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# Establishment and Maintenance of Mango orchard by Tribal Farmers of Khammam District - An Economic Evaluation

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## ABSTRACT

The total cost of maintenance of Mango orchard during the bearing period was Rs. 11391.51 per hectare. The major share was occupied by the variable cost Rs.5541.24/ha (48.64%) and share of establishment cost was Rs.891.68 (7.83%) . The per hectare net returns obtained were Rs. 35808.49. Discounted benefit cost ratio of the mango was 2.49 and this indicates mango is the most profitable crop. The high positive NPV indicates the soundness of the investment made in mango garden. The internal rate of return obtained was high than the prevailing market rate of interest indicating the favourable nature of returns.

**Keywords:** Mango, Orchard.

Mango is one of the most acclaimed and celebrated fruit in India and is grown in almost all parts of India. Mango and its products account for single important items of the export trade in fruits. India is the world leading producer of Mango and occupies more than 60 per cent of the world production. Horiticulture cum social forestry is found to be more advantageous than any other way of economic upliftment in tribla areas, which not only provides the source of income to tribals but also leads to afforestation and creation of favourable environomental conditions.

## 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. Five mandals were selected randomly from the list of mandals implemetning ITDA developmental programmes. The villages from each mandal were selected based on the highest number of beneficiaries under ITDA.

From each village, beneficiaries were selected through random sampling technique with probability proportion to different size groups. 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. Different methods used for measuring the productivity of investment are (i) Pay back period (ii) Net present value (iii) benefit cost ratio (iv) Internal rate of returns.

## RESULTS AND DISCUSSION

The establishment costs incurred on different items in mango orchard during the first year is presented in Table 1.

The total cost of establishment was Rs. 9968.18. Out of the total, the variable cost was Rs. 6488.44 (65.05%) and that of fixed cost Rs.3483.74 (34.95%). Among the variable cost, the manures occupied a major share with Rs.2539.84 (25.48 per cent of the total cost) followed by plant cost and transport charges with Rs.1280.14 (12.84%) irrigation with Rs.783.98 (7.86%). Land rent which comes under fixedcost constitutes Rs.3000.98 (30.11%) to the total cost.

The details regarding the costs incurred from second year and up to the bearing period for mango orchard are being discussed in Table-2. In the second year of maintenance of mango orchard, the amount spent on manuring was Rs.789.03 (13.12%) on fertilization Rs.420.29 (7.03%) Irrigation Rs.530.35(8.88%), weeding Rs.138.40 (2.32%) followed by fencing renovation Rs.130.65 (2.19%) per hectare respectively. In the fixed cost, the land rent was Rs.3000.78 per hectare which formed 50.22% of the total cost.

The total cost for the second, third and fourth year was Rs.5975.10, Rs 7078.81, Rs.7886.92, per hecatare repectively. In all these years, the land rent formed the major share followed by manuring and irrigation etc. The annual maintenance costs incurred in maintaining a garden from the bearing year onwards has been worked out and presented in Table 3.

Table 1. Establishment cost of mango orchard during first year (Rs ha$^{-1}$)

| S.No. | Operations | Cost incurred Rupees | % to total |
|---|---|---|---|
| A | **VARIABLE COST** | | |
| 1. | Land preparation | 158.16 | 1.59 |
| 2. | Digging the pits treating and filling the pits | 303.60 | 3.04 |
| 3. | Plant cost and transport charges | 1280.14 | 12.84 |
| 4. | Gap filling | 265.75 | 2.67 |
| 5. | Fencing (thorn bushes) | 233.34 | 2.34 |
| 6. | Manuring | 2539.84 | 25.48 |
| 7. | Fertilizer | 187.26 | 1.88 |
| 8. | Intercultivation | 119.80 | 1.20 |
| 9. | Irrigation | 783.98 | 7.86 |
| 10. | Weeding | 240.18 | 2.41 |
| 11. | Interest on variable cost | 372.39 | 3.74 |
| | Total variable cost | 6484.44 | 65.05 |
| B | **FIXED COST** | | |
| 1 | Land rent | 3000.98 | 30.11 |
| 2 | Revenue and cess | 255.26 | 2.56 |
| 3 | Interest on fixed capital | 227.50 | 2.28 |
| 4 | Total fixed cost | 3483.74 | 34.95 |
| 5 | Total cost (A+B) | 9968.18 | 100.00 |

The total cost of maintenance for bearing period was Rs.11391.51 per hectare consisting of direct and indirect costs of Rs.5541.24 (48.64%) and Rs.5850.27 (51.36%) respectively. In the direct costs major share was noticed under fertilization charges Rs.1484.18 (13.02%) followed by manure Rs.1260.11 (11.06%) watch and ward Rs.521.35 (4.58%), harvesting Rs.465.42 (4.08%), plant protection Rs. 236.57 (2.08%) and irrigation charges Rs.199.44 (1.75%) respectively. The share of rental value of land was highest with 36 per cent which stood at Rs.4100.35 per hectare.

The Table 4 showed that one hectare of mango garden yielded 8 tonnes of produce. In monetary terms, the gross and net returns were Rs.47200 and Rs.35808.49 per hectare respectively.

The investment made on mango orchard was tested for its productivity, using pay back period, the discounted methods such as benefit cost ratio, net present value and internal rate of return. The details are furnished in Tables 5 and 6.

Pay back period $P = \frac{I}{E}$

$$P = \frac{39987.31}{1872170} = 2.13 \text{ Years}$$

Where

P = Pay back period of the project in years
I = Investment of the project in rupees
E= Annual net cash revenue in rupees

Benefit cost ratio =

$$\frac{\sum_{t=1}^{n} \frac{Bt}{(1+i)^n}}{\sum_{t=1}^{n} \frac{ct}{(1+i)^n}} = \frac{152069.40}{60854.79} = 2.49$$

Net present value (NPV) $= \frac{\sum n}{t=1} = \frac{B_n - C_n}{(i+i)^n}$

Table 2. Year wise maintenance expenditure in mango orchards upto pre-bearing period (Rs.ha)

| S.No. | Particulars | Amount spent on year-wise | | | | | |
|---|---|---|---|---|---|---|---|
| | | II nd year | % to total | III nd year | % to total | IV nd year | % to total |
| 1. | Manuring | 789.03 | (13.21) | 940.10 | (13.28) | 1161.24 | (14.72) |
| 2. | Fertilizers | 420.29 | (7.03) | 598.02 | (8.45) | 957.27 | (12.14) |
| 3. | intercultivation | 158.80 | (2.65) | 216.29 | (3.05) | 239.25 | (3.03) |
| 4. | Irrication | 530.35 | (8.88) | 461.69 | (6.52) | 412.01 | (5.22) |
| 5. | Weeding | 138.40 | (2.32) | 226.50 | (3.20) | 232.68 | (2.95) |
| 6. | Fencing (thornbushed) renovation | 130.65 | (2.19) | 150.10 | (2.12) | 120.25 | (1.53) |
| 7. | Interest on variable cost Land rent | 252.59 | (4.23) | 297.76 | (4.21) | 348.94 | (4.42) |
| 8. | Land rent | 3000.78 | (50.22) | 3600.45 | (50.86) | 3800.64 | (48.19) |
| 9. | Land revenue and cess | 255.26 | (4.27) | 255.26 | (3.61) | 255.26 | (3.24) |
| 10. | Interest on fixed capital | 298.95 | (5.00) | 332.64 | (4.70) | 359.38 | (4.56) |
| | Total | 5975.10 | (100) | 7078.81 | (100) | 7886.92 | (100) |

(Figures in parentheses indicate percentage to total)

Where Bn = Benefits from each year
Cn = Cost in each year
n = Number of years
i = Discount rate

$$NPV = \frac{91214.61}{133.175} = 684.92$$

Pay-back period, benefit- cost ratio and net present value are presented in Table-5. The pay-back period for the investment made upto the fifth year in mango was worked out to be about 2.13 years. The benefit cost ration of the mango was 2.49. This is indicated that mango was most profitable crop. the net present value (NPV) for the mango was worked out to Rs.684.92. The high positive NPV indicates the soundness of the investment made in fruit orchard.

Internal rate of returns (IRR) = (Lower discount rate) + (Difference between the two discount rates)

$$X\left[\frac{\text{Present worth of the cash flow at the lower distcount rate}}{\text{Absolute difference between the present worth of the cash flow at the two discount rates.}}\right]$$

$$40+(45-40)x\frac{2017.43}{3360.90}$$

$$=40 + 5 \times 0.60 = 40+3$$

IRR = 43%

On perusal of the table 6, it can be observed that the internal rate of returns in the case of mango in tribal area was worked out to be 43 percent. These returns clearly indicated that the capital investment on mango garden in this region was worthwhile and viable.

**Financial support of ITDA (Kind and cash):**

Integrated Tribal Development Agency (ITDA) is supporting tribal people with financial assistance for growing mango garden. The financial assistance will be provided in the form of mango grafting, fertilizers and cash etc. only in the first year of establishment. The said costs (fertilizer, grafts charges ) are being deducted from financial assistance of Rs.5000 per hectare.

**Conclusion**

The strategy for development of mango gardens in tribal areas to concentrate on optimization of production per unit area, extension of area and introduction of concept of high value product as far as possible.

Table 3. Cost of production of mango (Rs ha$^{-1}$)

| S.No. | Particulars | Amount spent (Rs ha$^{-1}$) | % to total |
|---|---|---|---|
| A | **DIRECTCOST** | | |
| 1. | Manuring | 1260.11 | (11.06) |
| 2. | Fertilization | 1484.18 | (13.02) |
| | Intercultivation | 211.92 | (1.86) |
| 3. | Plant protection | 236.57 | (2.08) |
| 4. | Irrigation | 199.44 | (1.75) |
| 5. | Renovation of thorn bushes | 140.75 | (1.24) |
| 6. | (Fencing) | | |
| 7. | Harvesting | 465.42 | (4.08) |
| 8. | Transport | 176.23 | (1.55) |
| 9. | Watch and ward | 521.35 | (4.58) |
| 10. | Interest on working capital | 845.27 | (7.42) |
| | Sub-total-A | 5541.24 | (48.64) |
| B | **INDIRECT COST** | | |
| 1. | Rental value of land | 4100.35 | (36.00) |
| 2. | Revenue and cess | 255.26 | (2.24) |
| 3. | Depreciation | 228.65 | (2.00) |
| 4. | Interest on fixed capital | 374.33 | (3.29) |
| 5. | Share of establishment cost | 891.68 | (7.83) |
| | Sub-total-B | 5850.27 | (51.36) |
| | Grand total (A+B) | 11391.51 | (100) |

Table 4. Cost and returns of mango orchard (Rs ha$^{-1}$)

| S.No. | Particulars | Cost incurred rupees |
|---|---|---|
| 1. | Cost production of mango (Rs ha$^{-1}$) | 11391.51 |
| 2. | Yield (t ha$^{-1}$) | 8 |
| 3. | Returns (Rs.) | 47200 |
| 4. | Net returns (Rs.) | 35808.49 |

Table 5. Pay-back period, benefit cost ratio and net present value of the investment in mango cultivation

| S.No. | Costs (Rs) | Returns (Rs) | Net returns (Rs) | Discount factor 15% | Present value of the cost (Rs) | Present value of the benefit (Rs) |
|---|---|---|---|---|---|---|
| 1. | 9968.18 | 0 | -9968.18 | 0.869 | 8662.34 | 0 |
| 2. | 6275.10 | 0 | -6275.10 | 0.756 | 4743.98 | 0 |
| 3. | 7078.81 | 0 | -7078.81 | 0.657 | 4650.78 | 0 |
| 4. | 7886.92 | 0 | -7886.92 | 0.572 | 4511.31 | 0 |
| 5. | 8778.30 | 27500 | 18721.70 | 0.497 | 4362.81 | 13667.50 |
| 6. | 9028.55 | 36400 | 27371.45 | 0.432 | 3900.33 | 15724.80 |
| 7. | 9355.75 | 35100 | 27744.25 | 0.376 | 3517.76 | 13197.60 |
| 8. | 9668.35 | 37050 | 27381.65 | 0.327 | 3161.55 | 12115.35 |
| 9. | 9898.25 | 42750 | 32851.75 | 0.284 | 2811.10 | 12141.00 |
| 10. | 10155.25 | 41250 | 31094.75 | 0.247 | 2508.34 | 10188.75 |
| 11. | 10611.25 | 45600 | 34988.75 | 0.215 | 2281.42 | 9804.00 |
| 12-35 years | 11391.51 | 47200 | 35808.49 | 1.382 | 15743.07 | 65230.40 |

Table 6. Internal rate of returns in mango cultivation

| S.No. | Net returns | Discount factor 40% | Discounted net returns | Discount factor 45% | Discounted net returns |
|---|---|---|---|---|---|
| 1. | -9968.18 | 0.714 | -7117.28 | 0.69 | -6878.04 |
| 2. | -6275.10 | 0.510 | -3200.30 | 0.47 | -2949.29 |
| 3. | -7078.81 | 0.364 | -2576.68 | 0.33 | -2336.00 |
| 4. | -7886.92 | 0.26 | -2050.59 | 0.23 | -1813.99 |
| 5. | 18721.70 | 0.185 | 3463.51 | 0.16 | 2995.47 |
| 6. | 27371.45 | 0.133 | 3640.40 | 0.11 | 3010.85 |
| 7. | 27744.25 | 0.095 | 2445.70 | 0.07 | 1802.09 |
| 8. | 27381.65 | 0.068 | 1861.95 | 0.05 | 1369.08 |
| 9. | 32851.75 | 0.048 | 1576.88 | 0.03 | 985.55 |
| 10. | 31094.75 | 0.034 | 1057.22 | 0.02 | 621.89 |
| 11. | 34988.75 | 0.024 | 839.73 | 0.016 | 559.82 |
| 12-35 years | 35808.49 | 0.058 | 2076.89 | 0.036 | 1289.10 |

The internal rate of return obtained was higher than the prevailing market rate of interest indicating the favourable nature of returns. Simlilar trends were obtrained in the earlier studies of Jayaraman (1981), Sudha and Reddy (1990) and Chitra (1995).

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