Establishment and Maintenance of Mulberry Garden by Tribal Farmers of Khammam District – An Economic Evaluation

R Sekhar Babu, I Narender and K R Chowdry

Department of Agricultural Economics, College of Agriculture, A.N.G.R.Agrl. University, Rajendranagar, Andhra Pradesh

ABSTRACT

The total cost of establishing one hectare of mulberry garden on an average was around Rs.12423.73 for all farms. It is important to note that the share of fixed cost in the total cost of maintenance of one hectare of mulberry for all farms was 40.87 per unit. The remaining share of the total cost was the variable cost and it was 59.13 per cent. Thus it can be inferred that the share of fixed cost was lower than the variable cost. The overall picture shows that seed value manures and fertilizers are being used excessively by medium and large group farmers whereas human labour was being used excessively by medium size farmers.

Key words : Mulberry

Tribals are among the weakest sections of the society. The constitution of India provides for a comprehensive frame work for the socio-economic development of scheduled tribes and for preventing their exploitation by other groups of society. The strategy which has been adopted from fifth plan onwards has yielded results and has proved beneficial for the development of tribals and tribal areas.

MATERIAL AND METHODS

Khammam district of Andhra Pradesh was purposively selected for the present study as it ranks first in the state in tribal population. At the second stage five mandals were selected randomly from the list of mandals implementing ITDA developmental programmes. At the third stage villages from each mandal were selected based on the highest number of beneficiaries. From each village, beneficiaries were selected through random sampling technique with probability proportion to different size of holdings. Thus a district, 5 mandals, 17 villages and 296 beneficiaries constitute the sample for the study. Data was collected for the year 1999-2000 by survey method. The Cobb-Douglas production function was fitted by taking all the important inputs, variables *viz* land, human labour, bullock labour, seed, manures and fertilizers, irrigation as the independent variable and out put as the dependent variable.

The form of the function is as follows

$$Y = ax_1^{b1} x_2^{b2} x_3^{b3} \ldots\ldots\ldots x_k^{bk}$$

Where Y = output, x_1 to x_k = inputs
$ab_i \ldots\ldots b_k$ are the regression parameters
X_1 = Land in ha, X_2 = Bullock labour in Rs.,

X_3 = Seed in Rs., X_4 = manures and fertilizers in Rs., X_5 = Irrigation value in Rs., X_6 = Human labour value in Rs., Y = Dependent variable in gross income per hectare, a = constant, b_1-b_6 = Production elasticities of factors x_1 to x_6.
Marginal value product formula M V P

$$\text{MVP of } x_i = \frac{Y}{X_i} \times b_i$$

Where Y = Geometric mean of output Y, X_i = Geometric mean of input x_i, b_i = Regression coefficient x_i

RESULTS AND DISCUSSION

Total cost for establishing one hectare of mulberry garden on an average was around Rs.11618.24, Rs.13393.60, Rs.12817.73 and 12423.47 for small, medium, large and all farms respectively (Table 1). The variable cost was Rs.8107.09, Rs.10502.29, Rs.10074.54 and Rs.9543.72 for small, medium, large and all farms respectively and indicated that it has formed a major share in the total cost. This did not indicate any perceptible relationship with that of farm size. The most important item of cost of establishing the mulberry garden was the cost of cuttings which was around Rs.2968.00, Rs.3114.54, Rs.3171.52 and Rs .3077.12 for small, medium, large and all farms which accounted for 25.55, 23.25, 24.74 and 24.77 per cent of the total cost respectively. Next to cuttings is the cost of human labour, which were around Rs.1601.90, Rs.2763.61, Rs.2495.81 and Rs.2283.29 for small, medium, large and all farms respectively. The human labour in the total cost was

around 13.79, 20.63, 19.47 and 18.38 per cent for small, medium, large and all farms respectively.

Next to human labour was irrigation charges, which has ranged from Rs.990 (8.52%) on small farms to Rs.1481.81 (11.06%) on medium farms. The same was Rs.1402.77 (10.94%) and Rs.1287.23 (10.36%) for the large and all farms respectively.

Next to irrigation was fertilizer cost which was around Rs.825.40 (7.10%), Rs.903.63 (6.75%), Rs.1072.22 (8.37%) and Rs.918.93 (7.40%) for small, medium, large and all farms in the same order.

Next to fertilizers cost was bullock labour charges which were around Rs.655.00 (5.64%), Rs.741.36 (5.54%), Rs.702.08 (5.48%) and Rs.700.70 (5.64%) for small, medium, large and all farms respectively.

Next to bullock labour the manures cost was around Rs.572.00 (4.92%), Rs.856.36 (6.39%), Rs.615.27 (4.80%) and Rs.693.97 (5.59%) for small, medium, large and all farms respectively.

The total fixed cost was around Rs.3511 (30.22%), Rs.2891 (21.59%), Rs.2743 (21.40%) and Rs.2879 (23.18%) for small, medium, large and all farms respectively.

The share of land rent in the fixed cost was Rs.2775 (23.88%), Rs.2088.63 (15.59%), Rs.2100.69 (16.39%) and Rs.2157.80 (17.37%) for small, medium, large and all farms respectively.

The details of variable and over head costs incurred in maintenance of one hectare of mulberry garden are presented in Table 2.

It is obvious from the table that the average annual cost of cultivation of one hectare of mulberry garden for all farms was Rs.9645, which included Rs.5703 of variable cost and Rs.3942 of fixed cost accounting for 59.13 per cent and 40.87 per cent of the total costs.

The average annual cost of cultivation per hectare on small farms was Rs.8315 whereas for medium and large farms it was Rs.9962 and Rs.11193 respectively, which indicates only a marginal difference between medium and large farms.

The average variable cost per hectare for small farms was Rs.4494 for medium and large farms it was Rs.6057 and Rs.6932 which formed 54.05 per cent, 60.80 per cent and 61.93 per cent of the total cost. Both the variable and total costs have indicated a direct relationship with that of farm size. Similar trend was also observed by Wilson (1996).

Among the variable costs, the cost of human labour was major component, accounting to Rs.1480, Rs.2354, Rs.2811 and Rs.2142 respectively for small, medium large and all farms.

The next to important variable cost component was cost of irrigation, which accounted for 11.90, 14.39, 12.74 and 13.15 per cent for small, medium, large and all farms respectively.

Among the fixed costs, rental value of owned land was the major component accounting for Rs.2274 (27.35%), Rs.2063 (20.72%), Rs.2239 (20.00%) and Rs.2183 (22.64%) for small, medium, large and all farms. The apportioned establishment cost was Rs.774.55, Rs.892.90, Rs.954.51 and Rs.828.23 for small, medium, large and all farms respectively. These findings are in conformity with that of Radhika Rani (1998).

It is important to note that the share of fixed cost in the total cost of maintenance of one hectare of mulberry for all farms was 40.87 per cent. The remaining share of the total cost was the variable cost and it was 59.13 per cent. Thus it can be inferred that the share of fixed cost was lower than the variable cost. These findings are in accordance with Subbarayudu B V, *et al.* (1989). The details of unit cost of production of mulberry leaf, yield and returns from mulberry cultivation was presented in Table 3.

The cost of production per kg of leaves worked out to Rs.0.261, Rs.0.317, Rs.0.353 and Rs.0.305 for small, medium, large and all farms respectively. The difference in unit cost among the size groups was marginal. On an average, 31549.64 kg of mulberry leaf was obtained for all farms from one hectare of garden. On small farms average leaf yield was 31807.69 kg whereas for medium and large farms it was 31390.90 kg and 31411.76 kg respectively. Income from mulberry leaf was Rs.22265, Rs.21973, Rs.21988 and Rs.22084 for small, medium, large and all farms respectively. The findings is in line with result of Dilawar *et al.*, (1983).

The size wise estimated production functions for mulberry cultivation are presented in the table 4.

Multi colinearity was found to be present among the independent variables of the small farms and medium farms. Hence, step down procedure was applied for fitting the production function. This procedure lead to elimination of two independent variables in small farms irrigation and human labour and one independent variable in medium farms, *i.e.*, bullock labour.

The coefficient of multiple determination (R^2) of mulberry cultivation for all farms was 0.94 and was found statistically significant. This indicates that 94 per cent of the variation in the gross income was explained by the variables included in the function. The production elasticities of bullock labour, seed, manures and fertilizers and human labour which indicated that those four variables contributed

Table 1: Cost of establishment of mulberry garden (Rs ha^{-1})

S.No.	Particulars	Small		Medium		Large		All farms	
		Units	Value	Units	Value	Units	Value	Units	Value
A	**Variable cost**								
1.	Human labour	-	1601.90 (13.79)	-	2763.61 (20.63)	-	2495.81 (19.47)	-	2283.29 (18.38)
2.	Bullock labour	13.10	655.00 (5.64)	15	741.36 (5.54)	14.58	702.08 (5.48)	14.21	700.29 (5.64)
3.	Fertilizers								
	N	65.10		70		84.72		72.02	
	P	18.80	825.40 (7.10)	19.90	903.63 (6.75)	16.31	1072.22 (8.37)	18.83	918.93 (7.40)
	K	-		-		1.18		0.30	
	Total	83.90		89.90		102.21		83.15	
4.	Manures(T)	7.65	572.00 (4.92)	12.27	856.36 (6.39)	9.79	615.27 (4.80)	10.0	693.97 (5.59)
5.	Irrigation	-	990.00 (8.52)	-	1481.81 (11.06)	-	1402.77 (10.94)	-	1287.23 (10.36)
6.	Cuttings	28200	2968.00 (25.55)	27727.27	3114.54 (23.25)	28333.33	3171.52 (24.74)	28049.64	3077.12 (24.77)
7.	Interest on working capital	-	494.79 (4.26)	-	640.98 (4.79)	-	614.87 (4.80)	-	582.48 (4.68)
8.	Sub-total	-	8107.09 (69.78)	-	10502.29 (78.41)	-	10074.54 (78.60)	-	9543.72 (76.82)
B.	**Fixed Cost**								-
1.	Land rent	-	2775.00 (23.88)	-	2088.63 (15.59)	-	2100.69 (16.39)	-	2157.80 (17.37)
2.	Revenue and cess	-	125.00 (1.08)	-	125.00 (0.94)	-	125.00 (0.98)	-	125.00 (1.00)
3.	Interest on fixed capital	-	325.00 (2.80)	-	385.15 (2.88)	-	292.50 (2.28)	-	331.62 (2.67)
4.	Depreciation	-	286.15 (2.46)	-	292.50 (2.18)	-	225.00 (1.75)	-	265.33 (2.14)
	Total fixed costs	-	3511.15 (30.22)	-	2891.31 (21.59)	-	2743.19 (21.40)	-	2879.75 (23.18)
	Total costs (Rs)	-	11618.24 (100)	-	13393.60 (100)	-	12817.73 (100)	-	12423.47 (100)

Figures in parentheses indicate percentage to the total

2008 Economic Evaluation of Mulberry Garden 239

Table 2: Maintenance cost of mulberry cultivation (Rs ha^{-1})

S.No.	Particulars	Small		Medium		Large		All farms	
		Units	Value	Units	Value	Units	Value	Units	Value
A	**Operational cost**								
1.	Human labour	-	1480.45 (17.81)	-	2354.52 (23.63)	-	2811.75 (25.12)	-	2142.43 (22.21)
2.	Bullock labour	9.80	488.46 (5.87)	11.27	557.27 (5.59)	14.55	697.05 (6.23)	11.52	565.60 (5.86)
3.	Fertilizers								
	N	68.17		69.63		86.91		73.26	
	P	13.75	844.23 (10.15)	5.81	717.27 (7.20)	8.08	939.70 (8.39)	9.29	817.73 (8.48)
	K	-		-		-		-	
	Total	81.92		75.44		94.99		82.55	
4.	Manures(T)	5.52	417.30 (5.02)	9.18	625.45 (6.28)	9.85	634.55 (5.67)	7.99	550.88 (5.71)
5.	Irrigation	-	989.51 (11.90)	-	1433.18 (14.39)	-	1426.47 (12.74)	-	1267.94 (13.15)
6.	Interest on working capital	-	274.29 (3.30)	-	369.69 (3.71)	-	423.11 (3.78)	-	358.96 (3.72)
	Sub-total	-	4494.24 (54.05)	-	6057.38 (60.80)	-	6932.63 (61.93)	-	5703.54 (59.13)
B	**Fixed Cost**								
1.	Land rent	-	2274.03 (27.35)	-	2063.63 (20.72)	-	2238.97 (20.00)	-	2183.51 (22.64)
2.	Revenue and cess	-	125.00 (1.50	-	125.00 (1.25)	-	125.00 (1.12)	-	125.00 (1.30)
3.	Interest on fixed capital	-	422.34 (5.08)	-	478.60 (4.80)	-	513.81 (4.59)	-	475.38 (4.93)
4.	Depreciation	-	225.00 (2.71)	-	345.15 (3.47)	-	428.75 (3.83)	-	329.69 (3.42)
5.	Apportioned establishment cost	-	774.55 (9.31)	-	892.90 (8.96)	-	954.51 (8.53)	-	828.23 (8.58)
	Total fixed costs	-	3820.92 (45.95)	-	3905.28 (39.20)	-	4261.04 (38.07)	-	3941.81 (40.87)
	Total cost (A+B)	-	8315.16 (100)	-	9962.66 (100)	-	11193.67 (100)	-	9645.35 (100)

Figures in parentheses indicate percentage to the total

Table 3: Unit cost of production, yield and returns from mulberry cultivation.

S.No.	Particulars	Small	Medium	Large	All farms
1.	Total cost (Rs)	8315.16	9962.66	11093.67	9645.35
2.	Yield of mulberry leaves (kg ha^{-1})	31807.69	31390.90	31411.76	31549.64
3.	Cost of production of kg leaves (Rs)	0.261	0.317	0.353	0.305
4.	Income from mulberry leaves (Rs)	22265.38	21973.63	21988.23	22084.74

Table4 : Production elasticities of different input factors - In Mulberry cultivation

Particulars	Small	Medium	Large	All farms
Constant(a)	2.5171	5.4573	4.4336	0.7703
X_1 land	0.5814*	1.4837**	1.1421**	-0.0488
	(0.1989)	(0.3171)	(0.1847)	(0.0499)
X_2 bullock labour	0.0939	-	0.0180	0.2541**
	(0.0617)		(0.1386)	(0.0478)
X_3 seed value	0.2673	-0.3112	-1603	0.3649**
	(0.1985)	(0.2983)	(0.1784)	(0.0884)
X_4 manures and fertilizers	0.1336*	-0.2224*	0.0603	0.4920**
	(0.0486)	(0.1097)	(0.085)	(0.1761)
X_5 irrigation	-	0.1339*	0.0208	-0.3833*
		(0.0770)	(0.0733)	(0.1593)
X_6 human labour	-	-0.1051	0.0215	0.3876**
		(0.0962)	(0.1635)	(0.1212)
Ebi	1.0764	0.9790	0.9819	1.0667
R^2	0.9950	0.8929	0.8506	0.9485

Figures in parenthesis show standard error.
* at 5 per cent level of significance
** at 1 per cent level of significance
MC= Mulberry cultivation

positively and significantly to the gross income. The production elasticities of irrigation and land were -0.38 and -0.04 which indicated a negative and non-significant influence on the gross income.

The efficiency of the resource used in the production of crops is estimated by comparing the marginal value product of inputs with the factor opportunity costs. The MVP per rupee of expenditure incurred on land, bullock labour, cuttings, manures and fertilizers, irrigation, human labour and the MVP of land are computed and compared with the opportunity costs.

The opportunity costs for all the variables are considered to be one rupee except that of land, where the actual acquisition cost is taken since it is expressed in physical units.

The particulars of MVPs opportunity costs and their ratios of mulberry cultivation are presented in Table 5.

The utilization of bullock labour, seed, manures and fertilizer and human labour were 0.46,

060, 0.54 and 0.43 respectively. The MVP to opportunity cost for the above said ratios were less than one in all these variables and were positive. So the expenditure on these inputs can neither be increased nor curtailed, whereas the ratio of MVP to opportunity cost for irrigation was -0.42 indicated that this input was excessively used. Whereas, the MVP for opportunity cost ratio for land was negative, suggesting to reduce expenditure on the input to obtain better results on all farms.

Conclusion : The mulberry yields have indicated an inverse relationship with that of farm size indicating that small farmers had taken better personal care in the management of crop when compared with larger farms.

This analysis has clearly indicated the inefficient use of all these resources and there is a need to reorganize the use of these resources to increase the productivity.

Table5 : Resource use efficiency for Mulberry cultivation

MVP	Small	Medium	Large	All farms
X_1 land	23.7661	864.968	240.454	-0.0562
X_2 bullock labour	0.1548	-	0.0293	0.4605
X_3 seed value	0.3402	-0.5202	-0.2022	0.6098
X_4 manures and fertilizers	0.1898	-0.2829	-0.0865	0.5470
X_5 irrigation	-	0.1937	0.0305	-0.4235
X_6 human labour	-	-0.1510	0.0278	0.4360
OC				
X_1 land	-	-	-	-
X_2 bullock labour	1.0000	1.0000	1.0000	1.0000
X_3 seed value	1.0000	1.0000	1.0000	1.0000
X_4 manures and fertilizers	1.0000	1.0000	1.0000	1.0000
X_5 irrigation	1.0000	1.0000	1.0000	1.0000
X_6 human labour	1.0000	1.0000	1.0000	1.0000
MVP/OC Ratio				
X_1 land	-	-	-	-
X_2 bullock labour	0.1548	-	0.0293	0.4605
X_3 seed value	0.3402	-0.5202	-0.2022	0.6098
X_4 manures and fertilizers	0.1898	-0.2829	-0.0865	0.5470
X_5 irrigation	-	0.1937	0.0305	-0.4235
X_6 human labour	-	-0.1510	0.0278	0.4360

MVP = Marginal value of products   OC = Opprtunity cost

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