

# Working Paper

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61

ECONOMICS OF FARM FORESTRY:  
A CASE STUDY IN SHANKERPURA VILLAGE,  
DISTRICT PANCHMAHAL, GUJARAT

*Kulbushan Balooni  
Katar Singh*



Institute of Rural Management Anand 388001

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ECONOMICS OF FARM FORESTRY:  
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*Kulhushan Balooni\**  
*Katar singh\**

ABSTRACT

Farm forestry is an important component of social forestry programmes that are now underway in India. Economics of farm forestry varies from region to region and from farm to farm within a region depending upon a number of factors. This paper explores the economics of farm forestry in a tribal village in Gujarat. Net Present value, Benefit-cost Ratio, and Financial Internal Rate of Return are used as indicators of financial viability of farm forestry. Farm forestry was found to be financially viable and ecologically sound use of marginal (degraded) land. It transformed the entire village economy from a backward one to a prosperous one and the landscape from desolate to green.

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\* The authors are respectively RBI Junior Research Fellow and RBI Chair Professor, Institute of Rural Management, Anand - 388 001

## 2. RESEARCH PROCEDURE

### 2.1 Sampling

Shankerpura village in Panchmahai district was selected purposively for the case study. It is the village where Sadguru launched its farm forestry programme first. A sample of 20 tree growers from the village was selected using the systematic random sampling design. According to the latest (October, 1993) figures available in the village revenue register, there were 212 households in the village with a population of 1,596 households. A sample of 20 households (approximately 10% of the total number of households) was selected for the purpose of in depth interviews.

### 2.2 Data Collection

The primary data relating to cost of establishment and other recurring and harvesting costs; income accruing from the farm forestry plantations; and the number of trees planted etc., were collected from the selected households by holding personal interviews using pre-structured and pre-tested questionnaires. The secondary data relating to the cost of seedling and subsidy (fertiliser, irrigation etc.) provided to tree growers; cost of transporting saplings to planting sites by Sadguru; prices of forest produce prevailing in different years; marketing infrastructure; the total number of saplings by species provided to the villagers of Shankerpura; role played by Sadguru etc., were collected from the office of Sadguru and by holding personal interviews with the Sarpanch and the members of the village panchayats, members of the village Lift Irrigation Cooperative, village level workers working for sadguru, officials of Sadguru and other knowledgeable persons concerned.

### 2.3 Measures of Financial Feasibility

To determine the financial feasibility of farm forestry plantations in village Shankerpura, the following three measures were used:

1. Net Present Value (NPV);
2. Benefit-cost Ratio (BCR); and
3. Financial Internal Rate of Return (FIRR)

To compute these measures, the net cash flows were compounded at three different rates of interest viz., 5%, 10% and 15% using market prices for costs and benefits prevailing in the respective years of occurrence for a period of 11 years (July 1982 to October 1993). As the cash flows (outflows as well as inflows) related to the past so compounded values were used instead of discounted values as measures of present value.

Mathematically, these measures can be expressed as follows:

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

$$BCR = \frac{\sum_{t=1}^n B_t / (1+i)^t}{\sum_{t=1}^n C_t / (1+i)^t} \quad \dots(2)$$

$$FIRR = i \text{ such that } \sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t} = 0 \quad \dots(3)$$

Where:

$B_t$  = Benefits incurred at time period  $t$ .

$C_t$  = Costs incurred at time period  $t$ .

$i$  = interest rate which was taken as equal to the current interest rate on term deposits (10%). In addition two additional interest rates of 5% and 15% were also used for financial analysis,

$n$  = number of time periods ( $t$ ) which was taken as eleven years considering that farm forestry plantations were started by SWDF in July 1982 and the data was collected in October, 1993.

Uniform series of annual income were computed by multiplying total net present value per acre over the time period of eleven year by the inverse of appropriate annuity factor as values were compounded instead of discounting.

Present value interest factor for an annuity (in case of discounting) (Chandra, 1987)

$$= 1 - \frac{1}{(1+i)^n} \cdot \frac{1}{i}$$

Present value interest factor for an annuity (in case of compounding)

$$= \frac{1}{1 - \frac{1}{i}}$$

where:

t = time period

i = interest rate

All these values were calculated using personal computer softwares (Lotus 1-2-3) available at the Institute of Rural Management, Anand.

For determining financial feasibility of farm forestry, the sample respondents were grouped into the following three categories according to the size of their land holdings:

Category	Land holding( Acres)
Small	Below 4.94
Medium	4.95 to 9.88
Large	9.89 and above

### 3. A RESUME OF SADGURU

Sadguru, a non-political, non-profit making, secular, non-governmental organisation was established in the year 1969. Its head office is located at Dahod in Panchmahal district of Gujarat. The main objective of sadguru is to improve the living conditions of rural and tribal people and to remove their poverty, mainly by implementing environment-friendly programmes, which may in turn improve the natural resources base of the area. The main development activities taken up by the Sadguru in the area of its operation are: (i) water resources development; (ii) intensive watershed development; and (iii) farm/social forestry.

After lift irrigation, farm forestry is the next most important activity of Sadguru. Though social and farm forestry is a part of the broad watershed development

programme, it is given special attention by Sadguru in view of its tremendous potential in the area.

### 3.1 Farm Forestry Programme of Sadguru

Farm forestry programme of Sadguru was started in the year 1982 on an experimental basis in village Shankerpura in Panchmahal district. After witnessing the encouraging results of the first farm forestry plantations in Shankerpura and nearby villages, and on the request of the tribals from other villages, Sadguru adopted farm forestry as a major activity along with its various other activities. Tree plantation is done mostly on private waste/inferior lands, field bunds, field strips etc. Sadguru has deliberately chosen to concentrate its afforestation activities on private wastelands for the reason that there is substantial extent of private wastelands available in its area of operation. Apart from better land use, the other objectives of this programme are to meet the local requirements of fuelwood and construction wood and to generate cash income from the sale of surplus wood.

Table 1 gives year-wise achievements of Sadguru in terms of the number of villages covered; total number of beneficiaries; total number of saplings provided to tribal villagers in its area of operation; and total cost incurred under the farm forestry programme.

As of October 1993, 66 villages involving 17,438 beneficiaries had been brought under farm forestry plantations since 1982. More than two crores of saplings of different species have been planted over this period of time. To meet the demand for saplings, Sadguru encourages the tribals to raise saplings in their own land where plantation has to be carried out. Generally four to five nurseries mostly raised by tribal women are established in each village with the financial help as well as technical guidance of Sadguru. As of October, 1993, a sum of Rs. 119 lakhs had been expended by Sadguru on this programme. The expenditure is met out of the grants-in-aid provided by the National Wastelands Development Board (NWDB); District Rural Development Agency (DRDA), Department of Rural Development, Gujarat; Tribal Sub Plan; and Mahila Arthik Vikas Nigam and a number of other national as well as international donor agencies.

Table 1.  
Year-wise plantation done by the farmers under farm forestry  
and the total cost incurred by the Sadguru

Year	Number of villages	Number of beneficiaries (families)	Actual plan- tation (No.of trees in '000)	Total cost incurred (Rs.in '000)
1982	4	140	301	-
1983	10	563	1,183	-
1984	18	642	434	-
1987	24	1,576	872	77
1988	13	1,788	3,069	490
1989	22	3,005	4,634	860
1990	17	4,170	4,156	3,859
1991	18	3,829	3,568	2,525
1992	28	2,875	3,169	2,268
1993	33	2,320	2,323	1,862
Total	187 66*	20,908 17,438*	28,859 -	11,941 -

Source: NM Sadguru Water and Development Foundation, Dahod, Gujarat

\*These are the actual numbers of villages and beneficiaries covered under the programme. Since tree plantation was done more than once in many villages and by many beneficiaries over the period of time covered, there is the problems of multiple counting and hence the numbers of both villages and beneficiaries shown in the "Total" row are inflated.

Notes In the years 1982 and 1983 the saplings were provided free of cost by the Gujarat State Forest Department\*

#### 4 PHYSICAL AND SOCIO-ECONOMIC PROFILE OF VILLAGE SHANKERPURA

Village Shankerpura is located in Jhalod Taluka in Panchmahal District of Gujarat and is situated about 10 Km away from the Taluka headquarters. The village is wholly inhabited by tribal population fragmented into different sub-castes. All of the inhabitants are cultivators and there is no landless family in the village. A perusal of Tables 2 & 3 would give an overall present as well as past scenario of village Shankerpura, There are 212 families with a total population of 1,596 in the village according to 1991 census. The total geographical area of the village is 588 hectares (ha) and almost all of the land is used for one or the other purpose; only a small piece of 20 ha is under the category of wastelands (grazing land, unculturable land etc.)- There is a community lift irrigation



scheme in the village started by Sadguru in 1976 and at present a total of 260 ha of cultivated land is under irrigation. On an average, each family in the village is having 1.23 ha of cultivated land under irrigation. Prior to commissioning of the lift irrigation scheme, the village did not have any irrigation facilities. It was all a dry farming village subject to all kinds of hazards associated with rainfed agriculture. The main crops grown in kharif season are maize, paddy, pigeon pea and black gram and in rabi season wheat, barley, green gram, maize and pigeon pea.

Table 2  
A physical profile of village Shankerpura

Sl. No.	Particulars	-Position in-	
		1976	1993
1.	Total geographical area	588	588
2.	Land under any kind of use	328	568
3.	All kinds of wastelands: Grazing land, unculturable land etc.,	260	20
4.	Land under irrigation	Nil	260
5.	Community lift irrigation scheme	Nil	1
6.	Check dams	Nil	6
7.	Number of private wells	2	80
8.	Village tanks/ponds	1	4
9.	Number of trees/plants in Village (approximately)	100	10,00,000

Source: NM Sadguru Water and Foundation Development Foundation, Dahod, Gujarat.

Table 3  
A socio-economic profile of village Shankerpura

Sl. No.	Particulars	---Position in---	
		1976	1993
1.	Number of families	170	212
2.	Population	786 (1971)*	1596 (1991)*
3.	Percentage of tribal population	100%	100%
4.	Percentage of agricultural families	100%	100%
5.	Landless families	Nil	Nil
6.	Literacy rate of	17.43% (1971)	45% (1991)
7.	Seasonal migration	75%	3.5%
8.	Number of families having access to irrigation	Nil	200

\* Figures corresponding to Census 1971 and Census 1991.  
Source: NM Sadguru Water and Foundation Development Foundation, Dahod, Gujarat.

In addition to the lift irrigation scheme in the village, there are 80 privately owned wells, 4 village tanks (common pool resources). At present the number of families having access to irrigation is 200. The most valuable asset owned by the villagers is some 10 lakh trees growing on their private lands. The situation was different before 1982, the year when Sadguru started its farm forestry programme in the village. According to a survey conducted by Sadguru in 1976, there were only 100 trees existing on private farm land in the village but the area around the village was densely forested. However, during the last few years the natural forests have gradually disappeared. Twenty five percent of the area is still classified as "reserved forests", but as per remote sensing imageries only about three percent of this land has tree cover (Jagawat, 1988:2). A group discussion with the villagers revealed that the main reason for deforestation was heavy pressure on forest for fuel, fodder and timber. Moreover, the villagers earlier used to sell fuelwood in the nearby markets as there was no off-farm employment opportunities available in the area. In addition, lack of concern among the village people about the village common pool resources is also one of the reasons for the current situation. A clear cut contrast can be observed between the situations prevailing in the village in 1976 and 1993 (see Tables 2 & 3).

Prior to 1976, with no assured crop income even in monsoon season, a large number of people (75%) of this village used to migrate to various urban areas and better off rural areas in the State in search of livelihood for about 8 months in a year. But by 1993, the rate of migration drastically declined to 3.5 percent, thanks to Sadguru's interventions in the village.

In Table 4, year-wise total number of trees planted; total number of beneficiaries (families); and total number of plant nurseries raised in village are shown.

Provision of a lift irrigation facility and promotion of farm forestry plantation by Sadguru have not only made the people self-sufficient in their food requirements and other necessities, but also stabilised their life in their own village, without being compelled to migrate any longer under the compulsion of starvation (L

agawat, 1988: p.6). Now the farmers of Shankerpura have become totally self-sufficient in their firewood requirements which has helped release large amounts of cow-dung for use as manure (Conroy, 1991: p.36). They are building new houses from the wood available from their own fields and the

possession of a large number of trees has become a real wealth and asset in their hands which they can encash to meet their emergency needs.

Table 4  
Year-wise plantation in village Shankerpura under  
plantation programme of Sadguru (1982-1992)

Year	Number of beneficiaries	Number of trees planted (in thousand)	Nurseries raised
1982	112	234	-
1983	170	200	-
1987	179	93	6
1988	99	486	50
1989	169	277	29
1991	138	167	11
1992	143	157	9
<b>Total</b>	<b>1010</b>	<b>1,614</b>	<b>105</b>

Source: NM Sadguru Water and Foundation Development  
Foundation, Dahod, Gujarat

## 5. PROFILE OF SAMPLE TREE GROWERS

### 5.1 Socio-economic Characteristics

A total of 20 tree growers were interviewed for the case study. Out of 20 tree growers, 4 belonged to small farmers' category (2.84 to 4.94 acres of land holding), 11 belonged to medium farmers' category (4.95 to 9.88 acres of land holding) and 5 belonged to large farmers' category (more than 9.88 acres of land holding). The average family size of the respondents was 10, and the main occupation of all except one was agriculture (Table 5). As the people of Shankerpura do not have any opportunities for employment outside the village, most of them are engaged in agriculture though some people from the village are working in the nearby towns. All the sample tree growers except two were literate though most of them studied up to primary level only.

Table 5  
Socio-economic characteristic of the sample tree growers

Category of tree growers	Size of land holding (Acres)	Number of tree growers	Average family size	Characteristic				
				Occupation			Educational status	
				Main	(subsidiary)	Other	Illiterate	Primary
Small	2.84 to 4-94	4	9	4(0)	0(1)	0(0)	0	4
Medium	4.95 to 9.88	11	9	11(0)	0(1)	0(0)	1	10
Large	> 9.88	5	15	4(1)	0(0)	1(0)	1	4
All		20	10	19(1)	0(2)	1(0)	2	18

Table 6  
Land utilisation pattern of sample tree growers in village Shankerpura (Area in acres)

Category of tree growers according to land holding	Number of tree growers	Category of land										Total land holding		
		Cultivated land			Pasture/barren land			Under tree plantation			Irr.	Unir.	Totals	
		Irr.*	Unir.**	Total	Irr.	Unir.	Total	Irr.	Unir.	Total				
Small (2.44 to 4.94 Acres)	4	4.5	3.75	8.25	0.5	0.0	CL5Q (0.12)	3.0	2.5	5.50	8.00	6.25	14.25	(3.56)
Medium (4.95 to 9.88 Acres)	11	40.2	8.50	48.75	0.75	3.5	4.25 (0.39)	12.2	6.5	18.75	53.25	18.50	71.75	(6.52)
Large (More than 9.88 Acres)	5	23.5	15.50	39.00	0.00	3.0	3.00 (0.60)	2.5	13.0	15.50	26.00	31.50	57.50	(11.50)
All	20	68.2	27.75	96.00	1.25	6.5	7.75 (0.39)	17.7	32.0	39.75	87.25	56.25	143.50	(7.17)

\* Irrigated land \*\* Unirrigated land S Includes encroached government land

# Figures in parentheses are the average values corresponding to the total number

## 5.2 Land Use Pattern

On an average the sample tree growers were having 7.17 acres of land holding (including encroached government land). The average for small, medium and large tree growers was 3.56, 6.52 and 11.5 acres respectively (Table 6). Out of 153.5 acres of total area owned by sample tree growers, 61 percent was irrigated and the rest was unirrigated. They have irrigation facility from the lift irrigation scheme which was commissioned by Sadguru in the year 1976. But irrigation water is not available every year because of irregular rains. Out of a total of 143.5 acres of land holding owned by sample tree growers, 96, 39.75 and 7.75 acres of land was under cultivation, tree plantation and pasture/grazing respectively. A sizable chunk (27.7 percent) of the sample tree growers land was under tree plantation as they have brought their pasture/grazing land under plantation during the last 11 years and this has been increasing year after year due to higher profits accruing from farm forestry plantations. In Shankerpura, very few pieces of pasture/grazing land are available as villagers have taken up tree plantation on those lands. Cattle are either stall-fed or are grazed on pastures situated around the village. A sizeable extent of the cultivated land (71 percent) and land under tree plantation (44.5 percent) is under irrigation. Only 7.75 acres (5.4 percent) out of 143.5 acres of total land holding is under the category of wastelands. This indicates an economically efficient and environmentally-sound land use pattern by the sample tree growers, which is the crying need of the day, Table 6 shows that the area under all kinds of wastelands (grazing land, unculturable land etc.) in Shankerpura was 260 acres in 1976 and which has now (year 1993) been reduced to 20 acres owing to tree plantation, and more and more area is being brought under tree plantation by the villagers.

## 5.3 Pattern of Farm Forestry Piantation in Different Years

During the first year (1982) and second year (1983) of the plantation programme started by Sadguru in Shankerpura, only eucalyptus saplings were distributed among the interested villagers. Those were the golden days of eucalyptus in India and everyone was unequivocally advocating eucalyptus. In 1984, no new plantation was supported by Sadguru in Shankerpura, as saplings could not be arranged. Also in the years 1985, 1986 and 1990 no plantation activity was taken up owing to droughts. Of late, Sadguru has realised the need for giving a mixture of saplings of different species instead of providing only eucalyptus

\* Irrigated land  
# Figures in parentheses are the average values corresponding to the total number of tree growers  
\*\* Unirrigated land  
\$ Includes encroached government land

saplings. This was in response to a general opinion in the country against monoculture of eucalyptus. Thus in the year 1987 and onwards, Sadguru distributed a mixture of saplings of different useful tree species like sevan, **jamphal**, **desibabul**, **subabul**, **gandabahul**, **sitaphai**, **gora sambli**, **kasid**, **bamboo**, **dadam**, **neem**, etc., (see Annexure 1 for botanical names). Saplings of various species were mixed in an equal proportion for distribution to tree growers irrespective of the size of their land holding, though there was much demand for eucalyptus. A total of over two lakh saplings were planted by the sample tree growers between the year 1982 to 1993. In Table 7, the pattern of plantation in different years by different categories of sample tree growers is shown.

Table 7  
Farm forestry plantations carried out by the sample tree growers during the period 1982 to 1993

Year of plantation	Species planted	Number of trees planted by farmers			Total
		Small	Medium	Large	
1982	Eucalyptus	13,000	34,000	29,000	76,000
1983	Eucalyptus	1,500	1,000	18,000	20,500
1987	Mixture*	4,000	12,950	3,000	19,950
1988	Mixture	2,500	6,000	12,000	20,500
1989	Mixture	3,000	1,500	3,000	7,500
1991	Mixture	1,255	2,200	1,500	4,955
1992	Mixture	3,000	7,620	10,000	20,620
1993	Mixture	4,000	17,900	12,500	34,400
Total		32,255	83,170	89,000	2,04,425

\*The mixture included eucalyptus, sevan, dadam, jamphal, subabul, **ganda-babul**, **desibabul**, **sitaphal**, **gora-sambli**, **kasid**, **bamboo**, **ratanjyot** and **neem**.

#### 5.4 Area and Plantation Pattern on Different Categories of Land

The sample tree growers have planted trees on marginal land (uncultivated land, pasture land, and barren land), cultivated land and field bunds. On an average, **1.99** acres of private land was planted under block plantation. This excludes the plantation on field bunds by the sample tree growers. The small, medium and large categories of farmers have planted on an average 1.38, 1.70 and 3.10 acres respectively (Table 8). Eighty five percent of the total plantation

excluding plantation on bunds have been carried out in marginal land whereas the rest of it was carried out on cultivated land. This explains that only a meagre proportion of cultivated land was put under plantation by the sample tree growers and so tree plantation did not affect agricultural production adversely.

Table 8  
Area under block plantation in cultivated and marginal lands

Category of tree growers according to land holding	Number of tree growers	Area under block plantation		Total plantation area excluding plantation on field bunds
		Cultivated land	Marginal land*	
		(in acres)		
Small	4	1.0	4.50	5.50 (1.38)
Medium	11	3.5	15.25	18.75 (1.70)
Large	5	1.5	14.00	15.50 (3.10)
All	20	6.0	33.75	39.75 (1.99)

\* Marginal land includes uncultivated land, pastures and barren lands

Figures in parenthesis are the average to the total number of tree growers in the respective category

The small, medium and large categories of sample tree growers have planted on an average 8,054, 7,561 and 17,800 trees respectively whereas the number of trees that survived after one year of plantation on an average were 6,000, 6,020 and 13,850 respectively with an average survival rate of 78% (Table 9).

Table 9  
Plantation pattern on different types of land and total number of plantations carried out by the sample tree growers from the Year 1982 to 1993

Tree growers category- number of tree growers	Number of trees planted				Number of trees surviving after one year of plantation	Total number of plantations carried out in different years			
	On cultivated land	On marginal land*	On field bunds	Total		On cultivated land	On marginal land	On field bunds	Total
Small-4	2,000	16,000	14,255	32,255	24,000	1	9	14	24
				(8,064)	(6,000)				(6)
Medium-11	12,000	46,270	24,900	83,170	66,220	5	21	21	47
				(7,561)	(6,020)				(4)
Large-5	5,000	75,000	9,000	89,000	69,250	1	18	7	26
				(17,800)	(13,850)				(5)
AU-20	19,000	1,37,270	48,155	2,04,425	1,59,470	7	48	42	97
				do.	(7,973)				(5)

\* Includes uncultivated, pastures and barren land

\*\* Figures in parenthesis are the average for the total number of tree growers in the category

On an average, 10,221 trees were planted by sample tree growers whereas the number of surviving trees after one year was 7,973. Likewise almost all the households of village Shankerpura have a good asset in the form of tree plantations which they harvest and sell whenever they need cash to meet their multifarious needs. Besides, trees also serve as a source of contingency income during intermittent droughts that occur so frequently in the area. In Table 9, the plantation pattern on different categories of land along with the total number of plantations carried out by them during the period 1982 to 1993 is depicted. On an average, the respondents have carried out plantations five times during this period. A maximum of 48 plantations were carried out by the sample tree growers on marginal lands followed by field bunds (42) and cultivated lands (7).

## 6. COST OF PLANTATIONS

Different costs (establishment, recurring and harvesting) incurred during eleven years (July 1982 to October 1993) on the plantations carried out in the year 1982 are shown in Table 10. These figures are expressed on per acre basis and compounded at three interest rates of 5 percent, 10 percent and 15 percent and prices prevailing in their respective years of occurrence have been used to compute the costs and benefits.

### 6.1 Establishment Cost

The establishment cost includes the imputed value of family labour and free services provided by the volunteers organised by Sadguru. The establishment cost of plantations does not include the cost of land as the opportunity cost of the marginal lands has been taken to be zero. The income forgone by allocating these lands for plantation is almost zero and moreover they were not earlier used for any purpose. The cost of using agricultural machinery and equipment has been computed using the straight line method of calculating depreciation. The annualised capital cost of fencing around plantation has been also included. The variable cost of establishment on per acre basis has been calculated by both including and excluding the subsidy provided by Sadguru. Sadguru provided villagers of Shankerpura necessary inputs like saplings, fertilisers and irrigation free of cost. The saplings were provided to tree growers by the Gujarat State Forest Department through Sadguru. The cost of transportation of saplings to the



plantation sites wherever possible was also borne by them. On an average the cost of saplings was 25 paise per sapling. Moreover, a subsidy of 15 paise per saplings and 10 paise per saplings was provided to the tree growers for digging pits and for plantation respectively. Thus a total subsidy of 50 paise per sapling planted was provided. The average present value of establishment cost of plantation compounded at the interest rate of 10 percent excluding subsidy was estimated to be Rs.4,034, Rs.3,112 and Rs.3,165 respectively for small, medium and large tree growers whereas on an average overall establishment cost was found to be Rs.3,305 (Table 10).

Like-wise, on an average, establishment cost compounded at 10 percent interest rate was found to be Rs.7,894 per acre. This included the subsidy provided by Sadguru which accounted for almost 48 percent of the total establishment cost. The success of farm forestry in Shankerpura exemplifies the role of NGOs in promoting tree plantation by farmers by providing subsidy in the form of necessary inputs. This pattern of financing of afforestation of wastelands can be followed in different parts of the country for successful implementation of such programmes. In the farm forestry programme followed by Sadguru in tribal areas of Panchmahal district, incentives are provided in the form of cash subsidy and production inputs such as saplings, fertilizers, and pesticides. Generally, the tribal villagers of Shankerpura take up plantation operation when they have no other alternative employment opportunities available to them and if we exclude the imputed cost of family labour treating opportunity cost as zero, establishment cost will fall drastically.

## 6.2 Recurring Cost

The recurring cost includes all expenditures incurred by tree growers after establishment of plantation. Here in this analysis, it includes all the variable costs incurred on replacement of dead saplings, watch and ward, irrigation, cleaning, pruning, weeding, soil working etc., in different years. The present value of recurring cost on per acre basis compounded at 10 percent was found to be Rs.4,158, Rs.4,315 and Rs.4,560 for small, medium and large tree growers whereas the overall average cost for the sample tree growers was found to be Rs.4,375 (Table 10).

Table 10

Establishment, recurring & harvesting costs of tree plantation incurred during the period, 1982 to October 1993

(Rs./acre)

Category of tree growers <sup>i</sup>	Total area planted (Acres)	Interest rate (%)	Establishment cost excluding the subsidy provided by the MGO	Establishment cost including the subsidy provided by the NGO	Recurring cost	Harvesting cost	Total cost excluding subsidy (3+5+6)	Total cost including subsidy (4+5+6)	
Small	(4)*	5.0	5	2,418	5,012	3,183	1,542	7,144	9,737
			10	4,034	8,361	4,158	1,805	9,998	14,324
			15	6,578	13,633	5,514	2,124	14,216	21,270
Medium	(11)	12.0	5	1,865	4,600	3,253	1,655	6,774	9,509
			10	3,112	7,673	4,315	1,921	9,348	13,909
			15	5,074	12,513	6,014	2,237	13,325	20,763
Large	(5)	9.5	5	1,898	4,752	3,497	2,169	7,564	10,418
			10	3,165	7,926	4,560	2,546	10,272	15,033
			15	5,162	12,925	6,618	3,002	14,782	22,545
All	(20)	26.5	5	1,981	4,732	3,327	1,818	7,127	9,878
			10	3,305	7,894	4,373	2,123	9,802	14,390
			15	5,389	12,872	6,136	2,490	14,015	21,498

H  
as

\* Figures in parentheses are the number of tree growers in the respective categories

### 6.3 Harvesting Cost

The harvesting cost includes all the costs incurred in cutting grasses, thinning of plantations and the cost of final harvesting. Almost all the beneficiaries harvested grass during the first two to three years after plantation whereas those having large plantations, harvested grass for the first five to six years after plantation. Treating the gestation period of eucalyptus as 6 years, the tree growers have harvested their trees crop at least twice during the period of eleven years. This was possible because of coppicing nature of eucalyptus. The harvesting cost includes all the imputed cost of family labour used for cutting fuelwood for their own use. However, it excludes the cost of conversion of trees into timber to be sold to buyers from adjoining villages. It is interesting to note that tree growers in Shankerpura mark the trees to be felled but the felling of trees, and their debarking and conversion into timber and other forms is done by buyers. This helps them in saving their own labour. This practice is unique as elsewhere it is generally found that harvesting cost is borne by the tree growers themselves. The present value of per acre harvesting cost compounded at 10% interest rate for sample tree growers was found to be Rs. 1,805, Rs. 1,921 and Rs.2,546 for small, medium and large categories respectively for the period of eleven years whereas the overall average cost was Rs.2,123 only (Table 10).

The overall average cost including establishment, recurring and harvesting costs compounded at 10 percent was found to be Rs.9,802/acre excluding subsidy and Rs 14,390/acre including subsidy provided by Sadguru. The year-wise cash outflow of the sample tree growers during the period of 11 years are shown in Annexure 2 for different categories of sample tree growers and at different interest rates.

### 7\* BENEFITS FROM PLANTATION

The sample tree growers told us during the course of our interviews with them that returns from eucalyptus plantations accrue to them in the form of timber, small timber, fuelwood, grass and a number of other minor produce. Table 11 presents estimates of net income from eucalyptus plantations for the sample tree growers. The net income is expressed on per acre basis and represents present value as in 1993. The present values have been computed by compounding costs and returns at three different rates of 5, 10, and 15 percent. The overall average

Table 11  
Income from eucalyptus plantations during the period July 1982 to October 1993

(Rs/acre)

Category of tree growers	Area of plantation (In acres)	Compounding rate	Sources of income														
			Grass			Fuelwood			Timber			Miscellaneous produce*			All		
			Total	Average*	Annuity*	Total	Average	Annuity	Total	Average	Annuity	Total	Average	Annuity	Total	Average	Annuity
Small	5.0	5	8287	1657	200	111699	22340	2689	144629	28926	3482	5456	1091	131	270071	54014	6503
		10	12938	2588	398	133946	26789	4124	164494	32899	5065	6416	1283	198	317794	63559	9786
		15	19824	3965	757	161345	32269	6165	187740	37548	7174	7555	1511	289	376464	75293	14385
			(5.27)**		(42.88)		(49.86)		(2.00)		(100)						
Medium	12.0	5	93681	7807	940	269117	22426	2700	394265	32855	3955	26956	2246	270	784019	65335	7866
		10	123524	10294	1585	317666	26472	4076	461404	38450	5920	31449	2621	403	934043	77837	11984
		15	164706	13726	2622	376443	31370	5993	540037	45003	8598	36740	3062	585	1117926	93161	17798
			(14.73)		(33.67)		(48.31)		(3.29)		(100)						
Large	9.5	5	289582	30482	3670	301372	31723	3819	215197	22652	2727	62557	6585	793	868708	91443	11009
		10	366922	38623	5946	361884	38093	5865	244180	25703	3957	74561	7849	1208	1047547	110268	16977
		15	469750	49447	9447	436505	45948	8778	277421	29202	5579	89065	9375	1791	1272741	133973	25595
			(36.90)		(34.30)		(21.80)		(7.00)		(100)						
All	26.5	5	391550	14775	1779	682188	25743	3099	754091	28456	3426	94969	3584	431	1922798	72558	8735
		10	503384	18996	2925	813496	30698	4726	870078	32833	5055	112426	4242	653	2299384	86769	13359
		15	654280	24690	4717	974293	36766	7024	1005198	37932	7247	133360	5032	961	2767131	108158	20663
			(23.64)		(35.21)		(36.33)		(4.82)		(100)						

\$ Average and annuity values are based on per acre basis

\* Miscellaneous produce includes timber used for making agricultural implements, furniture and wood used for fencing agricultural fields etc.,

\*\* Figures in parentheses are the percentage of the total of the respective rows

net present value at 10 percent compounding rate was Rs. 18,996, Rs.30,698, Rs.32,833 and Rs.4,242 from grass, fuelwood, timber and other produce respectively. On an average, grasses, fuelwood, timber and other produce contributed 23.64 percent, 35.21 percent, 36.33 percent and 4.82 percent respectively to the net income of the sample tree growers from the plantations (Table 11). There were no significant differences in percent contribution from different sources among small and medium farmers. However, for the big farmers category the contributions from grasses was much higher than for the small and medium farmers. This difference can be attributed to the bigger size and lower density plantations of the big farmers and hence more area available for grasses to grow. Overall, all the tree growers from all the categories harvested grass for the first three to five years of plantations except two large category farmers who have been harvesting grass since the establishment of their plantations in 1982.

All of the tree growers have become totally self-sufficient in fuelwood. Most of them have been meeting their full requirements of fuelwood from their plantations for the last 7 to 8 years. Now they do not go to nearby forests for collection of fuelwood as all of them use fuelwood from eucalyptus plantations and agricultural by-products. They use as fuelwood all the lops and tops left after converting eucalyptus trees into poles, planks or beams. The sample tree growers revealed that this is the foremost use of farm forestry plantations on their private lands. Some of the tree growers are also selling fuelwood in the nearby market but mostly people from other nearby villages come over to Shankerpura for buying fuelwood. One can see in village Shaokerpura big heaps of fuelwood lying in the verandas and backyards of houses of the villagers. On an average, small, medium and large category of respondents realised net incomes (annuity compounded at 10% interest rate) of Rs.4,124, Rs.4,076 and Rs.5,865 per acre respectively, while the overall average for the sample tree growers was Rs.4,726 (Table 11).

Wood in the form of poles, beams, planks and pillar is also harvested by the tree growers at different stages of the life cycle of eucalyptus according to their needs. All of the sample tree growers have built new houses using eucalyptus timber. They use eucalyptus for house construction in the form of poles, beams, side beams, planks for making roofs, window frames, doors etc. Earlier the villagers of Shankerpura used to live in small huts thatched with grasses and locally available materials. But now they have built houses using

eucalyptus timber and roof tiles, metallic bolts etc. bought from the income received from the sale of timber.

The tribals of Shankerpura and other nearby villages classify eucalyptus timber into different categories according to size, viz., poles (Rs. 15-75), side beams (Rs.75-300), main beam (Rs.300-500), pillars (Rs.500-1,000), and price each of them differently. Eucalyptus timber has become synonymous with their improved standard of living. In addition to timber used for house construction, they sell a major portion of eucalyptus to nearby villagers who come over to Shankerpura to buy them. The utilisation pattern of the income accruing from the sale of timber is shown in Table 13.

An analysis of the sample tree growers revealed that on an average and at 10% compounding interest rate they received the total income of Rs.32,838 per acre. If converted into annuity, this figure works to be Rs.5,055 during a span of 11 years (Table 11). The small, medium and large farmers were getting an annuity (at 10% interest rate and on per acre basis) of Rs.5,065, Rs.5,920 and Rs.3,957 respectively.

The sample tree growers revealed that in addition to income in the form of grass, fuel wood and timber, they also use eucalyptus wood for a number of other purposes viz., making agricultural implements, furniture, using small wood sticks for giving support to agricultural crops and for fencing the agricultural fields. The average per acre income accruing to sample tree growers from miscellaneous uses of eucalyptus compounded at 10% interest rate was found to be Rs.4,242 with an annuity of Rs.653 over a span of 11 years (Table 11).

On the whole, over a span of 11 years, on an average, the sample tree growers received the total income (on per acre basis compounded at 10% interest rate) of Rs.86,769 with an annuity of Rs.9,786, Rs.11,984 and Rs.16,977 for small, medium and large categories of respondents respectively. The year-wise cash inflow of the sample tree growers during the period of eleven years (1982-1993) for different categories of the tree growers and at different interest rates are shown in Annexure 2. The respondents revealed that the farm forestry plantations are the only assets they are owning which help them to meet their contingency needs during drought years which are a common feature of the tribal belt of Panchmahal district.

To sum up, we can say that tree growers of village Shankerpura have tremendously benefited from the farm forestry plantations. This is reflected in their higher standard of living and in the attention that the villagers have received from foresters, environmentalists and government officials. Village Shankerpura has become a model of farm forestry plantations for the people of the tribal belt in Panchmahal district and now nearby villages are also trying and vying with one another to emulate the same course to boost their economy. The three basic necessities of life i.e., food, shelter and clothing, have all been provided in plenty by tree plantations to the people of Shankerpura and who feel obliged to Sadguru for its contribution to the overall development of the village.

## 8. EMPLOYMENT GENERATION

The farm forestry programme initiated by Sadguru has generated quite a significant amount of gainful self-employment to tree growers since its inception. Employment is generated first during the establishment phase and subsequently in recurring maintenance operations and harvesting of tree produce. In Shankerpura, all the villagers have planted trees on their private lands and have benefited from the additional employment opportunities thus created.

An analysis of a sample of 20 households who had taken up plantation of eucalyptus in the year 1982 revealed that, on an average, 577, 471 and 936 mandays of employment were generated (in various plantation activities up to the year 1993) for small, medium and large category farmers respectively whereas the overall average was 609 mandays of employment. Table 12 shows the mandays generated in various plantation activities for different categories of farmers. On per acre basis, 493, 436 and 460 mandays were generated for small, medium and large categories respectively whereas the overall average was 453 mandays of employment.

The effect of farm forestry plantation on employment can also be judged on the basis of seasonal migration which was .75 percent in the year 1976 and has been reduced to 3.5 percent in 1993 (see Table 2). Reduced seasonal migration also contributes positively towards other rural developmental programmes taken up by Sadguru.

Table 12

Total labour employed (family & hired) in carrying out various plantation activities during the period August 1982 to October 1993

(in mandays)

Category of tree growers	Number of tree growers	Total tree area plantation (in acres)	Mandays generated			Total mandays generated	Average mandays generated per Acre
			Establishment of plantation	Recurring maintenance of plantation	Harvesting of products from plantation		
1. Small	4	5.0 (1.25)*	833 (208)	1030 (258)	446 (112)	2309 (577)	493
2. Medium	11	12.0 (1.09)	1483 (135)	2565 (233)	1142 (104)	5190 (471)	436
3. Large	5	9.5 (1.90)	1315 (263)	2168 (434)	1196 (239)	4679 (936)	460
All Average	20	26.5 (1.32)	3631 (182)	5763 (288)	2784 (139)	12178 (609)	453

\* Figures in parentheses are the averages for the number of respondents

## 9. MARKETING OF TREE PRODUCE

The marketing strategy adopted by the sample tree growers of village Shankerpura is unique in the region. The tree growers have complete control over the pricing of the produce and as mentioned earlier they classify the eucalyptus wood according to its size and quality. There is no role of middlemen in the marketing and thus no exploitation of the tree growers. This system of direct sale helps them fetch higher prices for their tree produce. The villagers of the nearby villages and even from far-flung villages on the border of Gujarat and Rajasthan come over to the village Shankerpura for buying eucalyptus wood which they get at lower prices as compared to the prices prevailing in the nearby markets. The tree growers of village Shankerpura have become very wise over time which is reflected in their marketing strategy of tree produce. When a buyer approaches a tree grower of Shankerpura, the latter earmarks the trees according to the choice of the buyer in the plantation area. However, the felling of trees, debarking, and their conversion into timber is done by the buyer himself and that way the tree growers save a lot of expenditure which otherwise has to be incurred on these operations. This way the tree growers not only save the harvesting cost but also the transportation cost which is borne by the buyer himself. Our interviews with the sample tree



growers revealed that they have adopted this strategy to avoid the middlemen as well as to avoid the inconvenience involved in selling the tree produce in nearby markets. There is no tree growers cooperatives or any government intervention for marketing of tree produce in the area. But the tree growers on their own have evolved this unique marketing strategy which is mutually beneficial to themselves as well as the buyers.

#### 10. UTILIZATION PATTERN OF INCOME ACCRUING FROM THE SALE OF TREES

The villagers of Shankerpura can also be termed as tree growers as all the 212 households have planted trees on their private lands. All of the tree growers selected for the purpose of case study revealed that the benefits from the plantations included fuel wood, fodder, and timber and as well as cash income that they are receiving now every year from the sale of tree produce. Part of the tree produce is utilised by tree growers for home consumption while the rest of it is sold to the nearby villagers and others who come over to the village for purchasing eucalyptus poles. Though farmers have planted a mixture of different species but only eucalyptus is sold whereas the rest of the tree produce from other species is used for home consumption.

The sample tree growers were asked about the utilisation pattern of income accruing from the sale of trees. They revealed that they utilise it for different uses (Table 13). All the tree growers have built new houses for themselves and have brought roof tiles, metallic bolts and other accessories from the income from trees. The cash income was also used for making payment to carpenters and other skilled labour employed for house construction. Three of the respondents have constructed more than one house. The other important uses revealed by sample tree growers were buying food items and clothes, and purchase of bullocks and buffaloes. Eight of the respondents revealed that they used the income for meeting the expenses on the marriage of their children, sister or for giving bridewealth to bride's parents. Unlike in non-tribal areas, in the tribal areas of Panchmahal, dowry has to be given to the parents of bride. Some of the sample tree growers also revealed that they utilised the income for the purpose of their children's education, for purchasing feed for livestock during drought period; for purchasing jewellery; and for meeting medical expenses. While a few revealed that they utilised the income for buying

agricultural implements and buying cows and buffaloes. Only one of the respondents revealed that he had put the income in a fixed deposit account in a bank. The utilisation pattern of income was almost the same across all the sample households as most of them preferred to give priority to meeting their basic necessities. The sample tree growers also revealed that they also contribute to the marriage ceremonies of their fellow villagers by way of giving cash and/or gifts. This is done on reciprocal basis to help one another on such occasions. They told us that the income from their planted trees started accruing to them from 1985 onwards and thereafter the money contributed to marriages or other religious ceremonies had drastically increased.

Table 13  
Utilisation pattern of income accruing from the sale of tree produce

Various uses	Number of sample tree growers reporting the uses			
	Small	Medium	Large	All
Children's education	1	4	1	6
Medical expenses	2	1	0	3
Saving as fixed term deposit	0	0	1	1
Purchase of jewellery	0	4	1	5
Bridewealth/expenses for marriages	2	3	3	8
Buying clothes	2	10	3	15
Buying food items	4	11	4	19
House construction (Roof tiles, payment to carpenter etc.)	4	11	5	20
Buying bullocks	2	5	4	11
Buying buffaloes	1	2	1	4
Buying cows	0	2	0	2
Buying feed for livestock during the period of drought	3	5	1	9
Buying agricultural implement	0	2	0	2

The most incredible effect of farm forestry plantations as revealed by the sample respondents was the emergence of a custom among the villagers to help their needy close relatives by providing eucalyptus poles and planks for their house construction. Most of the respondents revealed that they had each helped their relatives this way at least once by providing timber to them.

## 11. FINANCIAL ANALYSIS OF FARM FORESTRY PLANTATIONS

As we mentioned earlier in this paper, the financial feasibility of farm forestry plantations in village Shankerpura was determined using three measures: (i) Net Present Value (NPV); (ii) Benefit Cost Ratio (BCR); and (iii) Financial Internal Rate of Return (FIRR). A brief description of these measures is given in Section 2.3 of this paper.

Sadguru provided assistance to the tree growers in the form production inputs like fertilisers, irrigation and saplings. In addition, it also provided cash incentives in the form of 50 paise/plant for planting trees in their private lands. Financial analysis was carried out both with subsidy and without subsidy.

### 11.1 Financial Analysis with Subsidy

Table 14 shows the estimates of NPV, BCR and FIRR of eucalyptus plantations of sample tree growers in village Shankerpura. The year-wise total costs (cash outflows), gross benefit (cash inflows) and net income (net cash flows) from farm forestry plantations for the sample tree growers in village Shankerpura are presented in Annexures 2 and 3. Item-wise costs and returns from eucalyptus plantation at the current prices over a period of 11 years for different categories of tree growers were computed and then compounded at the rates of 5, 10 and 15 percent to express them all as of October 1993.

Table 14  
Financial analysis of eucalyptus plantations with subsidy in Shankerpura village, 1993

Category of tree growers	Total area of plantation (Acres)	Compounding rate 5 percent				Compounding rate 10 percent				Compounding rate 15 percent			
		NPV* (Rs/acre)	FIRR**	BCR***	Annuity (Rs/acre)	NPV (Rs/acre)	FIRR	BCR	Annuity (Rs/acre)	NPV (Rs/acre)	FIRR	BCR	Annuity (Rs/acre)
Small (4)	5.0	44,277	22	5.55	5,331	17	4.44	7,882	54,022	12	3.54	10,321	
Medium (11)	12.0	55,826	32	6.87	6,721	26	5.60	9,842	72,397	21	4.49	13,831	
Large (5)	9.5	81,025	58	8.78	9,755	51	7.34	14,663	1,11,428	44	5.94	21,288	
All (20)	26.5	62,681	39	7.35	7,546	33	6.03	11,144	82,923	27	4.86	15,842	

\* Net present value as of October 1993

\*\* Financial internal rate of return

\*\*\* Benefit cost ratio

t Figures in parentheses are the number of sample tree growers in the respective categories

Note: NPV, FIRR, BCR and Annuity are calculated on the basis of average of the respective category

Table 14 shows that the eucalyptus plantations owned by all the three categories of sample tree growers are all financially feasible at the 5, 10 and 15 percent compounding rates in terms of both NPV and BCR criteria. The NPV (compounded at 10% rate) was found to be Rs.49,248, Rs.63,927 and Rs.95,236 for small, medium and large categories of tree growers respectively and the overall BC ratio was found to be 6.03. Both these measures indicate that eucalyptus plantations are a profit earning adventure for the tree growers.

The overall average FIRR for all the sample tree growers at 10 percent compounding rate was 33 percent. It was highest (51 %) for the large farmers' category. It implies that it would be financially desirable to invest money in eucalyptus plantations so long as the rate of interest on eucalyptus plantation loans is equal to or less than 33 percent. The overall estimates of NPV and BCR showed an increasing trend with the increase in the compounding rate from 5 percent to 15 percent and FIRR showed a decreasing trend. The estimated annual net income (annuity) at 10 percent compounding rate was found to be Rs.7,882 ,Rs.9,842 and Rs. 14,663 for small, medium and large categories of respondents. The overall average annuity was found to be Rs, 11,144. Besides, eucalyptus plantations generate a lot of employment. In India there is a large proportion of rural population living in areas where large chunks of lands are lying unutilized and productivity of land which is in use is low. Planting eucalyptus on such lands will help the rural poor rise above the poverty line as has been clearly demonstrated by Sadguru in village Shankerpura.

#### 11.2 • Financial Analysis without Subsidy

The financial feasibility measures, NPV, BCR and FIRR, calculated by excluding the amount of subsidy provided by Sadguru during the establishment of eucalyptus plantations in 1982 also showed that eucalyptus plantations were financially viable. The overall estimates (compounded at 10% rate) for NPV, BCR, FIRR and annuity were found to be Rs.76,971, 8.85, 72 percent and Rs.11,850 respectively (Table 15). The FIRR was found to be as high as 118 percent for the large category of respondents and it was also at comfortable levels for small (36%) and medium (59%) categories of respondents.

The financial feasibility analysis done here clearly shows the role of subsidy as an instrument of improving the financial desirability of eucalyptus plantations.

Table 15  
Financial analysis of eucalyptus plantations without subsidy in  
Shankerpura village, 1993

Category of tree growers	Total area of planta- tion (Acres)	Compounding rate 5 percent				Compounding rate 10 percent				Compounding rate 15 percent				
		MPV* (Rs/ acre)	FIRR **	BCR ***	Annu- ity (Rs/ acre)	NPV (Rs/ acre)	FIRR	BCR	Annu- ity (Rs/ acre)	NPV (Rs/ acre)	FIRR	BCR	Annu- ity (Rs/ acre)	
Small	(4)\$	5.0	46,871	42	7.56	5,643	53,575	36	6.36	8,248	61,077	30	5.30	11,669
Medium	(11)	12.0	58,561	64	9.65	7,050	68,489	57	8.33	10,545	79,835	50	6.99	15,252
Large	(3)	9.5	83,879	129	12.09	10,098	99,946	118	10.73	15,388	1,19,191	73	9.06	22,771
All	(20)	26.5	65,432	80	10.18	7,877	76,971	72	8.85	11,850	90,405	64	7.45	17,272

\* Met present value as of October 1993

\*\* Financial internal rate of return

\*\*\* Benefit cost ratio

\$Figures in parentheses are the number of sample tree growers in the respective categories.

Note: NPV, FIRR, B:C Ratio and Annuity are based on the average of the respective category.

## 12. CONCLUSIONS

It is not possible to draw any definite conclusions and make any generalisations based on a single case study. However, we can make the following propositions based on our case study:

1. The case study revealed that the sample tree growers have done most of the plantations (80%) in various years on their privately owned marginal lands other than cultivated lands;
2. The financial feasibility analysis of eucalyptus plantations showed that they are financially viable. The average estimates of NPV, FIRR, BCR, and annuity at 10 percent compounding rate were found to be Rs.72,382, 33 percent and 6.03 and Rs. 11,144 respectively;
3. Eucalyptus plantation programmes as initiated by Sadguru can be taken up in the areas where waste/marginal lands privately owned by the rural poor are in abundance and the opportunity cost of using such lands for tree plantations is almost zero;

4. In this case study it was found that, on an average eucalyptus plantations generated 453 mandays of employment per acre during a span of eleven years;
5. The study revealed that the tribal villagers of shankerpura who were once deficient in fuelwood and timber are now not only self-sufficient but also sell quite a high proportion of their tree produce to nearby villagers;
6. Selling of tree produce at the plantation site itself as was done by the sample tree growers helps to eliminate their exploitation at the hands of middlemen and is beneficial to both the sellers and the buyers. This strategy deserves to be considered for replication in other region of the country also;
7. The income accruing to the tribal tree growers from the sale of tree produce is being utilised to meet their daily subsistence and other needs. Their standard of living seems to have improved as a result of incremental incomes from eucalyptus plantations;
8. The NGOs like Sadguru who have requisite technical, financial and managerial expertise can play an important role in channelising funds earmarked for afforestation programmes by the National Wastelands Development Board (NWDB), National Afforestation and Eco-Development Board (NAEDB), District Rural Development Agencies (DRDAs), Tribal Sub-Plans and many other organisations for promoting farm forestry in rural areas and in providing technical advice, necessary inputs and cash incentives to tree growers. They thus can make significant contribution to the gigantic task of afforestation of privately owned wastelands in India.

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ANNEXURE 1

Common and botanical names of different tree species planted by sample tree growers

Common name	Botanical name
Bamboo	<i>Dendrocalaraus strictus</i>
Bangali Baval	<i>Acacia auriculiformis</i>
Dadam	<i>Punica granatum</i>
Desi Baval	<i>Acacia catechu</i>
Desi Karanj	<i>Pongammia pinnata</i>
Ganda Baval	<i>Prosopis juliflora</i>
Goras Amfoli	<i>Pithecolobium dulce</i>
Jamphal	<i>Psidium guajava</i>
Kashid	<i>Cassia siaraea</i>
Kala Siris	<i>Albizsia odoratissima</i>
Khair	<i>Acacia catechu</i>
Khati Amlı	<i>Tamarindus indica</i>
Neem	<i>Azadirachta indica</i>
Nilgiri	<i>Eucalyptus species</i>
Saragave	<i>Moringa oleifera</i>
Sewan	<i>Gmelina arborea</i>
Sitaphal	<i>Annona squamosa</i>
Subabul	<i>Leucaena leucocephala</i>
Ratanjyot	<i>Jatoropha curcas</i>

## ANNEXURE 2

Cash outflow and cash inflow during various years (July, 1982 to October, 1993) Species- Eucalyptus Year of Plantation-1982 (In Rs.)

Category of tree growers according to land holding	Interest Rate (%)	Establ. cost including subsidy** Zero year	Establ. cost excluding subsidy*** Zero year	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	Total cost including subsidy	Total cost excluding subsidy
				1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year	9th Year	10th Year	11th Year		
Cash-outflow																
Small (4)*	5	25059	12092	3023	2271	1492	1168	2380	1547	1821	1982	1746	1796	4400	48685	35718
	10	41802	20172	4813	3450	2162	1613	3141	1946	2186	2271	1908	1871	4389	71553	49922
	15	68165	32892	7509	5150	3090	2208	4108	2438	2620	2604	2095	1967	4400	106352	71079
Medium (11)	5	55199	22385	9461	3810	3044	3658	4197	5850	4969	5445	5257	7031	6180	114102	81287
	10	92081	37342	15064	5791	4416	5067	5549	7383	5985	6261	5769	7366	6180	166912	112172
	15	150151	60890	23497	8640	6302	6916	7245	9220	7150	7154	6306	7700	8880	249160	159899
Large (5)	5	45139	18027	4848	3289	4240	5502	4406	4196	4765	5483	5010	5670	6420	98967	71855
	10	75299	30072	7719	4999	6152	7619	5825	5295	5739	6304	5498	5940	6420	142810	97583
	15	122785	49036	12040	7458	8779	10401	7605	6613	6856	7203	6009	6210	12220	214180	140431
Total (20)	5	125398	52504	17331	9370	8776	10328	10983	11594	11555	12910	12013	14496	17000	261754	188860
	10	209183	87586	27596	14240	12730	14300	14515	14624	13911	14835	13175	15177	16989	381274	259677
	15	341101	142818	43045	21248	18171	19525	18958	18271	16626	16961	14410	15877	25500	569692	371409
Cash-inflow																
Small (4)	5	0	0	5538	2172	9504	18855	22536	23600	37031	38248	41001	21723	49864	270072	
	10	0	0	8819	3301	13789	26113	29791	29780	44605	43976	44999	22758	49864	317794	
	15	0	0	13755	4925	19677	35644	38898	37192	53284	50250	49183	23792	49864	376464	
Medium (11)	5	0	0	21013	11914	20640	21168	88363	125665	96295	110582	123821	89051	75507	784019	
	10	0	0	33459	18109	29946	29317	116813	158574	115989	127144	135894	93291	75507	934042	
	15	0	0	52188	27017	42735	40017	152519	198042	138560	145282	148529	97532	75507	1117926	
Large (5)	5	0	0	28180	25752	48808	54224	87876	97793	101095	103686	103854	118594	98846	868708	
	10	0	0	44872	39142	70813	75096	116169	123402	121771	119215	113980	124242	98846	1047548	
	15	0	0	69988	58397	101055	102507	151678	154116	145467	136222	124578	129889	98846	1272742	
Total (20)	5	0	0	54731	39838	78952	94248	198775	247057	234421	252516	268676	229368	224216	1922798	
	10	0	0	87150	60552	114548	130525	262774	311756	282365	290335	294873	240291	224216	2299384	
	15	0	0	135931	90339	163467	178168	343094	389350	337312	331753	322289	251213	224216	2767131	

\* Figures in parentheses are the number of tree growers in the respective categories

\*\* Establishment cost including the subsidy provided by Sadguru

\*\*\* Establishment cost excluding the subsidy provided by Sadguru

Annexure - 3  
(July, 1982 to October, 1993)

Species-Eucalyptus      Year of Plantation-1982

(In Rs.)

Category of tree growers according to land holding	Interest Rate (X)	Zero year**	Zero year***	1982-83 1st Year	1983-84 2nd Year	1984-85 3rd Year	1985-86 4th Year	1986-87 5th Year	1987-88 6th Year	1988-89 7th Year	1989-90 8th Year	1990-91 9th Year	1991-92 10th Year	1992-93 11th Year	Total**	Total***
Small (4)*	5	-25059	-12092	2515	-99	8012	17687	20156	22053	35210	36266	39255	19928	45464	221387	234354
	10	-41802	-20172	4006	-149	11627	24499	26650	27834	42418	41706	43092	20887	45475	246241	267872
	15	-68165	-32892	6246	-225	16588	33436	34790	34754	50664	47646	47088	21826	45464	270112	305385
Medium (11)	5	-55199	-22385	11552	8104	17596	17510	84166	119815	91326	105137	118564	82020	69327	669917	702731
	10	-92081	-37342	18395	12318	25530	24250	111265	151191	110004	120883	130125	85925	69327	767130	821870
	15	-150151	-60890	28691	18377	36433	33101	145274	188822	131410	138127	142223	89831	66627	868766	958027
Large <5)	5	-45139	-18027	23332	22463	44567	48722	83470	93596	96331	98204	98844	112924	92426	769740	796852
	10	-75299	-30072	37153	34143	64661	67476	110344	118107	116032	112911	108482	118302	92426	904738	949965
	15	-122785	-49036	57949	50939	92275	92106	144072	147503	138611	129019	118568	123679	86626	1058561	1132311
Total (20)	5	-125398	-52504	37399	30468	70175	83919	187792	235464	222867	239606	256663	214872	207216	1661044	1733937
	10	-209183	-87586	59553	46312	101818	116225	248259	297132	268454	275500	281698	225114	207227	1918110	2039707
	15	-341101	-142818	92886	69091	145296	158644	324136	371079	320686	314792	307879	235336	198716	2197439	2395723

\* Figures in parentheses are the number of tree growers in the respective categories

\*\* Including subsidy given by Sadguru

\*\*\* Excluding subsidy given by Sadguru