Profitability analysis of mango cultivation in Kangra district of Himachal Pradesh

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ABSTRACT

A study was carried out to investigate profitability analysis of mango cultivation. Mango is cultivated in tropical and subtropical climatic zones which are frost free. A total of 80 mango growers were selected using multi-stage random sampling technique. Descriptive statistics and financial profitability analysis were used to analyze the data. Net present value was estimated to be Rs 5,51,274.37 which indicated that mango cultivation fetched higher returns. The estimated benefit-cost ratio was 2.02 which showed that investment was feasible for the mango farmers. Average cost of cultivation during bearing stage was increasing with age between Rs 56,873.30 and 57,861.70 per hundred plants in early and main bearing stage respectively and then gradually decreased to Rs 55,536.36 in the late bearing stage. The payback period was worked out to be 8th year of plantation and internal rate of return (IRR) was 26.06 per cent. These measures clearly indicated that mango plantation in the study area was a profitable venture.

Keywords: Mango; cost and returns; NPV; benefit-cost ratio; IRR

INTRODUCTION

Agriculture is the backbone of Indian economy. There are a number of sub-sectors in the agricultural sector such as sericulture, floriculture, horticulture etc. Among these fields, horticulture has played a dominant role in the total agricultural output throughout India. Mango is cultivated in many tropical regions and is distributed widely in the world. The ideal temperature range for mango is 24 to 30^{o}C during the growing season along with high humidity. It is cultivated on an area of 2,291 thousand hectares in India with a production of 20,444 million tonnes accounting for 40 per cent of total global mango production (Anon 2020a). Mango cultivation in Himachal Pradesh covers 42.41 thousand hectares accounting for 18.06 per cent of the total fruit area and yields 51.54 thousand metric tonnes accounting for 8.0 per cent of total fruit production (Anon 2020b). Farmers are always trying to find a way to maximise their profit and not only production. Therefore there is a need to carry out benefit-cost ratio and systematic return analysis.

METHODOLOGY

Selection of the study area

Kangra district of Himachal Pradesh was purposively selected for the present study because of its significant contribution in area and production of mango in Himachal Pradesh. Multistage random sampling technique was used to select the ultimate respondents.

At first stage, two blocks of Kangra district (Nurpur and Indora) were selected on the basis of area under mango cultivation. At the second stage, a list of the villages in the selected blocks was prepared and 8 villages from each selected block were selected.

At the third stage, a list of farmers having mango orchards in the selected villages was prepared with the help of the officials from the revenue and horticulture departments and 5 mango growers were selected from each village forming a sample of 80 farmers.

Economic viability of mango plantation

A cash flow analysis of various categories of mango orchards was done by discounted cash flow approach. Since the collection of time series data pertaining to single farm holding was difficult, the analysis of life cycle data was made based on cross-sectional information from mango plantation of different ages to approximate the entire plantation life cycle. The following discounted measures of project worth were used for hundred plants.

The bearing stage was divided into three groups viz early bearing (6-15 years), main bearing (16-35 years) and late bearing (>35 years). The total age of mango plantation was considered to be 60 years.

Payback period: Payback period is the period of time required to fully recover the initial cash outflow of the investment.

Net present value (NPV): The NPV was used to determine the present value of each investment in orchards by the discounted sum of all the cash flows received from investment as below.

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

where NPV= Net present value in period 't', B_t= Benefit from mango cultivation in each year, C_t= Cost of mango cultivation in each year, r = Discount rate, t= 1,2,3…..n, the entire life of cultivation across the study regions (comprising five years of gestation period followed by 55 years bearing years), n= Number of years

Annuity: Annuity value of the project is the annual expected income from the project. It was computed as follows:

$$A = \frac{NPV \times i \times (1+i)^t}{(1+i)^t - 1}$$

where A= Annuity value, i= Rate of interest

Benefit-cost ratio: The benefit-cost ratio of an investment is ratio of the discounted value of all cash inflows to the discounted value of all cash outflows during the life of the project and was computed as:

$$B-C\ ratio = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+r)^t}}$$

Internal rate of return (IRR): It was used to evaluate the overall feasibility of mango cultivation in the study area. The internal rate of return is that discount rate at which the NPV is zero.

RESULTS and DISCUSSION

Cost and return from mango

The cost of cultivation and production of any crop is the most important aspect of the farm economy at both the micro- and macro-levels; it serves as a guideline for the government in implementing price policies for both factors of production and produce. Table 1 reveals that in marginal farm category, total cost varied from Rs 56,373.30, 58,275.84 and 55,566.00 in early bearing stage, main bearing stage and late bearing stage respectively.

The cost of cultivation was recorded highest in case of marginal farms ie Rs 56,988.22 followed by small farmers (Rs 52,831.81) and medium farmers (Rs 52,549.84). At overall level, it was Rs 53,625.06. The total cost increase in the early and main bearing stages was calculated to be Rs 56,873.30 and 57,861.70 per hundred plants respectively and then gradually decreased to Rs 55,536.40 in the late bearing stage at the overall level.

The average gross return was highest in case of marginal farms ie Rs 1,85,507.40 followed by small farms Rs 1,81,254.40 and medium farms Rs 1,78,365.50 (Table 2). At overall level, gross return was Rs 1,77,446.70 during early bearing stage that increased to Rs 1,91,064.70 in main bearing stage that decreased to Rs 1,78,558.90 in late bearing stage. Average gross return of mango at overall level was Rs 1,82,356.80.

Feasibility of mango plantation

The economic viability of raising mango plantation was evaluated with the help of different appraisal methods viz payback period, net present value, uniform annual return, internal rate of return and benefit-cost ratio. Benefit-cost ratio was 2.06, 2.01 and 1.98 in case of marginal, small and medium farm categories respectively and at overall level it was 2.02 (Table 3). It indicates that the mango growers earned a gross income of Rs 2.02 by investing Re 1.00 per hectare of mango orchard. Similar results have been shown by Vaidya et al (1991) and Bakhsh et al (2006). At overall level, NPV was Rs 5,51,274.37 per hundred plants. Data show that the NPV of a mango orchard

Table 1. Farm category-wise average cost of cultivation from different age groups of mango trees in the sampled households

Age group (years)	Cost of cultivation of mango orchard (Rs)			
	Marginal	Small	Medium	Overall
Early bearing (6 to 15)	56,373.30	55,805.40	55,566.00	56,873.30
Main bearing (16 to 35)	58,275.84	57,532.90	57,547.20	57,861.70
Late bearing (>35)	55,566.00	54,354.70	53,303.30	55,536.40
Average	56,988.22	52,831.81	52,549.84	53,625.06

Table 2. Farm category-wise average gross return from different age groups of mango trees in the sampled households

Age group (years)	Average gross return (Rs) of mango/100 plants			
	Marginal	Small	Medium	Overall
Early bearing (6 to 15)	1,80,000.00	1,76,750.00	1,73,987.30	1,77,446.70
Main bearing (16 to 35)	1,94,958.00	1,89,235.30	1,86,666.70	1,91,064.70
Late bearing (>35)	1,81,564.30	1,77,777.80	1,74,442.70	1,78,558.90
Average	1,85,507.40	1,81,254.40	1,78,365.50	1,82,356.80

Table 3. Farm category-wise measures of investment worth per 100 trees of mango in the sampled households

Measures of investment worth	Farm category			
	Marginal	Small	Medium	Overall
Net present value (Rs)	5,69,289.40	5,45,479.48	5,27,302.46	5,51,274.37
Uniform annual return (Rs)	28,464.47	27,273.97	26,365.12	27,563.72
Internal rate of return (%)	26.64	25.97	25.38	26.06
Benefit-cost ratio	2.06	2.01	1.98	2.02
Payback period (years)	8	8	8	8

was positive and greater than zero. Therefore the mango production is an acceptable practice and feasible from financial point of view. The analysis across farm categories revealed that NPV was maximum in case of marginal farms (Rs 5,69,289.40) and minimum in case of medium farms (Rs 5,27,302.46). Uniform annual return was Rs 28,464.47 in case of marginal farm, Rs 27,273.97 in small farm and Rs 26,365.12 in case of medium farm categories respectively.

The internal rate of return estimated to be 26.06 per cent at overall level indicates the maximum paying capacity of mango plantation implying thereby that investing in the mango was financially desirable as long as the rate of interest on loan did not exceed 26 per cent. The payback period for mango plantation was estimated at 8th year for all the farm categories. The analysis showed that mango plantation was financially feasible in terms of their prices received by mango growers in the sampled area.

CONCLUSION

Maintenance cost of bearing mango per hundred plants at overall level showed an increase in cost up to main bearing stage and thereafter it started decreasing which could be due to the decrease in production leading to lesser labour requirement. Benifit-cost ratio was 2.02, internal rate of return (IRR) 26.06 per cent and net present value Rs 5,51,274.37. These measures clearly indicate that mango cultivation in the study area was a profitable venture. Processing and manufacturing plants should be installed for easy access to the farmers where the farmers could either sell their

produce at profitable rates or make juices, jams, squashes etc. This could result in more mango production and better socio-economic conditions of the farmers. Due to the perishable nature of the produce, fruit processing and cold storage units in the study area can help the orchardists in getting better prices.

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