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Economic Analysis of Cherry Cultivation in Shimla District of Himachal Pradesh

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ABSTRACT

A study aiming of working out the economics of cherry cultivation in Shimla district of Himachal Pradesh was carried out in three purposively selected tehsils i.e. Kumarsain, Nankhari, and Kotkhai, by taking a representative sample of 50 farmers. Economic worth indicators, namely Net Present Value (NPV), Internal Rate of Return (IRR), Modified Internal Rate of Return, Payback period, and Benefit cost (BC) Ratio, were estimated. Analysis of the results showed that the average cost of establishment of cherry orchards per hundred plants was ₹ 1,29,438.26 and the average maintenance costs were ₹ 44,650.19, ₹ 49,664.57 and ₹ 54,477.83 during early, main and late bearing stages, respectively. The net return was found to vary between ₹ 24,603.78, ₹ 1,65,094.40 and ₹ 99,109.13 during different bearing stages of cherry, and investment in cherry was found to be economically feasible. The payback period was 11 years, NPV varied between ₹ 4,15,661 to ₹ 8,62,528 at 6.25 to 10 percent discount rates when calculated using the present value method. The benefit-cost ratio was also found to be greater than one varying between 2.03 to 2.59; IRR was found to vary between 20 to 24 percent among different categories. The investment in cherry proved to be stable towards cost and yield variations; when there was 5 to 10 percent increase in cost and a decrease in returns, the economic measures were well in the range, overall benefit-cost ratio ranged between 1.95 to 2.60 and IRR varied between 20.24 percent to 22.24 percent in a sensitivity analysis.

HIGHLIGHTS

◎ Cherry cultivation proved to be economically feasible during all bearing stages.
◎ Investment in cherry is stable towards cost and yield variations as shown by the sensitivity analysis.

Keywords: Economic analysis, cherry, benefit cost ratio, payback period and sensitivity analysis

Production of horticultural crops has become one of the key thrust areas for the growth of the agriculture sector in India, with a record 334.60 million metric tons (MMT) in 2020-21 (DA & FW, 2022). Likewise, in Himachal Pradesh, horticulture is a predominant sector and an economic necessity with limited land for crops due to hilly terrain. But rich diversity of climatic conditions, topographical variations, and altitudinal differences provides opportunities for the cultivation of temperate to tropical fruits in the state. By realizing these opportunities, the state has emerged as the 'Horticultural State of India' with total fruit production of 624.49 thousand metric tonnes from an area of 234.78 thousand ha (DA & FW, 2022). Apple is the major horticultural crop in the state. Still, cherry, fleshy stone fruit is belonging to the genus Prunus of the family Rosaceae is also rising as an alternative fruit crop because it has many advantages compared to other competing fruit crops, such as short-production duration, less water requirement, and high value in the market (Webster, 1996). In Himachal Pradesh, it is mainly grown in the higher reaches of Shimla, Kullu, Mandi, Chamba, Kinnaur, and Lahaul & Spiti districts, at an altitude of 6,000 to 8,000 feet above mean sea level.

Global production of cherries has changed significantly over the past 30 years. As a result of various research and developmental efforts, new technologies and varieties have been replacing the old ones, and new critical inputs have been entering into the production of cherry. To restrict vegetative growth, allow high-density planting and earlier fruiting new rootstocks are introduced, and new varieties have been developed that self-pollinate to give tougher and larger fruit. In India, cherry is mainly grown in the North-Western areas of Jammu and Kashmir (J&K), Himachal Pradesh (H.P.), and Uttarakhand. It provides crop diversification which ultimately gives additional income and economic gains and has a remarkable impact on the agro-socio-economic upliftment of resource-poor farming communities by extending employment and productivity. However, it is a long-term investment with an establishment and maturity period, for which careful planning is essential to ensure economic success, and the cultivator would like to know the results of his investment by working out a detailed cost-benefit analysis of the project. However, cherry is a marginalized fruit, and there is a drought of research regarding its production and marketing. Although there are studies regarding the technical aspects of fruit production, no such study in the past has estimated the economics of cherry cultivation and its economic feasibility. Given this, a study was undertaken with particular reference to the economics of cherry cultivation in the Shimla district of Himachal Pradesh to document and analyze various important production aspects. The study's main objective was to analyze the economic feasibility of cherry cultivation and the profitability of investment in fruit farms in the study area.

The study of the cherry farming system shall help suggest possible improvements in the producing region. Besides,, a thorough understanding of the existing cherry production system will help evolve effective measures, policies, and procedures for tackling the problems of cherry orchardists.

MATERIALS AND METHODS

Purposive sampling was adopted to select the study area, i.e., Shimla district, which is the central pocket under cherry cultivation covering an area of 352 ha, i.e., 78.4 percent of the total area under cherry in the state, with a production of 591 tonnes i.e., 95 percent of the total production in Himachal Pradesh (NHB, 2020). Shimla's main cherry production belts are Rampur, Narkanda, Rohru, Kandyali, Kotgarh, and Kotkhai. From three tehsils *viz.*, Kumarsain, Nankhari, and Kotkhai, were selected for the sample based on the secondary information available. Both primary and secondary data were collected for the study. The primary data on economic parameters and cost of production were collected through personal interviews with a sample of 50 cherry growers selected through simple random sampling from those Tehsils. Secondary data were also collected from the records of the Department of Horticulture-Shimla, Himachal Pradesh, National Horticulture Board, Block Development offices of respective blocks, respective revenue offices, and Directorates of Land Records.

To analyze the data, cherry growers were divided into two classes according to the type of cherry orchards, viz., sole cherry orchards and mixed cherry orchards with apple or other fruits. 56 percent of selected growers were in sole cherry orchards, whereas 44 percent were in mixed category orchards. To meet the requirements of the study objectives, general statistical and mathematical calculation has been done for the analysis of data and to determine the cost and returns of perennial crops procedure of cost of cultivation for the orchards were adopted. Various costs and returns concepts and worth economic indicators namely NPW, Annuity, IRR, MIRR, Payback period, and Benefit-cost Ratio were used, and their measurements are given below.

Plantation cost: all costs incurred by cherry growers from the preparation of land up to the planting of plants.:

Establishment cost = Plantation cost + Cost during non-bearing stage.

Fixed cost = Land revenue + Rental value of land + Depreciation + Interest on fixed capital

Variable cost = Cost of inputs used, including labor + interest on working capital

Total cost = Fixed cost + Variable cost

Prorated **establishment cost:** The establishment cost is distributed over the bearing life (n) using amortization principle at a given interest rate. It is charged at 7.5 percent and is amortized during the bearing stage, with the following formula:

$$P = E.C. \frac{1}{\left(1 - \left(1 - t\right)^{-n}\right)}$$

Where P = Amount of annual amortized cost; $E.C.$ = Establishment cost (cost during non-bearing stage); n = number of productive life period of crop in years; i = Rate of interest.

Net Present Value: The present value of each investment in orchards by the discounted sum of all the cash flows received from the investment.

$$NPV = -C_o + \sum_{t=1}^{n} \frac{C_i}{\left(1 + r\right)^t}$$

Where, C_o = Initial investment; C = Cash flow; r = Discount rate; t = 1, 2, 3.... n, the entire life of plantation across the study regions (comprising four years of gestation period followed by thirty bearing years); n = number of years

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

$$PBP = \frac{C_o}{\text{Cash-in-flow per Period}}$$

$$\text{or } PBP = n_n + \frac{C_a}{C_b}$$

Where, n_n = The last period with a negative cumulative cash flow; C_a = Absolute value of cumulative cash flow at the end of the period n_n; C_b = Cash flow during the period after n_n

Annuity (A) : The expected annual income from the cherry orchard:

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

Internal rate of return (IRR): IRR represents the level of discount rate that equates the present value of the future cash flows of an investment with the initial investment that generated the cash flows.

$$NPV = -C_o \sum_{i=1}^{t} C_i / \left(1 + r\right)^i = 0$$

$$C_o = \sum_{i=1}^{t} \frac{C_i}{\left(1 + r\right)^t}$$

Modified Internal rate of return (MIRR): In literature, the Modified Internal rate of return (MIRR) method of capital budgeting has been suggested to address the problems arising out of reinvestment assumption. When scale or period differences exist, the MIRR method may still rank mutually exclusive projects that are different from NPV.

$$MIRR = \sqrt[n]{\frac{FV \, (Positive \, Cash \, Flows)}{-PV \, (Negative \, Cash \, Flows)}} - 1$$

where n is a number of equal periods at the end of which the cash flows occur (not the number of cash flows), PV is the present value (at the beginning of first period), FV is future value (at the end of the last period).

Benefit-Cost ratio

$$B{:}C \, ratio = \frac{\sum_{t=0}^{n} B_t / \left(1 + r\right)^t}{\sum_{t=0}^{n} C_t / \left(1 + r\right)^t}$$

Sensitivity analysis

The rate of return from investment is likely to change in value with its change in basic parameters, such as yield, price of input and output, and demand estimates. It is quite possible that when the area under the cherry plantation is increased, the supply of the final product also increases. This will harm the prices of the final product and the income of producers. Therefore, it is essential to examine the sensitivity of thebenefit-cost ratio to notice the repercussions on the economic feasibility of the investments due to changes in the prices, yield, and demand conditions. Therefore, sensitivity analysis of cherry has been carried out under two assumed situations:

(a) Cash outflows of cherry increased by 5 percent and 10 percent with constant returns

(b) Returns decreased by 5 percent and 10 percent with ongoing cost.

RESULTS AND DISCUSSION

The establishment of a cherry orchard is a long-run investment with a life expectancy of 30 years, so it is important to establish an orchard well-planned activity. Keeping in view this point, analysis of

the economics of cherry production was classified into five groups according to the age of the cherry plant, viz. zero years of plantation, non-bearing (1-4 years), early bearing (5-12 years), main bearing (13-22 years) and late bearing (>22 years) plantation. In the present study, out of the total number of cherry plants, on average, 20.27 percent of plants were in the non-bearing stage, 25.10 percent were in the early bearing stage, 48.93 percent were in the main bearing stage, and the proportion of late-bearing plants was higher on isolated farms (9.62 percent) compared to the mixed farms (2.98 percent). Cost and returns per hundred plants were estimated and have all been discussed about the cost structure, output, and return from the cherry grown in the study area. It is divided into two parts: establishment cost, including the cost of plantation and maintenance during non-bearing stage, and maintenance cost, comprising expenses incurred during a bearing stage.

Establishment cost

Establishment cost is the total costs incurred during the initial investment and non-bearing stage i.e. 2nd Year to 5th year (Galinato *et al*. 2009). The establishment cost of non-bearing cherry orchard per 100 plants (Table 2) in the sampled farms was found ₹ 1,29,438.26 on an overall level and varied between ₹ 1,30,213.40 to ₹ 1,28,451.50 on sole and mixed farms, from which plantation cost was 21.96 percent. Variable and fixed costs contributed 77.27 percent and 22.73 percent, respectively, and the average cost of maintenance of the cherry plants was 78.04 percent. Average maintenance cost per hundred plants per year during non-bearing stage for cherry cultivation was estimated to be ₹ 25,253.95, of which labor investment was around 28.09 percent, and material inputs cost averaged about 35 percent of the total cost (Table 1).

Table 1: Component wise establishment cost of non-bearing cherry orchard (₹/100 plants)

Particulars	Plantation cost	Maintenance cost during non bearing stage
Material Cost	8701.40	8864.51
	(30.59)	(35.09)
Hired labour cost	7162.60	5657.77
	(25.20)	(22.41)
Family labour cost	2142.03	1433.62

	(7.53)	(5.68)
Interest on working capital @ 5%	793.20	726.11
	(2.79)	(2.87)
Risk Margin @ 10%	1586.40	72.61
	(5.58)	(0.29)
Managerial cost @ 10%	1586.40	72.61
	(5.58)	(0.29)
Total Variable Cost	21972.03	16827.23
	(77.27)	(66.63)
Land revenue	11.36	11.36
	(0.04)	(0.04)
Depreciation	1550.68	1650.68
	(5.48)	(6.54)
Interest on Fixed capital @ 6.5%	748.28	848.28
	(2.64)	(3.36)
Interest on past establishment cost @ 6.25%	—	1776.40
	—	(7.03)
Rental value of land	4140.00	4140.00
	(14.57)	(16.39)
Total fixed cost	6450.32	8426.72
	(22.73)	(33.37)
Total cost	28422.35	25253.95
	(100.00)	(100.00)

Figures in parentheses are percentage to total cost.

The average of maintenance cost of sole and mixed farms was almost the same in which the variable cost was 66.63 percent, and the fixed cost was 33.37 percent (Table 2).

Table 2: Establishment cost of non-bearing cherry orchard in sampled farms (₹/100 plants)

Sl. No.	Costs	Sole orchard	Mixed orchard	Overall
1.	**Plantation cost**	28848.16	27880.4 1	28422.35
		(22.15)	(21.71)	(21.96)
	Total Variable Cost	22766.79	20960.51	21972.03
		(78.92)	(75.18)	(77.27)
	Total fixed cost	6081.36	6919.91	6450.32
		(21.08)	(24.82)	(22.73)
2.	**Maintenance cost**	101365.27	100571.05	101015.81
		(77.85)	(78.29)	(78.04)
	Total Variable Cost	17256.94	16280.33	16827.23
		(68.10)	(64.75)	(66.63)
	Total fixed cost	8084.37	8862.43	8426.72
		(31.09)	(35.25)	(33.37)
3.	**Total establishment cost**	130213.40	128451.50	129438.26
		(100.00)	(100.00)	(100.00)

Figures in parentheses are percentage to total corresponding cost.

Plantation cost is an investment that takes time to pay off till total production i.e., the fifth year. Average plantation cost incurred per hundred plants was ₹ 28,422.35, which varied from ₹ 27,880.41 to ₹ 28,848.16 on isolated and mixed farms. Labor and material costs were the main constituents of variable cost, and their share ranged between 32.73 to 30.59 percent of the total cost, respectively (Table 1). Various research studies also determined similar plantation costs, such as establishment costs at $466,706 per 25 acres for the first year (Rattray, 2014) and the total production cost for a 6-year-old sweet cherry block at $11,824 per acre with a total useful life of 25 years (Galinato *et al.* 2009).

Maintenance costs during different bearing stages of cherry plantations

The establishment cost has been spread over 30 years of bearing life on a prorated basis using an interest rate of 7.5 percent. Table 3 shows the total maintenance cost per hundred plants at different bearing stages, which varies between ₹ 44650.19 to ₹ 54,477.83. In the sole category, it varies from ₹ 45,047.07 to ₹ 54,857.92, and in the mixed category, it varies from ₹ 44,145.06 to ₹ 53,994.08. There is a positive relationship between total cost and increasing age groups of fruit plantations. The share of variable costs in the total cost of maintenance also showed an increasing trend. This may be

Table 3: Maintenance cost during early, main and late bearing stages of cherry plantation (₹/100 plants)

Costs	Early bearing (5-12 years)			Main bearing (13-22 years)			Late bearing (>22 years)		
	Sole orchard	Mixed orchard	Overall	Sole orchard	Mixed orchard	Overall	Sole orchard	Mixed orchard	Overall
Variable	27679.03	26087.66	26978.83	33157.52	31193.17	32293.20	36789.88	35236.68	36106.47
Cost	(61.44)	(59.10)	(60.42)	(65.75)	(63.46)	(64.76)	(67.06)	(65.26)	(66.28)
Fixed	17368.04	18057.40	17671.36	17268.04	17957.40	17571.36	18068.04	18757.40	18371.36
Cost	(38.56)	(40.90)	(39.58)	(34.24)	(36.54)	(35.24)	(32.94)	(34.74)	(33.72)
Total	45047.07	44145.06	44650.19	50425.56	49150.57	49664.56	54857.92	53994.08	54,477.83
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Figures in parentheses are percentage to total cost.

Table 4: Component wise operational expenditure during early, main and late bearing stages of cherry cultivation (₹/100 plants)

Particulars	Early bearing	Main bearing	Late bearing
Material Cost			
Manure/FYM/Compost	3911.61 (8.76)	7450.21 (14.94)	7550.99 (13.86)
Fertilizing	4631.60 (10.37)	5006.99 (10.04)	5394.13 (9.90)
Plant protection chemical	3208.16 (7.19)	3355.22 (6.73)	3680.00 (6.76)
Family labour cost	2603.95 (5.83)	2083.39 (4.18)	3735.67 (6.86)
Hired labour cost	7748.54 (17.35)	8355.44 (16.76)	9271.53 (17.02)
Total Working capital	19499.90 (43.67)	24167.85 (48.47)	25896.64 (47.54)
Interest on working capital@ 5%	974.99 (2.18)	1208.39 (2.42)	1294.83 (2.38)
Risk Margin@ 10%	1949.99 (4.37)	2416.79 (4.85)	2589.66 (4.75)
Managerial cost@ 10%	1949.99 (4.37)	2416.79 (4.85)	2589.66 (4.75)
Total Variable Cost	26978.83 (60.42)	32293.20 (64.76)	36106.47 (66.28)
Land revenue	11.36 (0.03)	11.36 (0.02)	11.36 (0.02)
Depreciation	1950.68 (4.37)	1600.68 (3.21)	1550.68 (2.85)
Interest on Fixed capital@ 6.5%	648.28 (1.45)	1748.28 (3.51)	1748.28 (3.21)
Rental value of land	4140.00 (9.27)	4140.00 (8.30)	4140.00 (7.60)
Pro-rated establishment cost@ 7.5%	10921.04 (24.46)	10921.04 (21.90)	10921.04 (20.05)
Total fixed cost	17671.36 (39.58)	17571.36 (35.24)	18371.36 (33.72)
Total cost	44650.19 (100.00)	49864.57 (100.00)	54477.83 (100.00)

Figures in parentheses are percentage to total cost.

attributed to the decline in production, resulting in lesser employment of labor for various horticultural operations. It was revealed that variable costs per hundred plants constitute 60.42 percent, 64.76 percent, and 66.28 percent of the total costs during the early, main, and late bearing stages of plants, and a similar share of variable costs in different studies were examined; 65.44 percent, 63.73 percent and 62.24 percent (Seufert *et al.* 2012; Aydın *et al.* 2016; Litskas *et al.* 2011). The major portion of total variable costs was on inputs like farm yard manure, fertilizers, and plant protection material, followed by labor in all the bearing stages (Table 4). Overall the material cost decreased as the age of the plant's increased and moved towards the late bearing stage. The input usage increased initially and contributed 32.03 percent of the total cost in the main bearing stage and decreased at the late bearing stage with a proportion 29.51 of the total cost. Similar trends were shown by variable cost, but the labor cost decreases overall during the plant's growth at the main bearing stage and again increases at late bearing stage. Total fixed cost showed an increasing trend upto the age of 22 years old and then started declining.

Returns analysis using the amortization method

The returns from cherry orchards start from the fifth year of plantation and continue beyond 25 years of economic returns up to 30 years. The amortization cost over 26 years at the interest rate of 7.50 percent was ₹ 10,837.49 and ₹ 10,986.68, respectively, for sole and mixed category farms (Table 5). Overall, average gross returns per hundred cherry plants amounted to vary between ₹ 80,000 and ₹ 2,25,680 per year. The net returns per year were ₹ 80,000 to ₹ 2,25,680 and ₹ 1,64,508 during the early, primary, and late bearing stages, respectively, of cherry orchards in an overall category. The measures of investment worth of cherry orchards have been calculated by the amortization method since the net present value (NPV), and benefit-cost (B-C) ratio are functions of the discount rate; these measures were estimated at 7.25 percent discount rates. Cherry cultivation was economically feasible during all the stages of production as the BC ratio was greater than 1 and varied between 1.44 to 3.72 during the early and main bearing stages in the overall category. The net present value was found ₹ 1,44,111.79, ₹ 11,33,221.32, and ₹ 5,80,512.28

Table 5: Average costs and return per hundred plants and economic feasibility of cherry cultivation (Amortization method)

Particulars	Sole orchard				Mixed orchard				Overall			
	EB	MB	LB	Total	EB	MB	LB	Total	EB	MB	LB	Total
Average establishment cost	10986.68	10986.68	10986.68	10986.68	10837.49	10837.49	10837.49	10837.49	10921.04	10921.04	10921.04	10921.04
Average maintenance cost	44872.07	50225.56	54857.92	50003.68	43970.06	48950.57	53994.08	48969.95	44475.19	49664.57	54477.83	49548.84
Total cost	55858.75	61212.24	65844.60	60990.36	54807.55	59788.06	64831.57	59807.45	55396.22	60585.60	65398.87	60469.88
Average gross return	88800.00	249000.00	186200.00	158387.10	68800.00	196000.00	136900.00	122258.06	80000.00	225680.00	164508.00	142490.30
Net returns	32941.25	187787.76	120355.40	97396.74	13992.45	136211.94	72068.43	62450.62	24603.78	165094.40	99109.13	82020.45
BC ratio	1.59	4.07	2.83	2.60	1.26	3.28	2.11	2.04	1.44	3.72	2.51	2.35
NPV	192946.91	1288990.40	704958.12	1100533.0	81958.01	934969.77	422126.66	705659.81	144111.79	1133221.3	580512.28	926788.80

Table 6: Per farm maintenance cost and returns at different bearing stages on sampled households (₹/farm)

Farm Categories	Average total cost				Gross return				Net return			
	EB	MB	LB	Total	EB	MB	LB	Total	EB	MB	LB	Total
Sole orchard	31410.45	101957.89	20846.01	154214.35	62270	504580	70539	637389	30859	402623	49692	483174
Mixed orchard	32098.14	48950.57	4859.47	85908.18	50156	196356	11486	257998	18057	147405	6626	172088
Overall	31713.03	78634.67	13811.93	124159.63	57077	355581	40976	453634	25363	276946	27164	329473

during early, main, and late bearing, respectively, on the overall category.

Per farm cost and returns of cherry cultivation on sampled households

Per farm cost of cherry at different bearing stages of the plant was worked out and presented in Table 6. Results showed that total farm costs varied between ₹ 1,54,214.35 and ₹ 85,908.18 among sole and mixed farms. Gross and net farm returns were found to be more in mixed orchards. Net return ranged between ₹ 1,72,088 and ₹ 4,83,174 in mixed and sole category farms; however, overall at different bearing stages, it varies between ₹ 25,363 to ₹ 2,76,946 per farm.

Economic feasibility of cherry cultivation using present value method

The feasibility of cherry farms was also examined through the present value method. The criteria of net present value (NPV), cost-benefit ratio (BCR), and internal rate of return was used for investment analysis at four discount rates (6.25 percent, 7.50 percent, 9.00 percent, and 10.00 percent), and results are presented in Table 7. The payback period in cherry was found to be 11 years in the present

study which is parallel to other studies showing the discounted payback period ranging from 4.80 to 7.20 years depending on the costs included in the calculation (Galinato and Gallardo, 2015) and 8 to 15 years for a high-density orchard and standard-density orchard (Seavert and Long, 2004). The constant annual return value was positive at all the discount rates taken into consideration which are similar to other studies; (Akcay and Uzunoz, 2005; Rattray, 2014). Net present value at 6.25, 7.50, 9.00, and 10.00 percent discount rates varied from ₹ 4,15,661.00 to ₹ 8,62,528.00 per hundred plants at the overall level, and the benefit-cost ratio at different discount rates varies from 2.03 to 2.59; various studies by Akcay and Uzunoz in 2005 and 2006 also found BC ratio greater than one in cherry production. The internal rate of return estimated to be 22.24 percent is the maximum paying capacity of the cherry plantation, which was shown between 12.30, 45.31, and 47.13 percent in various other studies (Rattray, 2014; Akcay and Uzunoz, 2005; and Akcay and Uzunoz, 2006 respectively). These measures indicate the economic feasibility of cherry cultivation at all the discount rates in the study area (Fig. 1).

Table 7: Measures of investment worth per hundred plants of cherry cultivation (Present value method)

| Measures of investment worth		Sole orchard	Mixed orchard	Overall
Net present value (₹)				
	6.25%	1018260	664323	862528
	7.50%	804557	514702	677020
	9.00%	607194	376822	505830
	10.00%	503134	304331	415661
Benefit-cost ratio				
	6.25%	2.70	2.45	2.59
	7.50%	2.55	2.01	2.31
	9.00%	2.36	1.86	2.14
	10.00%	2.24	1.76	2.03
Internal rate of return (%)		24.00	20.00	22.24
Modified internal rate of return (%)		15.00	14.00	14.61
Uniform annual return (₹)				
	6.25%	86552.10	56467.50	73314.90
	7.50%	68387.30	43749.60	57546.70
	9.00%	51611.50	32029.80	42995.50
	10.00%	42766.40	25868.20	35331.20
Payback period		11	12	11.44
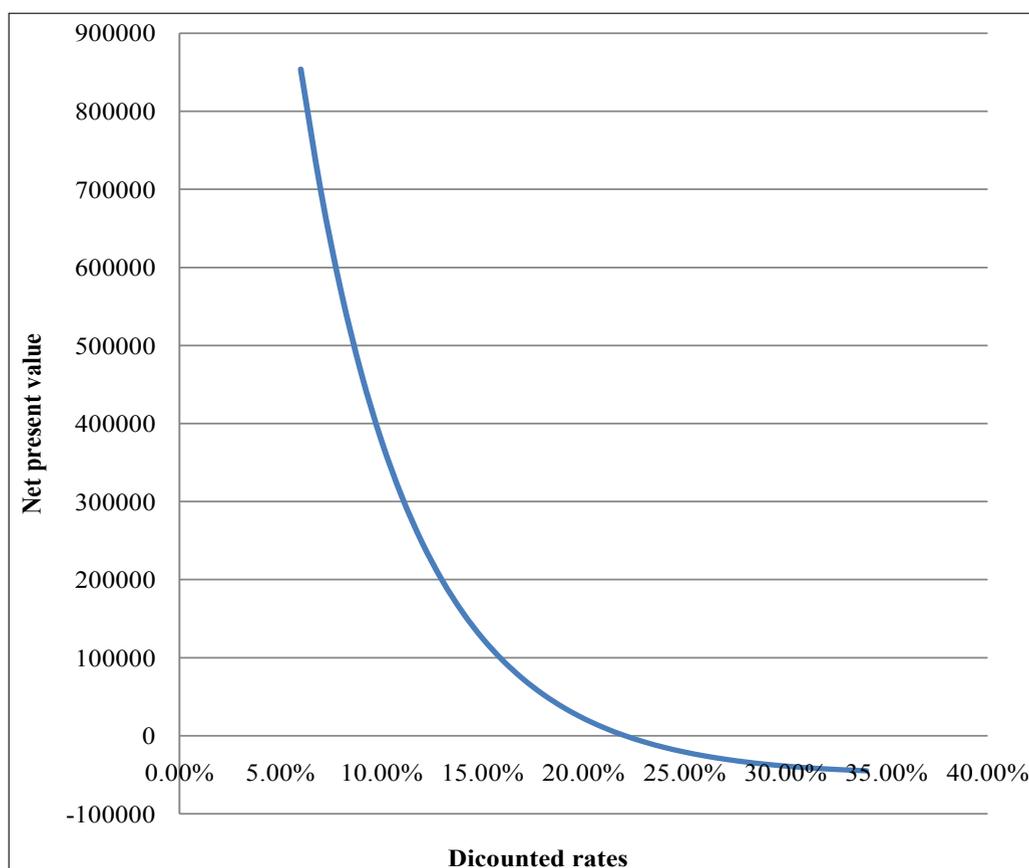
Fig. 1: NPV from cherry at different discount rates

Table 8: Sensitivity analysis per 100 plants of cherry in case of overall orchard

Particulars		Increase in cost		Decrease in return	
		5%	**10%**	**5%**	**10%**
NPV at discount rate of (₹)					
	6.25%	832909.27	803290.71	851814.63	779069.7
	7.50%	651231.44	625442.4	670267.51	610627.4
	9.00%	483689.37	461548.79	502554.82	455122.7
BCR at discount rate of					
	6.25%	2.34	2.23	2.60	2.46
	7.50%	2.20	2.10	2.44	2.31
	9.00%	2.04	1.95	2.26	2.14
Internal rate of return (%)		21.24	20.24	22.24	21.24

Sensitivity analysis

The results of sensitivity analysis of cherry plantation in the case of different farm categories are presented in Table 8. The analysis showed that an increase of 5 to 10 percent in cost does not make the cultivation uneconomic as economic measures are well in the range with a slight change in their magnitudes. Similarly, a 5 to 10 percent decrease in returns also does not affect the economic feasibility. Overall benefit-cost ratio ranged between 1.95 to 2.60 and IRR between 20.24 to 22.24 percent. Hence investment in cherry proves to be stable to cost and yield variations. Rattray (2014) revealed in his study that even with a 60 percent increase or decrease in the price or yield of sweet cherries, the investment still resulted in a positive net present value.

CONCLUSION

Cherry, a marginalized fruit, is attaining popularity as an alternative fruit crop in North-Western states of India because of its advantages such as short-production duration, less water requirement, high value in the market, crop diversification, and additional income and employment. It is, however, a long-term investment with a long establishment and maturity period, which require careful planning to ensure economic success. In this regard, a study was undertaken with particular reference to the economics of cherry cultivation in the Shimla district of Himachal Pradesh to analyze the economic feasibility of cherry cultivation and the profitability of investment in a fruit farm in the study area. It can be concluded that cherry cultivation is economically feasible during all the stages of production as the BC ratio was greater than 1 and varied between 1.44 to 3.72 during the early and main bearing stages of the overall category. The sensitivity analysis of cherry plantation also indicated that investment in cherry is stable towards cost and yield variations; 5 to 10 percent increase in cost and decrease in returns does not make the cultivation uneconomic as economic measures are well in the range; overall benefits cost ratio ranged between 1.95 to 2.60 and IRR between 20.24 percent to 22.24 percent. Hence cherry production has proved to be a highly remunerative farm activity.

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462