WORKING PAPER 85

SOCIAL FORESTRY IN KARNATAKA: COST-BENEFIT APPRAISAL OF A PROJECT

K N Ninan
Jyothis S

INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE
2001

ISBN 81-7791-041-8

Institute for Social and Economic Change (ISEC) is engaged in interdisciplinary research in analytical and applied areas of the social sciences, encompassing diverse aspects of development. ISEC works with central, state and local governments as well as international agencies by undertaking systematic studies of resource potential, identifying factors influencing growth and examining measures for reducing poverty. The thrust areas of research include state and local economic policies, issues relating to sociological and demographic transition, environmental issues and fiscal, administrative and political decentralization and governance. It pursues fruitful contacts with other institutions and scholars devoted to social science research through collaborative research programmes, seminars, etc.

The Working Paper Series provides an opportunity for ISEC faculty, visiting fellows and PhD scholars to discuss their ideas and research work before publication and to get feedback from their peer group. Papers selected for publication in the series present empirical analyses and generally deal with wider issues of public policy at a sectoral, regional or national level. These working papers undergo review but typically do not present final research results, and constitute works in progress.

SOCIAL FORESTRY IN KARNATAKA: COST-BENEFIT APPRAISAL OF A PROJECT*

K N Ninan
Jyothis S

Abstract

This paper reviews the development of the social forestry programme in India, followed by an economic evaluation of a social forestry project in Karnataka. The analysis notes that at full benefits net of all costs, including the opportunity cost of grazing benefits foregone, the project reports a high profit with the IRR exceeding 16 per cent. If benefits were to fall short by 50 per cent, the project still reports profits with the IRR exceeding 12.5 per cent. The study illustrates that social forestry projects are economically viable and socially desirable.

Introduction

Social forestry projects have been initiated in India since the eighties to meet the needs of local rural communities for fuelwood, fodder, food and small timber, as well as regenerate and improve the tree cover on degraded forest and common lands. Thereby, it seeks to reduce pressure on surviving natural forests which are depleting fast due to economic and demographic factors, as well as improve the natural resource base of the ecologically fragile regions. It also seeks to regenerate and make productive use of the country's degraded and extensive wastelands estimated at over 129.5 mil.ha. Farm forestry programme, a component of social forestry programme, was intended to induce farmers especially in the ecologically fragile and economically disadvantaged regions such as the arid, semi-arid and hill regions of the country to take up tree growing activities. This would help the farmers make better and optimum use of their lands, as well as earn income by meeting the needs of rural and urban markets for fuelwood, bamboo, pulpwood, small timber, etc. Although the terms social forestry

* This is to appear as a chapter in a book entitled Environmental Economics In India: A Case Study Work Book edited by Gopal Kadekodi and published by Oxford University Press. Thanks are due to Professors Gopal Kadekodi, Sudarshan Iyengar, U Sankar, and Paul Appasamy for comments on an earlier draft.

and farm forestry have been ambiguously used, the two are strictly speaking not the same. While farm forestry has been promoted largely on commercial considerations and with profit motive in view, the same is not the case with social forestry which has broader social objectives in view, such as improving the tree cover on degraded forestlands and village commons, making productive use of the country's wastelands, promoting soil and water conservation and improving the landscape. Notwithstanding its economic or social significance, investments in social forestry projects or any project for that matter, will be undertaken only if they are viable and yield returns at least to cover the investment or expenditure incurred.

In this paper, an economic evaluation of a social forestry project in Karnataka which has been in the forefront in implementing social forestry projects in the country, is presented. In attempting this exercise, the various steps to be taken for undertaking such an economic evaluation, as well as the use of standard economic tools and methods to assess the economic viability of a social forestry project are illustrated. In a way, this paper also introduces the cost-benefit analysis as relevant for forestry studies.

Social Forestry Programme in India

Before analysing the case study, a brief review of the social forestry programmes in India as a whole and Karnataka in particular is attempted. The National Commission for Agriculture (1976) noting the widening gap between the demand and supply of fuelwood, fodder and industrial wood in the country, recommended taking up of social forestry programme so as to bridge this gap as well as on environmental considerations. The programme envisaged raising plantations on all available private and community wastelands outside the forests, viz., along farm bunds, wastelands, and strips along roads, rails and canals, compounds of industrial, educational and social institutions, etc. The programme was to be implemented specifically through different plantation models like farm forestry, community forestry, strip plantations, rehabilitation of degraded forests, and development of recreation forests. The states were already implementing production forestry as a part of the state plan schemes. To supplement the efforts of the state governments, the Government of India launched a Centrally-

sponsored Scheme of Social Forestry including the Rural Fuelwood Plantation (RFWP) Programme during the Sixth Plan (1979-85) in 101 selected districts reporting acute shortage of fuelwood (Planning Commission, 1987). The programme was extended in 1982-83 to 56 more districts, thus covering a total of 157 districts from various states and union territories. The Sixth Five-Year Plan focussed on raising of fuelwood plantations over 2.6 lakhs ha. and supply of 580 mil. seedlings to farmers, and children under the 'A Tree for Every Child Programme'. The outlay under the programme was Rs. 97.21 crores out of which the central grant was Rs. 50 crores. The achievements under the programme during the Sixth Plan were 3 lakh ha of plantation and distribution of 740 million seedlings. The Social Forestry Programme gained added impetus especially from 1982-83 onwards, when afforestation was included in the New 20-Point Programme. The programme received a fillip when the World Bank and other foreign donor agencies such as USAID, DANIDA, SIDA and ODA came forward to support the programme. The Externally-aided Social Forestry Programme was commissioned under the State Sector Programme in 11 states initially and a few other states later. These foreign-aided projects were launched with a view to raising community forestry over 9.4 lakh ha and strip plantations over 6075 kms.

Information on the area afforested in India and Karnataka state during the plan periods from 1951-56 to 1993-94/1995-96 is furnished in Table 1. As evident, the area afforested in the country rose from 0.52 lakh ha during the First Plan to over 12.21 lakh ha during the Fifth-Five Year Plan. Thereafter, during the Sixth and Seventh Plan, periods from 1980 to 1990 recorded a sharp rise in the area afforested in the country. Beginning from the First Five-Year Plan period to 1995-96, over 22.6 mil. ha area was afforested in the country. Of this, over 19 mil. ha alone was afforested after 1980 when social forestry including farm forestry was taken up on a massive scale in the country. In Karnataka the total area afforested rose from a negligible 0.002 lakh ha during the First Five-Year Plan to about 1.67 lakh ha during the Fifth Plan. In Karnataka too, the area afforested registered a sharp rise between 1980 to 1990. By the end of 1993-94, over 1.6 mil. ha was afforested in Karnataka, of which over 1.2 mil. ha alone was afforested between 1980 and 1993-94. The nineties have, however, witnessed a sharp reduction in the afforestation efforts both at an all-India level and for Karnataka.

Table 1: Information on Area Afforested in India and Karnataka State During the Plan Periods 1951-56 to 1993-94

Five-Year Plan Period/Years	All India		Karnataka	
	Area Afforested	Cumulative	Area Afforested	Cumulative
	(lakh ha)		(lakh ha)	
First (1951-56)	0.52	0.52	0.002	0.002
Second (1956-61)	3.11	3.63	0.48	0.48
Third (1961-66)	5.83	9.46	0.64	1.12
1966-69	4.53	13.99	0.62	1.74
Fourth (1969-74)	7.14	21.13	0.61	2.35
Fifth (1974-79)	12.21	33.34	1.67	4.02
1979-80	2.22	35.56	0.08	4.1
Sixth (1980-85)	46.50	82.06	4.15	8.25
Seventh (1985-90)	88.86	170.92	6.67	14.92
1990-91	7.52	178.44	0.30	15.22
1991-92	10.16	188.60	0.34	15.56
1992-93	10.62	192.22	0.36	15.92
1993-94	9.64	208.86	0.46	16.38
1994-95	9.84	218.70		
1995-96	8.02	226.72		

Source: Forestry Statistics India, 1995; The Citizen's Fifth Report, Centre for Science and Environment, New Delhi, 1999, p.115.

Table 2 indicates the state-wise distribution of area covered under externally-aided social forestry projects in India during the period 1981-82 to 1992-93. The area covered under social forestry in the 14 states under these externally-funded projects was over 2 mil. ha by the end of 1992-93. Of these eight states, viz., Gujarat, Tamil Nadu, Orissa, Bihar, Uttar Pradesh, Andhra Pradesh, Karnataka and Rajasthan alone accounted for over three-fourths of the area covered under these projects. Over 8 lakh ha was brought under social forestry in Gujarat, Tamil Nadu and Orissa between 1981-82 to 1992-93 under these projects.

Table 2: Statewise Distribution of Area Covered Under Externally Aided Social Forestry Projects in India During 1981-82 to 1992-93

States	Total Area Covered Under Social Forestry Projects	
	000 ha	%
1 Gujarat	313.4	15.2
2 Tamil Nadu	302.9	14.7
3 Orissa	217.9	10.5
4 Bihar	168.2	8.1
5 Uttar Pradesh	161.9	7.8
6 Andhra Pradesh	150.7	7.3
7 Karnataka	149.5	7.2
8 Rajasthan	120.8	5.8
9 Himachal Pradesh	112.8	5.5
10 West Bengal	93.0	4.6
11 Kerala	85.3	4.1
12 Maharashtra	81.0	3.9
13 Haryana	67.0	3.2
14 Jammu & Kashmir	44.0	2.1
TOTAL	2068.4	100

Source: Forestry Statistics India, 1995.

Table 3 presents more detailed information of these externally-aided Social Forestry Projects implemented in various states of the country during the eighties and early nineties. These projects envisaged an investment of over Rs. 9,940 million. As stated earlier, the World Bank and other donor agencies such as USAID, SIDA, DANIDA and ODA funded these projects. Out of the total area covered under social forestry in these projects over 60 per cent was accounted for by farm forestry alone (over 1.24 mil. ha), 24.6 per cent by village woodlots (over 0.5 mil. ha) and the remaining over 15 per cent (i.e., over 0.3 mil. ha) by strip plantations and reforestation or rehabilitation of degraded forestlands.

Table 3: Information on Externally-aided Social Forestry Projects in India During 1981-82 to 1992-93

State	Donor Agency	Project Period	Project Cost (Rs.mil)	Area Covered (000 ha)			
				Farm Forestry	Village Woodlots	Strip Plantations	Reforestation/ Rehabilitation of Degraded Forestlands
Gujarat	WB & USAID	5 years	1296.5	230.5	35.0	17.5	30.4
Tamil Nadu	SIDA	1981-82 to 1992-93	1445.4	103.2	187.7	7.9	4.0
Orissa	SIDA	1983-84 to 1992-93	1065.1	88.5	74.2	0.6	54.6
Bihar	SIDA	1985-86 to 1990-91	538.6	71.7	30.7	1.2	64.6
Uttar Pradesh	WB & USAID	5 years	1611.6	147.2	14.0	0.7	-
Andhra Pradesh	SIDA	1983-84 to 1989-90	383.8	108.1	25.0	3.8	13.8
Karnataka	WB & ODA	1983-84 to 1987-88	552.3	120.5	25.0	4.0	-
Rajasthan	WB & USAID	5 years	391.9	91.5	5.0	4.4	20.0
Himachal Pradesh	WB & USAID	5 years	572.9	66.8	41.0	-	5.0

State	Donor Agency	Project Period	Project Cost (Rs.mil)	Area Covered (000 ha)			
				Farm Forestry	Village Woodlots	Strip Plantations	Reforestation/ Rehabilitation of Degraded Forestlands
West Bengal	WB	1981-82 to 1989-90	348.6	52.0	6.0	20.0	15.0
Kerala	WB	1984-85 to 1989-90	599.1	69.2	14.1	2.0	-
Maharashtra	USAID	1982-83 to 1989-90	564.0	44.0	34.0	3.0	-
Haryana	WB & DANIDA	1982-83 to 1989-90	333.2	30.0	12.0	9.5	15.5
Jammu & Kashmir	WB & DANIDA	1982-83 to 1989-90	237.4	19.0	5.0	3.0	17.0
TOTAL			9940.4	1242.2 (60.1)	508.7 (24.6)	77.6 (3.7)	239.9 (11.6)

Note: Figures in parentheses give the percentage share of total area covered under externally-aided social forestry projects

Source: Forestry Statistics India, 1995

The above pertains to area covered under externally-funded social forestry projects. Information pertaining to the area brought under social forestry including farm forestry implemented under other schemes are not readily available. An Evaluation Report on Social Forestry Programme by the Planning Commission in 1987 noted that between 1980-81 to 1983-1984 close to 4.81 lakh ha was covered under social forestry programme in the country. Of this, over 2.69 lakh ha were accounted by externally-funded social forestry projects and over 2.11 lakh ha by Rural Fuelwood Plantations (Planning Commission, 1987). Between 1990-91 to 1995-96, over 5.57 lakh ha of public lands were afforested, including forest lands. According to NC Saxena, some 18;000 mil. trees were planted in the country between 1980 and 1988, of which 10,000 mil. tree equivalent to an area of 5 mil. ha were planted on farm lands (cited in Citizen's Fifth Report, 1999). As per the above cited report, out of the 10,000 mil. trees planted on farm lands, 7,000 mil. trees was accounted by eucalyptus alone, of which 5,000 mil. trees are estimated to have survived. Because of its fast-growing characterisitics, eucalyptus was the pre-dominant species distributed and grown. Other species such as Subabul (Leucaenea Leucociphd), Shisham (Delbergia Sisso), Kikar (Accacia Nilotica), Casuarina, Neem (Azadirchi Indica), and fruit trees were also distributed. The survival rates of plants in community plantations during 1980-81 to 1983-84 in selected ranges as per the Planning Commission Evaluation ranged from 74.6 per cent in Uttar Pradesh to over 99 per cent in Karnataka. However, a survey of 907 beneficiary households across sixteen states revealed the survival rates of plants to be much lower. For instance, for seedlings planted in 1981-82, the number of the sample beneficiaries who reported survival rates of between 76 to 100 per cent at the end of planting season 1981-82 declined from 176 to 157 and then to 148 at the end of 1982-83 and 1983-84 planting seasons respectively (Planning Commission, 1987). An evaluation by the Indian Institute of Public Opinion in 1987 covering 2000 beneficiaries, each in five states, viz., Gujarat, Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal, reported average survival rates of trees of all species in farm forestry during 1983-88 to vary from 43.7 per cent in Gujarat to over 70.4 per cent in Uttar Pradesh (Srivastava, 1992). An evaluation of social forestry projects in selected states by the NCAER in 1988 observed that in 14 districts studied spread over six states survival rates ranged between 18.6 to 50 per cent. It exceeded 50 per cent in only two districts between 1980-83; in

the remaining 12 districts these rates varied from 18.6 per cent in Ganjam district of Orissa to over 47 per cent in Ajmer district of Rajasthan. For the period 1983-88 these survival rates in these fourteen districts ranged from 18.8 to 67 per cent (Srivastava, 1992). Insufficient rainfall, grazing, diseases and pests, inappropriate choice of areas taken up for plantations, improper preparation of treatment and work schedules and excessive targets, were among several factors which contributed to the high tree mortality rates (Srivastava, 1992). Among the species, the IIPO study noted that eucalyptus had the highest survival rate in almost all states.

Generating additional employment through forestry activities was another objective of the social forestry programme. It was envisaged that during the Sixth Plan primary and secondary sector forestry activities would generate about 240 mil. mandays of employment every day. Keeping this in view, the main thrust in the programme was promotion of a people's forestry programme. Data on employment generated in social forestry programmes are not readily available. The Planning Commission Evaluation Report of 1987 cited earlier has furnished some estimates for various states in the country during 1983-84 which pertain to the initial years of the programme. Table 4 presents information on person days of employment on own work and on farm forestry reported by the beneficiary households across different states of India during 1983-84. As evident, taking all the states together the average person days of employment on farm forestry was about 52. This constituted about 10.6 per cent of the average person days employed on own work including farm forestry reported by the beneficiary households. Across states one comes across wide variations in the average person days of employment in farm forestry ranging from one person day in Kerala and Orissa, to 108 person days in West Bengal and 122 person days in Rajasthan. The proportion of the average person days employed on farm forestry to total person days of employment (own work and farm forestry) ranged from 0.2 per cent in Orissa to over 19 per cent in Gujarat and West Bengal.

The Planning Commission evaluation noted the average employment of wage labour on social forestry programme to be about 123 person days during 1983-84 for 37 reporting beneficiaries across states in India. This average varied from 15 person days in

Madhya Pradesh to as high as 387 person days in Andhra Pradesh. The average income from wage employment on social forestry programme for these beneficiary households was about Rs1113 (Planning Commission, 1987).

Table 4: Person Days of Employment on Own Work and on Farm Forestry during 1983-84

State	Number Reported	Average Person Days Employed		% of Col. 4 to Col. 3 Forestry
		Own Work including Farm	On Farm Forestry	
(1)	(2)	(3)	(4)	
Andhra Pradesh	19	368	12	3.2
Assam	-	-	-	-
Bihar	57	404	18	4.4
Gujarat	48	418	83	19.8
Haryana	35	422	29	6.9
Himachal Pradesh	32	530	37	7.0
Jammu & Kashmir	-	-	-	-
Karnataka	62	433	56	12.9
Kerala	25	81	1	1.2
Madhya Pradesh	75	752	71	9.4
Maharashtra	57	340	42	12.4
Orissa	25	399	1	0.2
Rajasthan	70	795	122	15.3
Tamil Nadu	38	272	28	10.3
Uttar Pradesh	57	527	21	4.0
West Bengal	34	566	108	19.1
ALL STATES	634	492	52	10.6

Source: Planning Commission 1987

There are several studies on the social forestry programme and farm forestry programme in particular (cf. Saxena, 1994; Saxena and Ballabh, 1995). These studies suggest that experience

with farm forestry programme has varied from region to region. Farmers in North Western states, who took up to farm forestry in a big way in the initial years, found to their consternation that when their eucalyptus crop was ready to be harvested, there was a steep fall in prices, thereby incurring losses, and also losing interest in farm forestry subsequently (Saxena, 1994). Whether the sudden drop in prices was due to a glut in the market or due to buyers using their monopsony position to push down prices is a debatable point. In states like Gujarat, Karnataka and West Bengal, the programme was reported to be successful with farm forestry spreading fast. Small farmers also benefitted from the programme by earning additional income. Studies which have tried to evaluate social forestry projects using project appraisal techniques are rare. A notable exception is a study by Nadkarni, Ninan and Pasha (1994) which attempted to evaluate the economic and financial viability of thirteen selected social forestry projects from different agro-ecological zones in Karnataka. This study found that the IRRs taking full benefits, net of all costs including the opportunity cost of grazing benefits foregone varies from 28 to 39 per cent across the different projects. At reduced benefits (by 50 per cent) and netted of all costs including the opportunity cost, the Internal Rate of Returns (IRRs) ranged between 21.3 to over 34 per cent. The financial viability analysis showed the IRRs to range between 10.5 to over 46 per cent. This study thus found these selected social forestry projects to be viable both economically and financially. The social forestry programme has been criticised on a number of grounds: 1.eucalyptus which was widely distributed and grown, mainly catered to the needs of the paper industry, rather than meeting rural needs as intended by the programme. 2. the spread of farm forestry affected local food security in some regions by displacing food crops like ragi in Kolar district. 3. environmentalists criticised eucalyptus which was the most popular species raised under the programme on grounds that it led to depletion of the ground water table, loss of crop productivity in neighbouring lands and also affected on-farm and off-farm biodiversity. With this review of social forestry programme in India, we now take up the case study.

Social Forestry Project, Mittemari Watershed Area

As a case study, the social forestry plantation implemented in Mittemari Watershed development project, Karnataka will be

evaluated. This Watershed Development Project which is a sub-watershed of the Chitravathi district watershed is located in the semi-arid Kolar district of Karnataka State, India. This project was taken up for implementation in 1983-84 and is one of the oldest watersheds developed in the state. It received a national award for Best Productivity for Dryland Crop Production in 1987-88, apparently attributable to the watershed development. All components of watershed development activities have been implemented in this project. The area of the watershed is about 1245 ha, of which 643 ha is cultivated land, 167 ha forestland, and the rest barren rocky wastes. About 750 ha in the project were identified for treatment under Watershed Development Programme (WDP). This includes 583 ha of drylands and 167 ha of forestlands. About 710 households with a population size of 2325 resided in the watershed, in the bench mark year 1983-84. Over 78 per cent of the households are mostly dependent on agriculture. The area receives an annual rainfall of 679 mm. The predominant crops sown in the watershed are groundnut and finger millet (UAS, 1990; Lakshmikanthamma, 1997).

Degraded forest lands and village commons were taken up for raising a social forestry plantation under the watershed development project. A mix of fuel, fodder and forest species were raised in the social forestry plantation. However, information pertaining only to 60 ha of this social forestry plantation wherein *Acacia Nilotica* was planted under this project was available. For this case study, only the social forestry plantation component of the watershed development is taken for an in-depth economic evaluation.

Methodological Issues, Data and Approach

What are Cash Flows and how do we make the time series data comparable? A project incurs costs over the years, so also the flow of benefits. These are often termed as time-series data on costs and benefits. In evaluating a project a number of conceptual and methodological issues merit clarification. First, the cash flows of costs and benefits arising from a project belong to different time periods, and have to be made into a comparable series by converting them into real prices or adjusting for inflation. However, if one expects a rise in real prices itself, over time then the series of data has to be adjusted through use of an appropriate

adjustment factor. While project appraisals take note of this factor, often they do not spell out whether the data series used for the appraisal are in real terms or at current prices (Nadkarni et al., 1994). Second, even if a series is inflation-adjusted, there is another element to be taken note of, viz., the time value or time preference of money. One hundred rupees received today will be preferred over Rs100 (even if at real prices) received a year later, due to time preference.

What is 'discounting' and what discount rate to use?

Additivity of cost and benefit flows over time is meaningful only after adjusting for such time preference values. Invariably, all such flows are to be converted into present values. To undertake the viability analysis, the present values of the cash flows of costs and benefits have to be computed through discounting. Then, there is the third question. What is the appropriate discount rate for undertaking this exercise. One view is that this rate should reflect the opportunity cost of capital. But given the institutional and market rigidities characteristic of developing countries, arriving at the correct opportunity cost of capital is not an easy task. It is, however, assumed to vary between 8 to 15 per cent in real terms in developing countries (Gittinger, 1982). A second proposition is to consider the borrowing cost of capital. Many governments tap the domestic and international markets to finance projects. But then project selection may be biased in favour of those with best financial terms at the cost of economic efficiency. The third proposition is that it should reflect the social time preference rate, i.e., the rate at which the society weighs future consumption vis-a-vis present consumption. The World Bank, Indian Planning Commission and many researchers often use a discount rate of 12 per cent for project appraisals in developing countries. With a pure time preference rate of about 6%, an elasticity of social marginal utility of about -1.75 and an economic per capita growth rate of GDP at 3.5%, the estimate of social discount rate is 12.1%. This is assumed to reflect the pure time preference, elasticity of social marginal utility of consumption and the per capita growth rate of consumption benefit. Use of such a high discount rate is not justified if the cash flows are in real terms. It also discriminates against investments with a long gestation period and implies that smaller time preference weights are attached to the stream of benefits and costs of future years. But, as noted earlier, society keeps the long term horizon in view. Social discount rates are,

therefore, generally lower than private discount rates. But there is no magic formula to adjust the discount rate downwards (Pearce, 1992). Some have even suggested using zero discount rates for environment-oriented projects, but this has been criticised due to difficulties in demarcating environment-oriented projects from other projects; it may even lead to serious misallocation of scarce resources (Dixon and Meister, 1986; Pearce et.al., 1990; Nadkarni et al., 1994). What then is the appropriate social discount rate? A number of studies have used discount rates ranging between 3 to 6 per cent in real terms to evaluate afforestation projects (Pearce, 1992; Nadkarni et.al., 1994). These rates could vary across countries depending on the circumstances of individual countries (Dixon and Meister, 1986). In this analysis a discount rate of 3 per cent is used, and alternatively at 5 and 8 per cents respectively by way of sensitivity analysis.

What time horizon should we assume for the analysis?
The length of the period to be considered for undertaking the appraisal is another issue of concern. This, it is suggested, should be coterminus with the economic life of the project or the technical life of a major investment incurred in the project. *Acacia nilotica* which has been raised in this social forestry plantation has a life span of about 25 years. Although the life span of Acacia nilotica can go up to 50 years or even more, social forestry projects, apart from environmental considerations, have been raised in India primarily to meet the current needs of rural communities for fuelwood, fodder, small timber and supplementary food. Hence twenty-five years seems to be a reasonable upper limit for conducting our evaluation. Moreover, for most agricultural and related projects in developing countries, a project life span of 25 years is considered to be reasonable (Gittinger, 1982). Although the environmental benefits of social forestry projects may take a longer time to realise, it is difficult to quantify or value all of them.

The data for this study was collected in 1990 by S Lakshmikanthamma for her doctoral work wherein the impact of WDP primarily from the farmer viewpoint was studied (Lakshmikanthamma, 1997). The reference year for the study was 1989-90. The analysis covers only 60 ha where *Acacia nilotica* were planted; information on the remaining lands where multi-purpose trees were raised are not available. Hence, the benefits and investments made in these lands are excluded from our

analysis. Public investments in this watershed project have been incurred in the initial three or four years for soil and water conservation works, disseminating improved dry farm technologies, and afforestation. The cash flows of costs and benefits for the project are expressed at 1989-90 prices. The public investments were incurred in the initial few years and have been inflated to 1989-90 prices using the Consumer Price Index for Agricultural Labourers for Karnataka, the only available rural-specific price index.

Cost-Benefit Analysis of the Project

What are the costs and benefits of the project and how do we estimate them? The direct benefits (both marketed and non-marketed) from the project includes timber and non-timber benefits like pods, fuelwood, etc from the community woodlots raised on degraded forestlands and village commons used earlier by villagers for free grazing of their cattle. Being a public investment project, the opportunity cost of grazing benefits foregone by the villagers due to the establishment of community woodlots on degraded forestlands and village commons used earlier by the villagers for free grazing of their cattle have been considered. For estimating the opportunity cost of grazing benefits foregone by the villagers, an earlier study wherein the animal pressure in standardised units per ha of grazing lands available, animal grazing habits, the marginal value product of fodder grazed by ruminant livestock on Common Property Resources (Rs.271 per tonne), were used (Nadkarni et al., 1994). The opportunity cost is assumed to arise during the entire length of the project.

The capital investments incurred by the government or project implementing agency includes capital investments for raising community woodlots on degraded forestlands and village commons. The indirect benefits are mostly environmental in nature such as an improvement in moisture availability. In addition to the initial capital investment for establishing community woodlots, there are recurring costs for watch and ward (e.g., Rs.720 per month) and harvesting charges. *Acacia Nilotica* yields on an average 15 kgs of pods per tree (from year 12 onwards) valued at Rs0.15 per kg at 1989-90 prices; fuelwood of 0.5 tonne per tree when felled valued at Rs350 per tonne, and timber yield of 0.424 cubic metre per tree valued at Rs5313 per cubic metre (Nadkarni et al., 1994).

The pods are used as livestock feed. Although the leaves are also used as livestock feed, we donot have information on the quantity harvested and hence our estimates exclude them. In any case (after accounting for pods, fuelwood and timber) their share in the total benefits is negligible. The average density of the community woodlot is about 200 trees per ha. As part of a sensitivity analysis there is the possibility that expected full benefits may not be realised. Hence, an across-the-board 50 per cent reduction in the expected benefits from the social forestry project is considered as one extreme possibility. This will test the rigorousness of our estimates under alternative scenarios. The cash flow of costs and benefits from the social forestry plantation over the twenty-five year period are presented in Table 5.

Table 5 : Cash Flows of Costs and Benefits from Social Forestry Plantationin Mittemari Watershed Development Project, Karnataka (Units : Rs.)

Year	Cost						Benefits			
	Establish-ment	Recurring		Total Costs	Opportunity Costs of Grazing Benefits foregone	Total Costs Incl. Opportunity Costs	Pods	Fuelwood	Timber	Total Benefits
		Watch and Ward	Harvest-ing							
1.	419874	720	-	420594	52166	472760	-	-	-	-
2.		720	-	720	52166	52886				
3.	-	720	-	720	52166	52886	-	-	-	-
4.	-	720	-	720	52166	52886	-	-	-	-
5.	-	720	-	720	52166	52886	-	-	-	-
6.	-	720	-	720	52166	52886	-	-	-	-
7.	-	720	-	720	52166	52886	-	-	-	-
8.	-	720	-	720	52166	52886	-	-	-	-
9.	-	720	-	720	52166	52886	-	-	-	-
10.	-	720	-	720	52166	52886	-	-	-	-
11.	-	720	-	720	52166	52886	-	-	-	-
12.	-	720	-	720	52166	52886	27000	-	-	27000

Year	Cost						Benefits			
	Establish-ment	Recurring		Total Costs	Opportunity Costs of Grazing Benefits foregone	Total Costs Incl. Opportunity Costs	Pods	Fuelwood	Timber	Total Benefits
		Watch and Ward	Harvest-ing							
13.	-	720	-	720	52166	52886	27000	-	-	27000
14.	-	720	-	720	52166	52886	27000	-	-	27000
15.	-	720	-	720	52166	52886	27000	-	-	27000
16.	-	720	-	720	52166	52886	27000	-	-	27000
17.	-	720	-	720	52166	52886	27000	-	-	27000
18.	-	720	-	720	52166	52886	27000	-	-	27000
19.	-	720	-	720	52166	52886	27000	-	-	27000
20.	-	720	-	720	52166	52886	27000	-	-	27000
21.	-	720	-	720	52166	52886	27000	-	-	27000
22.	-	720	-	720	52166	52886	27000	-	-	27000
23.	-	720	-	720	52166	52886	27000	-	-	27000
24.	-	720	-	720	52166	52886	27000	-	-	27000
25.	-	720	154440	155160	52166	207326	27000	2100000	27032544	29159544

What are the measures used for the analysis? For the analysis, three viability measures are computed, viz., the Net Present Value (NPV) i.e., the present value of benefits minus the present value of costs at 1989-90 prices where cash flows are summed up for 25 years; Benefit-Cost Ratio (BC Ratio), i.e., the present value of benefits expressed as a ratio to the present value of costs, and the Internal Rate of Return (IRR) i.e., that rate which equates the NPV to zero.

The NPV, BCR and IRR are derived as follows:-

$$NPV = \sum_{t=1}^{t=n} \frac{B_t - C_t}{(1+i)^t}$$

where:

B_t = benefit in each year

C_t = cost in each year

t = 1, 2, ... n

n = number of years

i = discount (interest) rate

$$BCR = \frac{\sum_{t=1}^{t=n} \frac{B_t}{(1+r)^t}}{\sum_{t=1}^{t=n} \frac{C_t}{(1+r)^t}}$$

IRR is that rate of discount which equates NPV to zero, i.e.,

$$\sum_{t=1}^{t=n} \frac{B_t - C_t}{(1+i)^t}$$

Another measure, though not favoured by economists is the *Pay Back Period.* Essentially it refers to the period over which one can recoup the initial investment (Pearce and Nash, 1981). Thus, if one can recover the investment in a period of say 't' years, where 't' is some artificially established maxim, then one can undertake the project. This measure is used by some industries and agencies, but rarely by economists. Moreover, in the case of forestry investment the pay back period is not a suitable measure to use since most often the forestry investment is recovered only in the final year when the tree or trees are felled. As our case

study shows, the NPV after deducting all costs including the opportunity cost of grazing benefits foregone (see Table 8, Column 9) turns positive only in the 25th year, i.e., after the trees are felled and when the timber value is added.

Results

The results of the analysis are presented in Tables 6 to 9. Table 6 which presents the Net Present Values for the social forestry plantation in Mittemari Watershed development project in million Rupees at 1989-90 prices for cash flows summed up over twenty-five years indicates that at full benefits net of costs excluding opportunity costs, the NPVs under various scenarios range from Rs3.93 million to Rs13.64 million. If the opportunity cost of grazing benefits foregone by the villagers due to the establishment of the social forestry plantation on degraded forest lands and village commons used by them earlier for free grazing of their cattle are also included, the NPVs under different assumptions and scenarios range from Rs3.37 million to Rs12.73 million. At reduced benefits (by 50 per cent) excluding opportunity cost, the NPVs range from Rs1.76 million to Rs6.57 million. If, however, the opportunity cost of grazing benefits foregone are also added, the NPVs under various scenarios range from Rs1.2 millon to Rs5.66 million. The relationship between discount rate and NPV is depicted in Figure1. As evident, the relationship between discount rate and NPV is inverse.

Table 6: Net Present Values For Social Forestry Plantation in Mittemari Watershed Development Project, India in Million Rupees at 1989-90 prices (Cash Flows summed up for 25 years)

Items	Discount Rates		
	3%	5%	8%
Full benefits, net of costs, **excluding** the opportunity cost of grazing benefits foregone	13.64	8.30	3.93
Full benefits, net of costs, **including** the opportunity cost of grazing benefits foregone	12.73	7.57	3.37
Benefits reduced by 50%, net of costs, **excluding** the opportunity cost of grazing benefits foregone	6.57	3.92	1.76
Benefits reduced by 50%, net of costs, **including** the opportunity cost of grazing benefits foregone	5.66	3.19	1.20

Note: Net Present Value: Present Value of Benefits minus Present Value of Costs.

Table 7 presents the benefit-cost ratios for the social forestry plantation in Mittemari Watershed development project. At full benefits, net of costs, but excluding opportunity costs, the BC ratios under various assumptions and scenarios are very high ranging from 10.38 to 28.61. When the opportunity cost of grazing benefits foregone are also added, the BC ratios range from 4.46 to over 10. At reduced benefits net of costs, excluding opportunity costs, the BC ratios range between 5 to over 14.3. If the opportunity cost of grazing benefits foregone are also added to total costs the BC ratios under different scenarios range from 2.23 to over 5.

Table 7: Benefit-Cost Ratios Of Social Forestry Plantation in Mittemari Watershed Development Project, India

Items	Discount Rates		
	3%	5%	8%
Full benefits, net of costs, excluding the opportunity cost of grazing benefits foregone	28.61	19.22	10.38
Full benefits, net of costs, including the opportunity cost of grazing benefits foregone	10.08	7.36	4.46
Benefits reduced by 50%, net of costs, excluding the opportunity cost of grazing benefits foregone	14.31	9.61	5.19
Benefits reduced by 50%, net of costs, including the opportunity cost of grazing benefits foregone	5.04	3.68	2.23

Notes: Benefit-Cost ratio: Present Value of Benefits expressed as a ratio over the Present Value of costs at 1989-90 prices for cash flows summed up over 25 years.

The computational details are presented in Table 8. Detailed information on the cash flow of costs and (full) benefits, both undiscounted and discounted values at 3 per cent discount rate, over the twenty-five-year period are presented for each year. The table shows that at full benefits, net of costs, excluding the opportunity cost of grazing benefits foregone, the NPV is over Rs13.64 million, and over Rs12.73 million when opportunity costs are also added to total costs. The BC ratios are correspondingly 28.61 and 10.08.

Fig 1: Relationship between Discount Rate and NPV

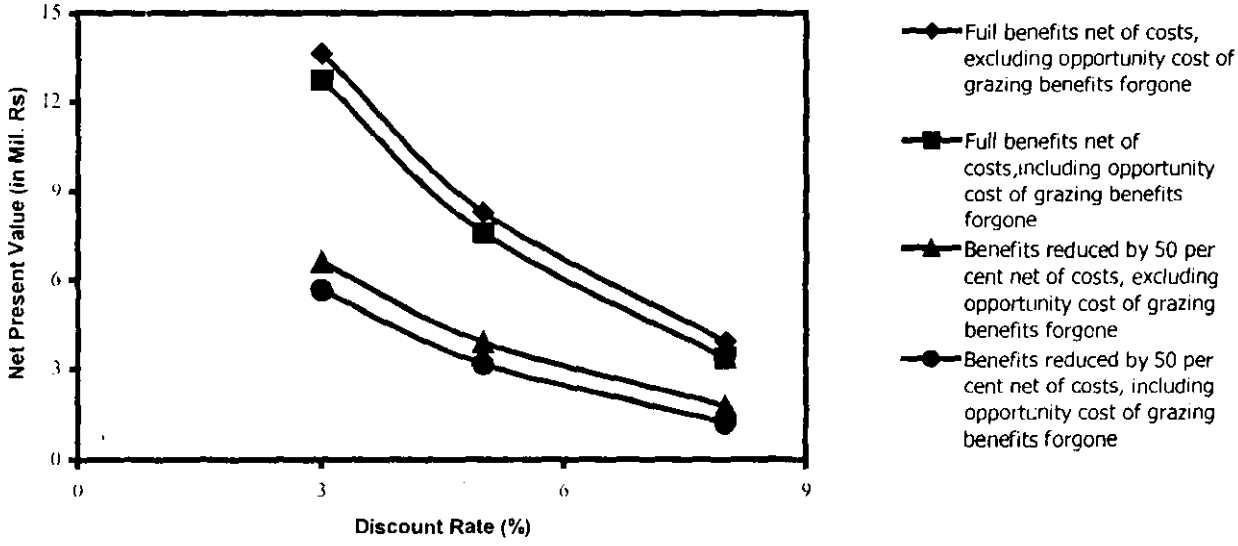

Table 8 : Cash Flows of Costs and Benefits (Undiscounted and Discounted Values at 3 percent Discount Rate) in Rupees from Social Forestry Plantation in Mittemari Watershed Development Project, Karnataka

Year	Total Benefits	Total Costs	Total Costs incl. Opportunity Costs	Discounted Benefits	Discounted Costs	Discounted Costs incl. Opportunity Costs	Discounted Net Benefits (a)	Discounted Net Benefits (b)
(1)	(2)	(3)	(4)	(5) = $\frac{(2)}{(1-r)^t}$	(6) = $\frac{(3)}{(1-r)^t}$	(7)	(8) = (5) - (6)	(9) = (5) - (7)
1.	-	420594	472760	0	408343.69	458990.29	-408343.69	-458990.29
2.	-	720	52886	0	678.69	49850.13	-678.67	-49850.13
3.	-	720	52886	0	658.90	48398.18	-658.90	-48398.18
4.	-	720	52886	0	639.71	46988.53	-639.71	-46988.53
5.	-	720	52886	0	621.08	45619.93	-621.07	-45619.93
6.	-	720	52886	0	602.99	44291.19	-602.99	-44291.19
7.	-	720	52886	0	585.43	43001.16	-585.43	-43001.16
8.	-	720	52886	0	568.37	41748.70	-568.37	-41748.70
9.	-	720	52886	0	551.82	40532.71	-551.82	-40532.72
10.	-	720	52886	0	535.75	39352.15	-535.75	-39352.15
11.	-	720	52886	0	520.14	38205.97	-520.14	-38205.97
12.	27000	720	52886	18937.26	504.99	37093.18	18432.26	-18155.92
13.	27000	720	52886	18385.69	490.28	36012.79	17895.40	-17627.11

Year	Total Benefits	Total Costs	Total Costs incl. Opportunity Costs	Discounted Benefits	Discounted Costs	Discounted Costs incl. Opportunity Costs	Discounted Net Benefits (a)	Discounted Net Benefits (b)
(1)	(2)	(3)	(4)	$(5) = \frac{(2)}{(1-r)^t}$	$(6) = \frac{(3)}{(1-r)^t}$	(7)	(8) = (5) - (6)	(9) = (5) - (7)
14.	27000	720	52886	17850.18	476.00	34963.88	17374.18	-17113.70
15.	27000	720	52886	17330.27	462.14	33945.51	16868.13	-16615.24
16.	27000	720	52886	16825.51	448.68	32956.81	16376.83	-16131.30
17.	27000	720	52886	16335.44	435.61	31996.9	15899.83	-15661.46
18.	27000	720	52886	15859.65	422.92	31064.95	15436.73	-15205.30
19.	27000	720	52886	15397.72	410.61	30160.15	14987.12	-14762.42
20.	27000	720	52886	14949.24	398.65	29281.70	14550.60	-14332.45
21.	27000	720	52886	14513.83	387.04	28428.83	14126.79	-13915.00
22.	27000	720	52886	14091.10	375.76	27600.81	13715.33	-13509.71
23.	27000	720	52886	13680.68	364.82	26796.9	13315.86	-13116.22
24.	27000	720	52886	13282.21	354.19	26016.41	12928.02	-12734.20
25.	29159544	155160	207326	13926761	74105.28	99020.52	13852655.33	13827740.56
	Net Present Values			14134199	493943.53	1402317.8	13640255.87	12731881.6
	BC Ratio						28.61	10.08

Note :(a) Discount Net Benefits here refer to full benefits net of costs **excluding** the opportunity cost of grazing benefits foregone.
(b) Discount Net Benefits here refers to full benefits net of costs **including** the opportunity cost of grazing benefits foregone.

Table 9 presents the Internal Rates of Return (IRR) for the social forestry plantation in Mittemari Watershed development project. As seen from the table at full benefits, net of costs excluding the opportunity cost of grazing benefits foregone, the IRR is 19.5 per cent. When the opportunity costs are also added, the IRR is over 16.4 per cent. At reduced benefits, net of costs excluding opportunity costs, the IRR is over 16 per cent. When the opportunity cost of grazing benefits foregone are also included, the IRR is around 12.5 per cent. Thus, looking at the three tables, the overall picture that emerges is that the social forestry project implemented as part of watershed development activities in Mittemari watershed development area, is economically viable and yields high returns.

Table 9: Internal Rates of Return (%) For Social Forestry Plantation in Mittemari Watershed Development Project, India

Item	%
Full benefits, net of costs, **excluding** the opportunity cost of grazing benefits foregone	19.50
Full benefits, net of costs, **including** the opportunity cost of grazing benefits foregone	16.41
Benefits reduced by 50%, net of costs, **excluding** the opportunity cost of grazing benefits foregone	16.01
Benefits reduced by 50%, net of costs, **including** the opportunity cost of grazing benefits foregone	12.56

Note: Internal Rate of Return:It is the rate of return which equates the NPV to zero.

Which criterion should we use when there is more than one project to choose from? In the foregoing we have illustrated the use of three alternate viability measures, i.e., NPV, BC ratio and IRR to assess the viability of the social forestry project. When there is only one project involved, one may employ any one or all of the above viability measures to decide whether to accept or reject the project in question. If, however, the choice is between projects, the general rule is to select the project offering the highest NPV (Pearce and Nash, 1981). In making such a choice between projects one has to assess how far the projects to be appraised are comparable or exclusive. There are three contexts within which the NPV criterion may be used, viz., (1) *Accept or Reject*: wherein the agency or evaluator must decide whether the project in question is to be accepted or rejected. Faced with a single

project, the NPV rule dictates that it should be accepted if the NPV exceeds zero, and rejected if it is less than zero; (2) Ranking: given a series of investments with positive NPVs and a budget or capital constraint, one needs to rank them in order of preference and work down the list until a given budget is exhausted. This ranking need not necessarily be in terms of the NPV but could be in terms of the BC ratio; and (3) Mutual Exclusivity: here the agency or evaluator has to decide between the projects simply because undertaking one means that the other project cannot be undertaken (Pearce and Nash, 1981).

CONCLUSIONS

Investing in social forestry projects in India seems to be an economically viable proposition. Using alternate viability measures, i.e., NPVs, BC ratios and IRRs, and under rigorous tests and sensitivity analysis, our analysis shows that if expected full benefits are realised, the benefits from the social forestry project are quite high, with the IRRs ranging from 12.5 to over 19 per cents under various scenarios. Even if the expected benefits fall short by 50 per cent, netted of all costs, including the opportunity cost of grazing benefits foregone by the villagers due to establishment of community woodlots on degraded forestlands and village commons used by them earlier for free grazing of their cattle, the social forestry project reports profits. If the direct benefits from some community woodlots which we could not include in our analysis due to data gaps, and other indirect benefits, mostly environmental ones are also included, these profits may be still higher. Social forestry projects initiated in India to improve the tree cover on degraded forestlands and common lands, as well as to meet the needs of local rural communities for fuelwood, fodder, small timber and supplementary food, are economically viable and socially desirable.

REFERENCES

Centre For Science and Environment (1999), *The Citizen's Fifth Report,* New Delhi.

Dixon, John, A and Meister, Anton, D, 1986, 'Time Horizons, Discounting and Computational Aids,' in J.A.Dixon and M.M.Hufschmidt (eds.), *Economic Valuation Techniques For The Environment-A Case Study Workbook,* The John Hopkins University Press, Baltimore.

Gittinger, J Price, 1982, *Economic Analysis of Agricultural Projects,* EDI Series in Economic Development, The John Hopkins University Press, Baltimore, 2nd Revised Edition.

India, Govt. of, Planning Commission (1987), *Evaluation Report on Social Forestry Programme,* Programme Evaluation Organisation, New Delhi, August.

Lakshmikanthamma, S, 1997, *Sustainability of Dryland Agriculture in India-A Case Study of Watershed Development Approach, M D Publications,* New Delhi.

Nadkarni, M V, Ninan, K N and Pasha, S A, 1994, *The Economic and Financial Viability of Social Forestry Projects in Karnataka,* Joint Forest Management Working Paper No.16, Society for Promotion of Wastelands Development, and the Ford Foundation, New Delhi.

Ninan, K N and Chandrashekar, H, 1992a, 'The Green Revolution, Dryland Agriculture and Sustainability-Insights from India', in G H Peters and B F Stanton (eds.), *Sustainable Agricultural Development-Role of International Cooperation,* IAAE, University of Oxford, Dartmouth, U K.

Ninan, K N and Chandrashekar, H, 1992b, *Impact of Watershed Development Programmes on Dryland Development in India,* Paper presented at the Second Meeting of the International Society For Ecological Economics, August 3-6, Stockholm, Sweden.

Ninan, K N and Lakshmikanthamma, S, 1994, 'Sustainable Development-The Case of Watershed Development in India', *International Journal of Sustainable Development and World Ecology,* Vol.1, December.

Ninan, K N, (1998), 'An Assessment of European-Aided Watershed Development Projects in India from the Perspective of Poverty Reduction and the Poor, *CDR Working Paper No. 98.3,* Centre for Development Research, Copenhagan, Denmark, January.

Pearce, David and Nash, C A (1981), *The Social Appraisal of Projects: A Text in Cost-Benefit Analysis,* Macmillan, London.

Pearce, David, Barbier, Edward, and Markandya, Anil, (1990), *Sustainable Development: Economics and Environment in the Third World,* Edward Elgar Hants, England and Gower Publishing Co., Vermont, U.S.A.

Pearce, David, 1992, *Assessing the Social Rate of Return from Investment in Temperate Zone Forestry,* GEC 92-07, Centre for Social and Economic Research on the Global Environment, University College, London.

Saxena, N C, (1994), *India's Eucalyptus Craze: The God That Failed,* Sage, New Delhi.

Saxena, N C and Ballabh, Viswa (1995), *Farm Forestry in South Asia,* Sage, New Delhi.

Srivastava, Manoj (1992), 'Survival Rates in the Social Forestry Programme' in Agarwal, Anil (ed.) *The Price of Forests,* Centre for Science and Environment, New Delhi, pp. 190-204.

University of Agricultural Sciences, 1990, *Operational Research Project For Resource Management on Watershed Basis-Status Report of the Model Watershed Mittemari,* Dryland Agricultural Project, Bangalore, March.

Recent Working Papers

47. **M GOVINDA RAO**
Principles of Intergovernmental Transfers : Have the Finance Commissions Followed Them?

48. **M GOVINDA RAO**
Intergovernmental Fiscal Arrangements in a Transitional Economy : A Look At Vietnam

49. **SYED AJMAL PASHA**
Forest Use and Management A Comparative Perspective from India and Canada

50. **S AMANULLA AND B KAMAIAH**
Indian Stock Market : Price Integration and Market Efficiency

51. **ALLEN ROY, S AMANULLA AND B KAMAIAH**
Indian Stock Market : A Test of A Semi-Strong Form of Efficiency

52. **K V RAJU AND TUSHAAR SHAH**
Revitalisation of Irrigation Tanks in Rajasthan: An Approach

53. **PRABIR KUMAR MOHANTY AND B KAMAIAH**
Volatility and its Persistence in Indian Stock Market: A Case Study of 30 Scrips

54. **ALLEN ROY, PRAVAKAR SAHOO AND B KAMAIAH**
A Causal Test of Fiscal Synchronisation Hypothesis in India

55. **ALLEN ROY, B KAMAIAH AND M GOVINDA RAO**
Educational Expenditure Needs of Large Indian States : A Normative View

56. **G K KARANTH**
Does Replication Mean Consensus

57. **H G HANUMAPPA**
State Policy Initiatives and Agricultural Development: A Case Study of Karnataka Province, India

58. **G THIMMAIAH**
Federalism and Economic Development: Indian Experience

59. **T KANNAN**
Caste Violence and Dalit Consciousness: A Critical Interpretation of Dominance

60. **K V RAJU AND JEFFREY D BREWER**
Conjunctive Water Management in Bihar

61. **MADHUSHREE SEKHER**
Local Organisations and Participatory CPR Management: Some Reflections

62. **PRATAP CHANDRA BISWAL AND B KAMAIAH**
Stock Market Development in India: Is There Any Trend Break?

63. **SANGHAMITRA SAHU AND B KAMAIAH**
Some Aspects of Monetary Targeting in India

64. **AMALENDU JYOTISHI**
Swidden Cultivation: A Review of Concepts and Issues

65. **K V RAJU**
Participatory Irrigation Management in Andhra Pradesh: Promise, Practice and a Way Forward

66. **D RAJASEKHAR**
Non-Governmental Organisations in India: Opportunities and Challenges

67. **S JYOTHIS**
Willingness to Participate in Biodiversity Conservation in Periyar Tiger Reserve: A Contingent Valuation

68. **ANAND INBANATHAN**
Power, Patronage and Accountability in the Panchayats of Karnataka

69. **PRATAP CHANDRA BISWAL AND B KAMAIAH**
On Stock Market Development, Banks and Economic Growth in India

70. **N R BHANUMURTHY**
Testing Long-Run Monetarists' Propositions in Some Industrialized Countries

71. **PRABIR KUMAR MOHANTY AND B KAMAIAH**
Does Seasonal Pattern in Indian Stock Returns Contain a Unit Root?

72. **V VIJAYALAKSHMI AND B K CHANDRASHEKAR**
Gender Inequality. Differences, and Identities: Women and Local Governance in Karnataka

73. **DEBASHIS AND B KAMAIAH**
Simple Sum Versus Divisia Monetary Aggregates: An Empirical Evaluation

74. **T S JEENA**
Wetland Conversion: The Case of Backwater Reclamation in Kerala

75. **P H RAYAPPA, T V SEKHER. M RAMAKRISHNA REDDY**
Population Policy for Karnataka: A Suggested Framework

76. **D RAJASEKHAR & P SHOBANA**
Economic Programmes and Poverty Reduction: NGO Experiences from Tamil Nadu

77. **PRAVAKAR SAHOO, GEETHANJALI NATARAJ, B KAMAIAH**
Savings and Economic Growth in India: The Long-Run Nexus

78. **KAUSHIK BASU**
A Note on Multiple General Equilibria with Child Labour

79. **A S SEETHARAMU**
Literacy, Employment and Social Security: A Review

80. **T V SEKHER**
Empowerment of Grassroots Leadership in Health and Population: A Training Experiment in Karnataka

81. **N R BHANUMURTHY, M RAMACHANDRAN AND PURNA CHANDRA PADHAN**
Is the QTM Controversy Settled?

82. **KAUSHIK BASU, AMBAR NARAYAN AND MARTIN RAVALLION**
Is Knowledge Shared within Households? Theory and Evidence for Bangladesh

83. **M THOMAS PAUL, N R BHANUMURTHY AND NISHANT BAPAT**
A Re-Examination of the Long-Run Relationship between Money Supply and Inflation in India

84. **GEETHANJALI NATARAJ, PRAVAKAR SAHOO AND B KAMAIAH**
Export-Led Growth in India: What do the VARS Reveal?

ISBN 81-7791-041-8

Price: Rs.30-00

INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE
Prof. V. K. R. V. Rao Road, Nagarbhavi, Bangalore - 560 072, India
Phone : 0091-80 - 3215468, 3215519, 3215592 ; Fax: 0091-80 - 3217008
Grams: ECOSOCI, Bangalore - 560 040
E-mail:kvraju@isec.kar.nic.in