Indian J. Agroforestry Vol. 4 No. 1 : 53 - 56 (2002)

Trees in Rainfed Agro-ecosystem - A Socio-economic Investigation in Bundelkhand Region

K.Kareemulla, R.H.Rizvi, Ramesh Singh and R.P.Dwivedi

National Research Centre for Agroforestry, Jhansi - 284003

ABSTRACT

This paper attempts to study the various socio-economic and bio-physical variables influencing the farmers' behaviour towards tree planting in their lands. Six variables viz. cultivated land, uncultivated land, family size, number of literate persons in a family, livestock and number of existing trees were taken for the study. Results of multiple correlation analysis revealed that significant interrelationship exists between number of planted trees and the uncultivated land as also between number of planted trees and number of existing trees. The value of coefficient of determination (R^2) indicated that 48 per cent of variation in dependent variable i.e. number of planted trees (saplings) is explained by chosen independent variables. Hence, an empirical model can be established based on these chosen predictors for estimating the number of planted trees.

Key words : *Ecosystem, multipurpose trees, rainfed, semi arid ,socio economic.*

1. INTRODUCTION

Multipurpose trees are an integral part of agriculture in several parts of the globe including India also. Studies in developing countries have stressed a scarcity of fuelwood as one of the key factors, which motivate farmers in tree planting (Dewees, 1992). Godoy (1992) suggested that high purchasing cost of fuelwood coupled with its scarcity also stimulate tree patronisation by farmers. Central India, characterised by semi-arid conditions faces scarcity of fuelwood and fodder (Tyagi, 1997). Jhansi district, a constituent of Uttar Pradesh is part of central India. A case study of three villages of Jhansi district was taken up to understand the nature and extent of trees on farmers' fields and their role in the socio-economic life of the farmers. The present paper deals with the socio-economic dimensions of tree raising in these villages based on a study conducted in the year 2000. The focus of the paper is on modelling the tree planting behaviour of farmers.

2. METHODOLOGY

The study was conducted in three villages of Jhansi district, a true representative of semi-arid (latitude 25° 27' N, longitude 78° 35' E and altitude 271 m above mean sea level) viz. Karari, Rund-Karari and Lakara, which are contiguous and nearer to the market centre viz. Jhansi. The data on the required parameters were collected both by way of interviewing and by physical observations on the fields. Based on the secondary data obtained from state government departments, the rural households were classified broadly into four categories viz. landless, small farmers, medium farmers and large farmers. The sample framework consisted of 123 households (Table 1). The overall sample comprised of 18 landless, 55 small farmers, 31 medium farmers and 19 large farmers from the three villages. The village-wise sample sizes were 41, 42 and 40 in Rund-Karari, Karari and Lakara villages, respectively.

Table 1. Sample framework of the study villages

Sl. No	Sample entity	Rund-Karari	Karari	Lakara	Pooled
1.	Landless	5	9	4	18 (15)
2	Small farmers (<= 2 ha)	15	22	18	55 (45)
3	Medium farmers (>2 to 5 ha)	17	8	6	31 (25)
4	Large farmers (>5 ha)	4	3	12	19 (15)
	Total	41	42	40	123 (100)

(Figures in parentheses indicate percentage)

A total of 105 farmers excluding landless were taken for the study. Sample size stood at 32 consisting of those farmers, which had multipurpose trees or fruit trees in their lands. Data on family particulars, land details, irrigation, crops, livestock and trees on farms were obtained. These data were utilized to arrive at the averages, estimate the functional relationships in terms of correlation and regression analyses. For estimating the empirical model on tree planting pattern of farmers, variables viz. cultivated area, area of uncultivated land, family size, literacy, livestock size, tree stock on farm lands and number of trees planted in the recent three years were used. Salam et al. (2000) had analysed the decision making pattern of households in tree planting by adopting multiple regression analysis. Whereas, Anim (1999) had used the logistic model for estimating the farmers choice to adopt or not to adopt the soil conservation measures. The present study used the multiple regression model for estimating the relationship

between the number of trees planted by the farmers and the identified predictor variables.

Since trees can be raised on agricultural lands, it is assumed that the cultivated area owned by the farmers influence the number of trees raised (planted) by the farmers. Similarly, the extent of uncultivated land, where either shrubs or trees can be raised has been included into the model as a predictor variable. As the number of people in a family explain the quantum of demand for tree products consumed domestically as also the required labour input for tree raising, this variable was included. It was believed that literacy is associated with awareness and problem solving, hence this variable was taken as one of the predictor variables. The number of adult literate farmers in the family is considered. Only those who have formal education upto primary level were considered as literate. The stock of natural trees is expected to induce the farmers to go for a few more and hence the same was included in the model.

3. RESULTS AND DISCUSSION

The study brought out the various features of the farmers and landless on socio-economic dimensions, bio-physical environment and pattern of tree existence on farmlands.

3.1 Socio-economic and Bio-physical Features of Households

The average family size of the sample households in the study villages was 9 (Table 2). The literacy level as observed by the number of literate adult persons in the family was only 37 per cent. Though the irrigation sources available with 77 per cent of the farmers, their reliance for both the cropping seasons was poor. More often, farmers use wells water (the major source of irrigation) for *kharif* and *rabi* crops. Wheat is the major crop in *rabi* season. The potential of irrigation utilization is indicated by the crop intensity, which stood at 133 per cent.

Table 2. Socio-economic and bio-physical features of the sample households

Indicator	Value
Family size (no.)	9.00
Adult composition in family (%)	55.00
Adult literacy (%)	37.00
Proportion of families with pucca houses (%)	39.00
Irrigated farms (%)	77.00
Cropping intensity (%)	133.00
Average land holding (ha)	3.73
Share of uncultivated area (%)	19.60
Average livestock heads (no.)	8.00
Average tree stock/ farmer (no.)	20.00

The average land holding size across different farm categories viz. small, medium and large were 1.47, 4.08 and 10.51 ha, respectively. The average uncultivated land with these farmers was 0.50, 0.92 and 1.72 ha.

Out of the total 105 farmers, 82 farmers had multipurpose tree species (MPTS) like *Butea monosperma, Acacia nilotica, Lueceana leucocephala, Madhuca indica, Azadirachta indica*, etc. and fruit species such as *Zizyphus marutiana, Sizijium cumini* and small bushy species like *Lantana camara, Zizyphus nummularia*, etc.; while the remaining farmers had only bushy species. Account of only MPTS and fruit species is taken for the study. There were on an average 20 trees per farmer (5 trees ha^{-1}) with 17 belonging to MPTS category and the rest to the fruit category. Out of the average of 20 trees found on each of the farmers' fields, four trees were reported to have been planted by the farmers. Across the farm size categories the range of trees varied form 2 trees ha^{-1} among large farmers to 13 trees ha^{-1} among small farmers. There were 32 farmers, who had planted some trees in their farm lands. Further, among the sample farmers, there were some who wanted to raise saplings in the near future. The details of the same are discussed first. Analysis of tree planting behaviour of such farmers is the focus of this paper.

3.2 Tree Planting Preference of Farmers

Almost two thirds (67%) of the sample households were interested in planting the tree saplings in the coming two years (Table 3). The species preferred by the sample households were Shisham, Subabool, Neem, Teak, Karonda, Acid Lime and Aonla. Notably, 81 per cent of such interested farmers belonged to the small and medium size category. The average number of saplings proposed to be planted by each of the interested farmers is 70 in an average land holding of 3.73 ha. Among the farmers who wanted to take up planting of saplings, 27 per cent were inclined to go for boundary plantation.

Table 3. Tree planting preference of farmers

Particular	Number
Farmers willing to plant trees in near future (%)	66
Of which, small / medium farmers (%)	81
Average no. of trees proposed to plant	70
Preference for boundary plantation (%)	27

3.3 Tree Planting as Influenced by Socio-economic and Bio-physical Variables

A multiple regression function was fitted with number of trees planted as the dependent variable and variables viz. cultivated land area of the farm family, uncultivated

area, family size, number of literate persons (literacy) in the family, number of livestock and trees already existing before planting as predictor variables. The descriptive statistics of the variables in the model are given in Table 4. The standard deviation was higher compared to the mean values especially in case of number of trees planted, area of uncultivated land and number of existing trees. This can be attributed to the fact that there was wide variability in the actual values.

Table 4. Descriptive statistics of the model (n=32)

Variable	Mean	Standard deviation
No. of planted trees (Y)	10.00	13.90
Cultivated land in ha (X_1)	6.35	4.16
Uncultivated land in ha (X_2)	1.35	1.86
Family size in no. (X_3)	10.00	5.60
No. of literate persons in family (X_4)	4.00	2.80
No. of livestock (X_5)	6.00	4.08
No. of existing trees (X_6)	23.00	25.65

Table 5. Correlation coefficients of the variables

Variable	Y	X_1	X_2	X_3	X_4	X_5
X_1	-0.004					
X_2	0.588**	0.130				
X_3	0.017	-0.017	0.567**			
X_4	0.006	0.092	0.551**	0.472**		
X_5	0.246	0.027	0.452**	0.374*	0.382*	
X_6	0.397**	0.368*	0.255	0.134	0.381*	0.311*

* Significant at 5%, ** Significant at 1%

A multiple correlation analysis was also done to get the interrelationships amongst the variables chosen (Table 5). The correlation coefficients indicated that, significant positive interrelationships exist among variable pairs viz. number of trees planted by the farmers and uncultivated land; tree stock prior to planting (natural tree stock). Similarly interrelationships were significant among the variables like - uncultivated land and family size; uncultivated land and livestock; family size and livestock.

The results of the multiple regression analysis (Table 6) indicated that 48 per cent of the variation in the dependent variable (number of trees raised by farmers) is explained by the identified predictors. The beta coefficient of only uncultivated land is found to be significant. This implies that as the uncultivated area increases with the farmers, the tendency to plant saplings will be higher. This is due to the fact that many farmers had kept some portion of their land as fallow for want of vital inputs like water, seeds etc. and some portion is not suitable for crop cultivation. Therefore tree planting is found to be a suitable option in such lands.

Table 6. Explanatory variables for the tree planting nature of farmers and their coefficients

Variable	Coefficient value (standardized)	Std. error
X_1	-0.229	0.660
X_2	0.550**	1.117
X_3	0.090	0.454
X_4	-0.152	0.905
X_5	0.295	0.578
X_6	0.208	0.093
Constant (a)	(2.331)	4.747

(R^2 : 0.480)

** Significant at 1%

Negative regression coefficient of variable-cultivated land indicates that as the area under cultivation increases, the number of planted trees may decrease due to the apprehensions of farmers that the crop yield decreases. Incidentally, this coefficient is not significant even at 5 per cent. Similar is the case with variable - number of literate persons in a family. Literate persons might prefer the government or private services rather than sticking to traditional agricultural practices like crop cultivation or tree planting. Although these two variables have negative beta coefficients, they have no significant effect on dependent variable. Thus, it can be concluded that the six variables taken in this model influence the number of trees planted by the farmers to a considerable extent.

4. CONCLUSIONS

A socio-economic investigation in three villages of Bundelkhand revealed that trees do play a supplementary role in agriculture, especially in rainfed conditions though most of the trees come up naturally in the agricultural fields. About 39 per cent of the farmers had planted saplings of trees, especially belonging to the fruit species. Regression analysis indicated that the predictor i.e. area of uncultivated land significantly influenced the number of saplings planted by the farmers.

ACKNOWLEDGEMENTS

The authors would like to acknowledge with thanks the efforts of Sh. Munna Ram, Dr. Anil Kumar, Dr.Ram Newaj, Dr.S.K.Shukla, Mrs. Chitra Shanker and Dr. D. B. V.

Ramana, Scientists of National Research Centre for Agroforestry. Jhansi who also collected data from the respondents in the study villages.

REFERENCES

Anim, F.D.K. 1999. A note on the adoption of soil conservation measures in the Northern Provence of South Africa. *Journal of Agricultural Economics 50(2):336-345.*

Devees, P. A. 1992. Social and economic incentives for small holder tree growing. A case study from Muranga district, Kenya. Community Forestry Case Study Series No. 5. FAO, Rome, Italy.

Godoy, R. 1992. Dterminants of small holder commercial tree cultivation. *World Development, 20: 713-725.*

Salam, M.A., Noguchi, T. and Koike, M. 2000. Understanding why farmers plant trees in the homestead agroforestry in Bangladesh. *Agroforestry Systems 50: 77-93.*

Tyagi, R. K. 1997. *Grassland and Fodder Atlas of Bundelkhand.* Indian Grassland and Fodder Research Institute, Jhansi.