM programme. They are summarily stated as:

1. ***Installation of ASTRA fuel-efficient stoves*****:** Fuel-efficient ASTRA stoves were installed in 16 houses free of cost under the JFPM programme. Karnataka Forest Department contributed a total of Rs. 5440 at the rate of Rs. 340 per stove. Individual households also contributed in terms of their free labour at the time of installation of the stoves[3] .

2. ***Installation of biogas plants:*** Nine biogas plants have been installed as part of a programme of the Government as an

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2. ***Installation of biogas plants:*** Nine biogas plants have been installed as part of a programme of the Government as an

additional incentive to each beneficiary from the JFPM programme. The people also invested in the biogas programme in cash and labour. Individual households contributed their labour in digging and levelling, etc. The cost of each biogas plant was Rs. 9000, shared between the Karnataka Forest Department (Rs. 1000), KVIC (Rs. 7000), and the individual households (Rs. 1000).

3. ***Construction of Village Community Hall:*** This is a village asset created purely by the voluntary efforts of the village community. The villagers contributed their community labour and finance. Villagers use it regularly for meetings, music, village functions etc. Villagers participate in protection, maintenance, and management of the Community Hall.

4. ***Acquisition of movable community assets:*** Through voluntary efforts the villagers collected tables, chairs, *tabla,* harmonium etc., used regularly in the Community Hall.

Creation of these individual and community assets was part of the JFPM package. It can be viewed that these acted as *catalysts* in making the villagers come together in participating on the forest protection and development jointly.

A summary of major features of the village is shown in Table 1.

Table 1 : Village-Level Major Features

Sl. No.	Major features	In 1993-1994	In 1999-2000
1	No. of hamlets	1	1
2	No of households (families)	16(16)	17 (23)
3	Total population	150	130
4	Total geographical area	161.6 ha	161.6 ha
5	Extent of village forest land	106.8 ha	106.8 ha
6	Extent of reserved forest land given to JFPM in 1992-93	34 ha in 1992-93	25 ha additionally out of village forest land in 1997-98
7	Extent of (paddy) cultivated land	44.5 ha	44.5 ha
9	Irrigation facility	5 tanks (dry in summer); no other	One tank is usable. Others are dry
10	Major crops	Paddy and sugarcane in kharif and a variety of pulses like groundnut, black gram, horse gram, etc., in rabi season.	Same as in 1993-94 period with ginger, sericulture added recently
11	Major occupations of households	Agri=12;Labour=1; Landless=3	Agri=13; labour=1; landless=3
12	Livestock	Cows+bullocks=111;Buffalo=14; goats and sheep=28	Cow+bullocks=80; buffalo=20; goats and sheep=35
13	Area protected by VFC	34 ha since 1994	34+25=59 since 1997
14	Total no. of seedlings planted	44,000	44,000+20,000
15	Species mix in JFM area	*Tectona grandis, Acacia auriculiformis, bamboo, Terminalia tomentosa, Terminalia paniculata, Lagerstroemia lanceolata, Sapindus emargianta, Emblica officinalis, jackfruit,* mango etc.	*Additionally, Acacia auriculiformis, Vitex altissima, Terminalia paniculata, Eugenia jambolana, Artocarpus lakoocha*
16	Forest protection arrangement	Livestock feeding away from JFPM area for the first 3 years	Now free grazing allowed in JFPM area since 1997.
17	Community investment	Built community hall	Fully under operation
18	Additional investments done by KFD	ASTRA stoves (16), biogas plants (9), one table+10 chairs, One *tabla*+harmonium+ Rs. 5000 initial seed money to the community	All these investments done in the first years.
General comments on the village: (1) Present survival rates of the plantation not yet assessed. But it can be assumed to be about 80%. (2) Homogeneous caste society, with very poor livelihood supports. Women's self-help group is very active.			

Methodology of Evaluating the JFPM

It may be useful to review very briefly the different methods of evaluating community-oriented forest management programmes. There are at least four major alternatives in any environmental protection projects; they are based on economic, multi-disciplinary (e.g., sociological), and scientific methods:

- ✓ **Benefit –cost analysis**
- ✓ **Multi-criterion analysis**
- ✓ **Stakeholder analysis**
- ✓ **Environmental impact analysis**

Cost benefit analysis (CBA) is the most common method of economic project and policy appraisal. CBA is a decision tool, which judges projects according to a comparison between their costs (disadvantages) and benefits (advantages). In this analysis, the direct and indirect costs incurred and the benefits gained by the implementing agency as well as all the stakeholders are to be compared and contrasted. The costs and benefits are evaluated using 'appropriate values' (often termed as shadow prices), which are not necessarily the actual prices. The stream of annual benefits and costs are then added separately using appropriate time discount rate. The aggregated benefits and costs thus arrived at are compared and evaluated. If a project shows a net benefit, it can be approved, and different projects can be ranked according to the size of their net benefit.

Two basics should be remembered here. One, fundamental for CBA, is to recognize that all costs (direct and indirect) and all benefits (direct and indirect) are to be valued (using valuation techniques). The values of all the inputs (i.e., costs) and outputs (i.e., benefits) are to be obtained in terms of what people are 'willing to pay' for them, and not necessarily what they are actually paying (i.e., price). Second, the technique is useful only when there are alternatives to be examined (be they ecological, commercial, or technical).

What are the different steps involved in any CBA? They may be summarily stated as below.

- Identification of alternative techniques, management practices and options that are relevant to the project;
- Identification of project life and an appropriate discount rate;

- Identification of all the direct and indirect cost and benefit components through the life of the project;
- Estimating or applying available values for benefits and costs;
- Discounting benefit and cost streams, and arriving at present value benefits and costs;
- Applying appropriate decision criteria regarding the project selection or evaluation. The alternatives available in general are, net present value benefits, benefit / cost ratio and internal rate of return.

As a case of evaluating JFM in a situation as in Kotekoppa village, an alternative option is management of the same patch of forest land by the forest department itself. Then the JFM is an alternative management technique (or option) available to the FD management. How should one view the net gains from JFM? There are two ways of doing this. First, the net present value benefits from each of the options are compared and contrasted. Second, the gains from JFM are viewed as 'incremental benefits', to be weighed over the 'incremental costs' between the JFM and FD management options. In other words, the incremental benefits between the two options are compared with the incremental costs between the two options.

All the costs and benefits are to be based on sound valuation methods or with shadow pricing for inputs including labour, man-made capital etc. After accounting for all costs and benefits under each of the options, they must be discounted so that they can be compared on an equal footing, allowing for the years in which they occur and reducing both streams to a single figure, namely present value. The CBA decision rule incorporating time is the net present value benefit (NPVB):

$$NPVB = S\ (B_t - C_t)\ (1 + r)^{-t}\ , \qquad (1)$$

where, subscript t refers to time, B - benefits (including environmental benefits), C - costs (including environmental costs), r- the discount rate.

If NPVB is found to be >0, then the project is said to be a viable one.
Are there alternative decision rules within CBA? Yes there are some alternative rules, which may also be considered. One can determine the net worth of the project by estimating the (a) benefit cost ratio (B/C) and (b) internal rate of return (IRR). The benefit cost ratio is defined as the ratio of the present value benefits to present value costs, and is expressed mathematically as:

$$\text{B/C ratio} = \{\Sigma B_t (1 + r)^{-t}\} / \{\Sigma C_t (1 + r)^{-t}\} \qquad (2)$$

As long as the B/C ratio is greater than unity, the project is worth taking up, or it is said to be functioning well. Higher the value of the ratio, the better is the option or project. The IRR is an indicator of the most probable break-even rate of return corresponding to the net present value benefit [shown in formula (1)] to be zero[4]. This can be computed by experimenting with different rates of discounts. That rate of discount that makes the NPVB equal to zero corresponds to the IRR[5].

Multi-criterion analysis is an alternative to CBA. In this method, using a large sample database (say at the individual beneficiary or stakeholder levels, both quantitative and qualitative) on the performance of the project, aggregate performance scores can be constructed and ranked for different alternatives. For instance, with the data from individual households, on the benefits and costs at the individual household levels (mainly quantitative), as well as their rankings of various opinions from them on the gains from JFM (mainly qualitative), a composite index or score can be computed for the JFM and FD management options[6].

Stakeholder Analysis (SA) is an approach and procedure for gaining an understanding of a process or project mainly from the point of view of key stakeholders, an assessment of their interests, and the ways in which these interests conflict and affect the process and vice-versa. SA can help in the design and monitoring of forest conservation projects in several ways.

- Elicit the interests of stakeholders in relation to the problems, which the process is seeking to address (at the identification stage) or its purpose (once it is started).
- Identify conflicts of interests between stakeholders, which influences the assessment of project risk before committing funds (for proposed project activities).
- Help to identify relations between stakeholders, and enable 'coalitions' of process ownership, sponsorship, and co-operation.
- Address the distributional and social impacts of policies and projects in a better way.
- Help to assess the appropriate type of participation by different stakeholders, at successive stages of the process cycle.

Although stakeholder approach is applied to a wide variety of areas in the development sector, there are several distinctive characteristics of forest resource management that make SA particularly relevant to the analysis. It can serve as a means of complementing and strengthening the policy and project assessment procedures, especially in dealing with stakeholder interests, where conventional methods such as cost-benefit analysis are deficient[7].

Environmental impact assessment (EIA) is yet another technique to take stock of the environmental aspects of a project, both immediately and also in the long run (Ram Babu, 2003). EIA is an iterative process of assessing the various environmental dimensions, incorporating improvements and mitigation measures in a project's development commencing right at the outset of the project. In this way, EIA can often prevent future liabilities or costly alterations in project design. EIA offers a decision aid to delineate the environmental consequences of a proposed development, to planners. The objective of EIA is to foresee the potential problems that would arise out of a proposed development and address them at the project planning and design stage. There is a cycle concept of the EIA. It is a kind of feedback process in which the experience from project monitoring and auditing regarding environmental matters are fed back to further improvements in the project system. The EIA cycle consists of the following phases: Screening, scoping, baseline determination, impact prediction, assessment of an alternative and delineation of mitigation measures, environmental impact statement and review, public consultation, and finally post project monitoring and auditing. However, this technique is not very useful for evaluating JFM, as JFM has much less to do with pollution and such other environmental issues.

Benefit-Cost Analysis Applied to Kotekoppa JFM

Comparison of 'before and after JFM' situations

Under BCA, one can carry out either a pure financial analysis or a social benefit-cost analysis. There are some basic differences between them. Under a financial analysis, only the direct financial costs and financial benefits of the project are accounted for. Whereas, under a social benefit-cost analysis, both direct and indirect benefits and costs as viewed from the point of view of the society are accounted for. Secondly, under social BCA, corrections are made wherever necessary, on prices and costs used in the financial analysis to reflect social values/prices/costs. Generally, in

financial analysis, a criterion such as 'pay-back-period' alone is used, whereas several alternative evaluation criteria are used in social analysis. Finally, there is a choice of discount rate in social BCA to reflect social preferences, whereas financial analysis is based on the applicable interest/ bank lending rates.

How do we carry out a BCA for the Kotekoppa village study? JFM is a land based project. Land has several alternative uses. Therefore, generally it has to be assessed based on a principle of *'with and without the project'*. In this regard, several aspects of the village have to be kept in mind.

- In the Kotekoppa situation, the locals were getting some benefits from the forests prior to the JFM project. Whenever their needs were not met from the forests, they relied on alternatives such as market purchase or going without them (a case of hardship). Its benefits spill over between benefits to the local communities, and ecological benefits of long-term reversal of forest degradation to sustainable forestry. Many of the benefits are in kind (i.e., not marketed or priced). There are also several eco-system benefits. All these need to be valued.
- Community labour is not paid for in cash (i.e., not priced). But these need to be accounted for (using a shadow pricing method). Contribution of the local communities is a major social catalyst in JFM.

Therefore, the best way to analyse JFM under BCA is to consider the social benefits and costs in '*Before JFM and After JFM'* situations and compare and contrast them.

Let the ***degree of dependency*** of the local on forests be analysed first. JFM is a community oriented programme. The success of the programme depends on the extent of local involvement, empowerment, and right to their basic needs. Identification of these is essential to foresee the involvement of communities as the major catalysts and actors in the programme.

Note that dependency analysis does not mean that only these are the expected benefits/changes from JFM. Additional gains from JFM can be:

- Timber benefits,
- Eco-system services (growth of micro organisms, carbon sequestration, rainfall regulation, nutrition cycling etc.),

- Watershed development (soil conservation, water retention),
- Wildlife conservation,
- Eco-tourism.

All these entities are part of the process of 'Identification of project demand and supply' or prospects from the project. The major tangible benefits or dependencies of the local communities are shown in Table 2.

Local communities are dependent on fuelwood, fodder, small timber, some NTFPs (*aonla*, soapnut, jackfruits etc.), leaf biomass for composting manure, and a few other needs such as drinking water etc. All these dependencies are to be analysed as in two situations, one before JFPM and the other after JFPM. How can the data and information on both these situations be obtained? They are obtained by conducting both household surveys and Focus Group discussions (FGD) in the village. Some of the data on the 'before JFPM' situation are taken from the Village Micro Plan, prepared at the time of launching the project. Additionally, field level impressionistic views and data are also recorded. Table 2 also gives the views and opinions of the people on different items (based on the Focus Group discussion). Some of the striking findings can be summarily stated here.

As compared to an expected decline in dependency on forest fuelwood by 50%, the actual decline is about 30%. The fodder availability seems to be as per the original estimates. This was possible because of strict vigilance during the first three years on not allowing any grazing in the forests[8]. Other benefits from JFM have been found to be far below the expected yields. However, because of higher prices, the current benefits may look quite rewarding.

Table 2 : Village Level Dependency on Forests (per year) Before and After JFPM Situations

Item	Before JFM		After JFM		As per field impression
	As per feasibility report	Comments	As per the feasibility report	Comments	
Fuel wood	108 tonnes: @20kg for 10 persons	Not fully met from the forests: Either market purchase or unfulfilled demands	54 tonnes from JFPM area	Some pressure is reduced by 'ASTRA' stove and biogas supply	Actual collection has come down by 30% due to biogas etc. Fuelwood collection now is 70 tonnes per year. Fuelwood price in the market: Rs.100 /quintal
Fodder	335 tonnes: @ 20 kg per live stock	Only 112 tonnes met from farm lands	136 tonnes in 93-94; 306 tonnes in 94-95; 374 tonnes in 95-96 onwards	After 1995-96 onwards self-sufficiency in fodder from JFPM	As expected: 374 tonnes per year; price Rs.0.50 per kg (green+dry)
Small timber	About 2 Cft per family for plow etc.	At present no provision	About 2.5 Cft per family can come from JFM	This has been promised.	At present 1.037 Cft per family; price Rs. 250/Cft.
NTFPs	Soapnut, jackfruits, kendu leaves etc.	No precise data: approx: Rs.8000 @Rs. 1000 per family	Rs. 100,000: marketable portion	Some more is collected for home consumption	About Rs.900 per family
Leaf biomass (green +dry)	11 tonnes: @10 kg per day per family for one month	Not fully met	11 tonnes	Currently being met	Rs. 9000 for the entire village @ 25 bundles per day per family for 2 months
Other depen-dency	Dairying; drinking water; handicrafts; employment as labourers	Limited opportunities	Nil from JFM		No data
General comments : Field impression is based on information from five surveyed households and Focus Group discussions.					

What are the components of the investments done in the village? The investments are done by different stakeholders in the village. The main stakeholders are the Karnataka Forest Department, village communities and a few donors. In the case of Kotekoppa, the government finances came from the DFID project as grants. Table 3 summarises the flow of investments, since the inception of the project, from the project authorities directly to the plantations. As mentioned earlier in the Introduction, several catalytic investments were also carried out in the village. They are summarised in Table 4. Both the tables are self-explanatory. Plantation costs are incurred only during the periods of initial plantation works. Subsequently, all the costs are treated as maintenance work.

The village communities participated as wage labourers in the basic plantation work. However, they contributed free labour in the installation of various catalytic investments shown in Table 4. In identifying the community labour in these activities, 'recall memory' methods were used. Only certain averaged norms of labour time and costs could be identified.

Table 3 : Investment Costs by Forest Department on Plantation (in Rs.)

Year	Advance work		Plantation		Maintenance: Department labour	Number of seedlings[a]	Comments
	Labour	Material	Labour	Material			
1992-93	107100	54381				44000	Local labour used
1993-94			122230	32603			-do-
1994-95					57275		-do-
1995-96					15582		-do-
1996-97	40457	20000				20000	-do-
1997-98			61023	30000			-do-
1998-99					52206		-do-
1999-00					42057		-do-

General comments : It is somewhat difficult to distinguish between plantation and maintenance work. The departmental wage rate paid was Rs. 25 per worker day; Material costs are on seedlings etc.

[a]: The mix of various species of seedlings is shown in Annexure 1.

Table 4 : Other Catalytic Village Level Investments

Item	No.	Direct investment cost	Labour component imputed: indirect cost
ASTRA stoves	16	By KFD: Rs.5440 @ Rs.340 per unit including labour cost	Rs.1600@ about 2 days of labour per unit at the time of installation @Rs. 50 per day
Biogas plants	9	Rs.81,000 @ Rs. 9000 per unit (Rs.1000 paid by KFD + Rs.7000 by KVIC+Rs.1000 by individual beneficiaries	Rs. 2700=Rs.300 x 9 at the time of installation
Community hall	1	Approx. total cost: Rs.30000, of which Rs. 15000 of material was supplied by the community	Rs.15000 worth of community labour at the time of initial construction; Subsequently every year about Rs.200.
General Comments: Community labour has been valued here based on "recall method".			

Assessment of Participation of Community Labour

In any community oriented project such as this one, recognition and assessment of community labour contribution is important. Perhaps there are no direct payments made for their contribution. However, their imputations are necessary to get a correct picture of the social costs of the project. They are treated as costs incurred by the community indirectly. How are such labour contributions in a JFM project valued?

Community labour was involved in two stages of the project. First, at the time of plantation work, the villagers were given training on JFM, plantations, protection and forming the village community and village protection committee, self-help group etc. Second, they also participated in the installation of biogas plants, ASTRA stoves, construction of community hall, etc.

What should be the appropriate value assigned to community labour time? Can departmental wages be used as a proxy to value the time spent by the community? As far as departmental and hired labour by the Forest Department is concerned, the official wage rate paid to them can be taken as the appropriate labour costs for the project works. These are the direct labour costs. When it comes to contributory community labour, it can be valued indirectly by applying an opportunity cost of labour. For this, the going market wage rates for men and women are taken. The details of the labour costs thus arrived at are shown in Table 5.

Table 5 : Details of Labour Costs in JFPM

Year	Department labour (in Rs.)	Community labour (in Rs.)
FOR JFPM WORK		
1992-93	107100	25200=35 days[a] x 18 HH x Rs. 40
1993-94	122230	17200=24 days x 18 HH x Rs.40 (average of male and female wage rate)[b]
1994-95	57275	17200 [b]
1995-96	15582	17200 [b]
1996-97	40457	17200 [b]
1997-98	61023	17200 [b]
1998-99	52206	17200 [b]
1999-00	42057	17200 [b]
FOR COMMUNITY HALL CONSTRUCTION		
1993-94		15,000 [c] For community hall construction: community labour imputed
Then onwards		Rs. 1000 per year for maintenance
General data and comments: (1) Departmental wage = Rs. 25/day; (2) opportunity cost of community labour = Rs. 60 for men and Rs. 30 for women; (3) [a]: Attending 12 meetings + 12 protection days per year + 8 days of planting + 3 days of training; (4) [b]: Community labour in protection; (5) [c]: As per detailed village recorded data		

Social Costs and Benefits from Kotekoppa JFM

As part of the BCA, two management alternatives have to be compared and contrasted. They are (a) the JFPM alternative and (b) the FD management option. The FD management option is treated as equivalent to the 'before JFM situation'.

The social benefits are defined to include both the direct and indirect benefits, evaluated using appropriate 'shadow prices'. Likewise social costs include the costs incurred directly (say by the Forest Department) and indirectly by the community. The shadow prices are expected to reflect the 'willingness to pay' by the beneficiaries and different stakeholders. When there are well-defined markets giving information on the prices of the benefit streams (i.e., outputs from the JFM programme), one can use them as the relevant values reflecting the 'willingness to pay'. The basic methodological question then is about the

values on such inputs and outputs for which there are no available market values. Consider the cases of collection of fuelwood, fodder, grazing, or benefits from the use of biogas plant and so on. There are no good markets (at least in the Western Ghat regions) from where the relevant prices can be obtained. Invariably, the people treat them as free commodities. Yet they have some value, to be deduced indirectly by using one or other of the following concepts/measures.

- Replacement values (or values of alternative source), say, kerosene for biogas
- Equivalent energy value, say, value of electricity for biogas
- Regeneration cost, say, cost of regenerating the fodder cut
- Savings in alternative resource, say, value of time saved
- Opportunity cost of time in collection (say, for fuelwood or fodder)

Table 6 shows the identification of such benefits and costs. It shows the values of various benefits and the costs in the two situations of "before" and "after" JFM. The values thus arrived can also be viewed differently by the different agents/actors in the programme such as the Forest Department, NGOs, local communities and so on. The methods of deriving the values are briefly explained here.

Grazing activity: Before the JFM programme, the villagers used to freely graze their cattle in the forests, on average for 120 days a year. What is the cost of this activity? There are no financial costs involved as such. However, some family labour is involved which is perhaps not paid for. Assuming that from each family one male member has to be with the cattle, the opportunity cost of such family labour can be estimated. With sixteen families deputing one male member per day for 120 days, and assuming the market wage rate to be Rs. 60 per day, the total imputed labour cost of grazing works out to Rs. 115,200 per year on average. What was the benefit from grazing then? The grazing activity yielded about 112 tonnes of fodder per year for the village as a whole. The price of green + dry fodder in the nearby market (at Sirsi) was Rs. 0.50 per kilogram. Accordingly the benefit from grazing was Rs.56,000 per year.

After the JFM programme, with better fodder growth, the time required for grazing would be less, say only three hours per day. Then the total cost of grazing at the village level would be less (Rs. 48,600 per year). But with the JFM, the yield of fodder is also higher. A total of 223

tonnes of fodder per year would be collected from the fourth year of the programme onwards. The imputed value of the grazing benefit is therefore Rs. 111,500 per year.

Fuelwood collection: In the situation of 'before JFM', the cost of fuelwood collection is imputed assuming that (a) it takes two hours per day for two women to collect the needed fuelwood, and (b) that it is an activity carried out for about 200 days in a year. With market wage rate for women of Rs. 40, the imputed cost of fuelwood collection is Rs. 64,000 for the sixteen families. The benefit of fuelwood of about 54 tonnes per year for the village as a whole is valued at the market rate of Rs.100 per quintal.

After the implementation of JFM, the cost of labour time for collecting fuelwood still remains the same, but the collection of wood is higher at 70 tonnes, valued at Rs. 70,000 per year.

Likewise, the benefits and costs for the biogas plant and ASTRA stove operations are imputed. Since the ASTRA stoves are not in use, no benefits are attributed, but the costs of their construction have to be considered. The biogas plants are assumed to release fuelwood consumption to a tune of 3 kg per family per day, all together valued at Rs. 8760 per year. During the first three years, when the cattle were stall-fed, the gain from additional dung collected in the house shed is a gain, attributed as benefit to the JFM option. This is estimated at about 10 cartloads of dung collected per family, valued at Rs. 60 per cart load.

Table 6 : Identification of major social costs and benefits

		No entry in JFPM area for the first three years only	Grazing	Fuelwood collection	Construction of community hall	ASTRA stoves: 16	Biogas plants: 9
Before JFPM	Costs	——	Rs. 115200= for 1920 man days imputed= 1 person x 120 days x 16hh	Rs.64000= 2 hours per day for 2 persons per HH x 200 days x 16hh = 1600 mandays imputed at Rs.40 per day		——	——
	Benefits	—— ——	Fodder demand: only 112 tonnes met	Minimal supply of 50% of demand = 54 tonnes met	——	——	——
After JFPM	Costs	Additional cost Rs. = 86400 = one labour x Rs.40 x 120 days x 18HH	Rs.48600=3 hours x 120 days x 18HH= 810 mandays imputed	Rs. 64000= same as before: Labour time cost	One time Rs. 30000 of which Rs. 15000 in material and Rs. 15000 community labour; every year Rs. 1000 recurring labour cost	Total cost= Rs.54 40	One time Rs.81000= Rs.9,000 per unit x 9
	Benefits	Additional dung worth Rs.10,800 = Rs.60 per cartload x 18 HH x 10 cartloads	Rs.111,500= Additional fodder: saving fodder purchase=223 tonnes per year from the 4th year onwards @ Rs.0.50 per kg.	Rs.70,000= 70 tonnes x Rs. 100 per quintal	Hall for community work	No benefit now, though some benefits initially	Only 8 working now: Rs. 8760= equivalent cost of 3 kg fuelwood per family saved x 8 HH x 365

Notes : Timber benefit at the end of 10th year is yet to be assessed. Timber price Rs. 650/cft; Price of Acacia is Rs. 86/cft.

The number of households have increased from 16 to 18 over the years.

All the costs and benefits shown in Tables 3-6 are aggregated to get the consolidated picture of the social costs and benefits. Their summary totals are shown in Appendix-Table 1 for the period from 1992 to 2000.

What are the corresponding social benefits? They include forest-related benefits such as enhanced availability of fodder, fuelwood, biomass, small timber, NTFPs and benefits from biogas. Additional eco-system service benefits such as watershed benefits are expected in the coming years. However, no such visible benefits have been observed so far. Under JFM, the village communities are expected to get some timber benefits as well, though they will arrive only after the 10th year (as per the project design). Therefore, it has not been possible to obtain the value of the actual timber benefits derived. Some rough estimates are however made based on DBS analysis and field data collected by the Centre for Ecological Studies (CES), Indian Institute of Science. Appendix-Table 2 shows the totality of all those benefits on an annual basis for the years 1992 to 2000.

Ecological Benefits to be Valued

Three most important ecological benefits that JFM can enable are: the growth of micro-organisms, watershed benefits and timber benefits. One can also add to this list values of other ecological functions such as carbon sequestration, wildlife support etc. In the Kotekoppa situation, so far no visible watershed benefits were observed. However, timber benefits due to support to micro-organism growth are already visible. Visitation of a variety of birds has increased to this area (an indication of the increased availability of ants and worms. It has not been possible to value the contribution of such an ecological function due to this JFM activity.

As far as timber is concerned, in the first phase of 1992-93, in all 44,000 saplings were planted. Out of these, 8000 are *Acacia auriculliformis,* the rest being varieties of teak and non-teak species (see annex for details). Only the acacia plantations qualify for cutting by the year 2001-2002. The Centre for Ecological Studies has carried out a volumetric study of these plantations. The details are as follows:

Total number of acacia planted in 1992-93= 8000;

Survival rate of acacia (reported by RFO Sirsi)= 80%;

Total number of acacia surviving for cutting at the end of 10th year =6400;

Volume of acacia after 10 years of plantation (Source: ODA)= 0.041 m^3 per tree;

Total volume of acacia cut= 262.4 m^3 =9266.39 cft;

Market price of acacia (source RFO, Sirsi)= Rs. 86/cft;

Total market value of acacia= Rs. 796910.

Appendix-Table 2 shows all these annual benefits except for the timber benefits that would accrue only in the year 2001-02.

Evaluation of the Programme

The last step involved in CBA is the choice of criterion to evaluate the project. Two issues are involved here. First, there is the question of the appropriate discount rate. Then is the purpose of evaluation for which the appropriate decision criterion has to be applied. Both need to be kept in mind in recommending the appropriate criterion for evaluation.

Objectives behind the Kotekoppa JFM project

The major objectives of the JFPM can be recapitulated now. They are:

- To increase the area under forest
- To conserve and to increase the biodiversity
- To assure sustainable use of forest products
- To meet the basic needs of the community such as fuel wood, fodder, leaf biomass etc
- To ensure the involvement of the local community in the planning and management of the forest resources
- To prevent forest degradation

There is a mix of both long term and short term benefits, and local and global objectives in any JFM. Therefore, in this case study, two different discount rates are used. In addition, three different criteria are used. The annual streams of benefits and costs have to be evaluated now using appropriate discount rates. The consolidated annual social benefits and costs are shown in tables 7 and 8. The table also shows the incremental gain (i.e., benefits) and also the incremental costs of the JFM.

Table 7 : Consolidated Table of Social Costs (in Rs.)

Year	Before JFM	After JFM	Incremental costs attributable to JFM
1	**2**	**3**	**4= 3-2**
1992-93	221257	299281	78024
1993-94	221257	284633	63376
1994-95	221257	187075	-34182
1995-96	221257	145382	-75875
1996-97	221257	190257	-31000
1997-98	221257	220823	-434
1998-99	221257	182006	-39251
1999-00	221257	171857	-49400
2000-01	221257	171857	-49400
2001-02	221257	171857	-49400

Note: Incrementals are over the "before JFM" situation.

Table 8: Consolidated Table of Social Benefits (in Rs.)

Year	Before JFM	After JFM	Incremental benefits attributable to JFM
1	**2**	**3**	**4= 3-2**
1992-93	136500	184260	47760
1993-94	136500	184260	47760
1994-95	136500	184260	47760
1995-96	136500	228960	92460
1996-97	136500	228960	92460
1997-98	136500	228960	92460
1998-99	136500	228960	92460
1999-00	136500	228960	92460
2000-01	136500	228960	92460
2001-02 (without timber benefits)	136500	228960	92460
2001-02 (with timber benefits)	136500	1025870	889370

Note: Incrementals are over the "before JFM" situation.

In the usual short-term investment projects, invariably a social discount rate of 12% is used (Murty *et al.,* 1992). But in the case of JFM, which is an ecologically oriented project with more long-term ecological benefits than tangible benefits (of livelihood relevance), a lower discount rate is recommended. In this case study, a discount rate of 6.25% is used for this purpose. This discount rate corresponds to the pure time preference rate. However, computations are carried at both the discount rates. This way, the sensitiveness of the project to long-term and short-term goals can be analysed. Various criteria of evaluation are already described in section 3. Tables 9 and 10 show the computations as required for these criteria.

Table 9: Cost-Benefit Analysis (Using 6.25 % Discount Rate)

Year	Discount factor	Discounted costs before JFM	Discounted benefits before JFM	Discounted costs after JFM	Discounted benefits after JFM
1	2	3	4	5	6
1992-93	0.941	208241.88	128470.59	281676.24	173421.18
1993-94	0.886	195992.36	120913.49	252131.65	163219.93
1994-95	0.834	184463.40	113800.94	155965.64	153618.76
1995-96	0.785	173612.61	107106.76	114076.16	179656.88
1996-97	0.739	163400.10	100806.37	140506.35	169088.83
1997-98	0.695	153788.33	94876.58	153486.67	159142.43
1998-99	0.654	144741.96	89295.60	119064.73	149781.11
1999-00	0.616	136227.73	84042.92	105812.19	140970.46
2000-01	0.579	128214.33	79099.22	99587.95	132678.08
2001-02 (Without timber benefits)	0.545	120672.31	74446.33	93729.83	124873.48
2001-02 (with timber benefits)	0.545	120672.31	74446.33	93729.83	559503.67
Total (with timber benefits)		1609355.01	992858.80	1516037.41	1981081.33
Total (without timber benefits)		1609355.01	992858.80	1516037.41	1546451.14

Note : Discount rate assumed is 6.25 %; Discount factor = $1/\{1+0.0625\}^{t}$, where

Table 10: Cost-Benefit Analysis (Using 12 % Discount Rate)

Year	Discount factor	Discounted costs before JFM	Discounted benefits before JFM	Discounted costs after JFM	Discounted benefits after JFM
1	2	3	4	5	6
1992-93	0.893	197550.89	121875.00	267215.18	164517.86
1993-94	0.797	176384.73	108816.96	226907.68	146890.94
1994-95	0.712	157486.36	97158.00	133156.29	131152.63
1995-96	0.636	140612.82	86748.22	92392.89	145508.22
1996-97	0.567	125547.16	77453.77	107956.93	129918.05
1997-98	0.507	112095.68	69155.15	111875.80	115998.26
1998-99	0.452	100085.43	61745.67	82330.27	103569.88
1999-00	0.404	89361.99	55130.06	69410.16	92473.10
2000-01	0.361	79787.49	49223.27	61973.36	82565.27
2001-02 (Without timber Benefits)	0.322	71238.38	43949.35	55333.35	73718.99
2001-02 (With timber benefits)	0.322	71238.83	43949.35	55333.35	330302.68
Total (Without timber benefits)		1250151.40	771255.44	1208551.92	1186313.21
Total (With timber benefits)		1250151.40	771255.44	1208551.92	442896.90

Note : Discount rate assumed is 12%; Discount factor = $1/\{1+0.12\}^{t}$, where t stands for the year as 1,2,3…

Table 11: Evaluation of JFM in Kotekoppa

	Evaluation indicators			
	With timber benefits		Without timber benefits	
	At 6.25 % discount rate	At 12 % discount rate	At 6.25 % discount rate	At 12 % discount rate
Benefit cost ratio after JFM	1.3067	1.1939	1.0201	0.9816
Benefit cost ratio before JFM	0.6169	0.6169	0.6169	0.6169
Net present value benefit before JFM	-616496			-478896
Net present value benefit of JFM	465044	234345	30414	-22239
Internal rate of return: %	26.19		9.20	
Incremental cost of JFM over non-JFM (in Rs.)[a]	-93318	-41599	-93318	-41599
Incremental benefit of JFM over non-JFM (in Rs.)	988223	671641	553592	415058
Net incremental benefit from JFM (in Rs.)	1081540	713241	646910	456657
Per hectare net incremental benefit from JFM per year (in Rs.)	1833.12	1208.88	1096.46	774.00

Notes : [a] These incremental costs are negative. This means that it is indeed incremental social benefits, i.e., the social costs associated with JFM are lower than that without JFM.

The JFM in Kotekoppa has several messages for policy making. Clearly, before the JFM programme the villagers were incurring more social costs than real benefits. This is obvious from the fact that before JFM, the benefit cost ratio is 0.6169, much below unity. Also to be noted is the fact that the net present value social benefit of 'before JFM' situation is negative.

With the introduction of JFM, the situation seems to improve. The benefit cost ratio improves significantly. Second, if one ignores the timber benefits, at the discount rate of 6.25%, the benefit cost ratio is just about unity. Without the timber benefits, the internal rate of return is only 9.20%. At the commercially acceptable 12% discount rate, the benefit-cost ratio without timber benefits is close to but less than unity.

In other words, without the timber benefits, the project is just breaking even. The internal rate of return of 9.20% is not sufficient to induce the JFM programme on a large scale, without the incentive of providing timber benefits.

Third, when the timber benefits are considered, the project viability improves further very significantly. The benefit-cost ratio increases to 1.19 with the 12% discount rate, and 1.30 with the 6.25% discount rate. The internal rate of return with timber benefit jumps to a very high value of 26.10%. This is clearly a reflection on the long-term social benefits being more important than the short-term ones.

The average per hectare net return with timber benefits (over and above the returns without the JFM situation) is as high as Rs. 1830 (at the low 6.25% discount rate). Without the timber benefits of course, the net benefit per hectare is as low as Rs. 782 (at 12% discount rate). Therefore, the social gains from JFM are very sensitive to (a) the availability of timber benefits, (b) the discount rate.

Lessons from the JFM and Conclusions

The Kotekoppa JFM project is quite small for any major generalization. However, some of the lessons from such a project are extremely relevant for the future of the programme. First, the findings reveal that the JFM project can yield some net benefits to the people of the village, though not without uncertainty or sensitivity of outcomes. Uncertainties lie partly among themselves, partly due to unclear institutional rules and sharing procedures. The fact that, at the end of the first three years of stall-feeding of cattle, the villagers did not know in clear terms whether they have to continue with stall-feeding or let the cattle go to the forest for free grazing. As can be guessed, the people chose free grazing, an event of the 'tragedy of commons'. The analysis shows, that with free grazing, the net yield of fodder grass is lower than that under protection and stall feeding.

Second, the role of the catalysts provided by the various official stakeholders is very important. Without such involvement of the people and governmental agencies together, JFM as a pure biomass programme or forest conservation programme would not stand. As the analysis suggests, long-term ecological benefits are more important. Third, equally important is the provision of a share in the timber benefits to the locals. The high internal rate of return and the per hectare net incremental

benefits under 'sharing timber benefits' need to be taken seriously. Without this, there can be a reversal process, already being witnessed marginally in Kotekoppa. The crucial issue, therefore, is one of introducing well-announced sharing rules on all long-term benefits as well. Thus, strengthening the VFCs with clearly defined long-term and short-benefit sharing rules, protection and monitoring procedures are the next major steps in promoting the institution of JFM.

Annexure

Species-wise Plantation Details of Kotekoppa JFM

Sl. No.	Local name of the Species	Scientific name of the species	No. of seedlings planted during the 1st phase [a]	No. of seedlings planted during the 2nd Phase [b]
1	*Saga*	*Tectona grandis*	10,000	—
2	*Acacia*	*Acacia auriculiformis*	8,000	15,000
3	*Nandi*	*Lagestroemia lanceolata*	1,500	100
4	*Kindala*	*Terminalia paniculata*	2,000	1,500
5	*Matti*	*Terminalia tomentosa*	2,500	—
6	*Tare*	*Terminalia bellerica*	1,500	1,500
7	*Shivane*	*Gmelina arborea*	500	—
8	*Antuwala*	*Sapindus emarginata*	2,000	—
9	*Hunase*	*Tamarindus indica*	2,000	—
10	*Murugalu*	*Garcinia Indica*	500	100
11	*Shame*	*Bamboo*	6,000	—
12	*Nelli*	*Phyllanthus emblica*	1,000	—
13	*Gudde Geru*	*Semecarpus anacardium*	500	50
14	*Halasu*	*Artocarpus integrifolis*	1,000	50
15	*Hedde*	*Adina cardifolia*	1,000	—
16	*Neralu*	*Eugenia jambolana*	1,000	1,500
17	*Mavu*	*Mangifera indica*	1,000	300
18	*Banagi*	*Vitex altissima*	500	1,000
19	*Hidanga*	*Bixa sp.,*	500	—
20	*Honne*	*Pterocarpus marsupium*	500	50
21		Miscellaneous		400
Total			**44,000**	**20,000**

Source : RFO office, Banavasi

Note : [a]: 1993; [b]: 1997

Notes

[1] It is in the Ekkambi beat of the Ekkambi Forest Section in the Banavasi Forest Range of the Sirsi Forest Division in Kanara Circle, to the East of the crest line of the Western Ghats in Karnataka.

[2] For instance, once the villagers caught a thief stealing wood from the forest and handed him over to the Forest Department.

[3] However, all households have discontinued the use of these stoves since they failed to meet the requirements of the communities and the purpose of the programme.

[4] It measures the intrinsic value of the project investment.

[5] Obviously, for some values of discount rates, the NPVB would be positive, and some others negative. Therefore, generally it is possible to estimate the IRR by a trial and error method of computing. The uniqueness of the IRR is of course something to be assumed, though mathematically not ensured.

[6] Interested readers can refer to Janssen et.al (2001).

[7] For a detailed account of the methodology and application, see Singh and Hegde (2001).

[8] However fodder availability from JFM area decreased after the removal of protection and also since the seedlings, after their establishment and growth, suppressed the growth of grass. Cattle are grazing in the forest now and grass is not available for harvesting. This information is later used for a sensitivity analysis.

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Appendix-Table 1: Social Costs at the Village Level (in Rs.)

Year	Associated with plantation work				Other catalytic works			
	Before		After		Before			After
	Labour	Material	Labour	Material	Labour	Material	Labour	Material
1992-93	115200(G)+64000 (F)+ 42057(D)	0	107100(D)+48600 (G)+64000(F)+ 25200(C)	54381(D)	0	0	1600(A)+ 2700(B)+ 1000(C)	5440(A)+ 81000(B)+ 15000(DC)
1993-94	115200(G)+64000(F)+42057(D)	0	122230(D)+48600(G)+64000(F) +17200(C)	32603(D)	0	0	15000 (CCV)+1000(C)	15000(CCV)
1994-95	115200(G)+64000(F)+42057(D)	0	48600(G)+64000(F)+57275(D)+ 17200(C)	0	0	0	1000(C)	
1995-96	115200(G)+64000(F)+42057(D)	0	48600(G)+64000(F)+15582(D)+ 17200(C)	0	0		1000(C)	
1996-97	115200(G)+64000(F)+42057(D)	0	40457(D)+ 48600(G)+64000(F)+ 17200(C)	20000(D)	0	0	1000(C)	
1997-98	115200(G)+64000(F)+42057(D)	0	61023(D)+ 48600(G)+64000(F)+ 17200(C)	30000(D)	0	0	1000(C)	
1998-99	115200(G)+64000(F)+42057(D)	0	48600(G)+64000(F)+52206(D)+ 17200(C)	0	0	0	1000(C)	
1999-00	115200(G)+64000(F)+42057(D)	0	48600(G)+64000(F)+42057(D)+ 17200(C)	0	0	0	1000(C)	
General comments : Table shows both the investment and annual costs to KFD and the community								

Notes: G= grazing; F= fuelwood collection; A= ASTRA stove; B= biogas plant; D= KF department; C= community; CCV= voluntary labour for community centre; DC= KF department for community centre;

Source: Tables 2-6

Appendix-Table 2: Social Benefits from Kotekoppa JFPM (in Rs.)

Year	Dung		Fodder		Fuelwood		Biogas		Biomass		Small timber		NTFP	
	Before	After	Before	After	Before[a]	After	Before	After	Before[a]	After	Before[b]	After[b]	Before	After
1992-93	0	10800	56000	56000	54000	70000	0	8760	4500	9000	4000	9000	18000	207000
1993-94	0	10800	56000	56000	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
1994-95	0	10800	56000	56000	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
1995-96	0	0	56000	111500	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
1996-97	0	0	56000	111500	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
1997-98	0	0	56000	111500	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
1998-99	0	0	56000	111500	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
1999-00	0	0	56000	111500	54000	70000	0	8760	4500	9000	4000	9000	18000	20700
	0	0	56000	111500	54000	70000	0	8760	4500	9000	4000	9000	18000	20700

Notes: [a]: Only 50% actually collected, there may have been some collection of dung prior to JFM, and is assumed to be continued.
[b]: As per the views from the village