Economic Tools for Evaluating Grape Business

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ABSTRACT

The capital investment and land-use pattern in Indian agriculture has traditionally promoted cereal-based cropping systems. However, diversification towards more productive and profitable crops like grape and other higher returns crops has become the new milestone to be achieved in Indian agriculture. A shift in area towards horticulture crops as a more viable and attractive alternative is a part of such diversification drive. In the present study production and financial feasibility of grape cultivation was done using primary data collected pertaining to Vijayapur district of Karnataka. The results of study revealed an annual establishment cost of ₹ 1,59,889/ ha with a net returns of ₹ 3,43,987/ ha. The financial feasibility analysis revealed that the investment in grape orchards can be recovered within five years. The net present values (NPV) were positive and high indicating worthiness of investment in grape business. The estimated B.C. ratio (1.42) was also revealed the profitableness of grape enterprise. The internal rate of return (IRR) was found to be (34.10%) found to be much higher than the cost of capital (12.50%), indicating grape cultivation as a highly profitable enterprise.

Keywords: Investment pattern, cost, returns, financial feasibility

The capital investment and land-use pattern in Indian agriculture has traditionally promoted cereal-based cropping systems. However, diversification towards more productive and remunerative horticultural crops like grape has become the new milestone to be achieved in Indian agriculture. A shift in horticultural crops as a more viable and attractive alternative is a part of such diversification drive and strategy. Market liberalization and globalization are major driving factors for transformation in agriculture and agri-food markets. Food basket is changing towards high-value food products like fruits, vegetables and other horticultural crops in general and their derivatives in particular. Growing demand for high-value food commodities is opening up opportunities for farmers, especially marginal and smallholders to diversify towards strong potential for higher returns to land, labour and capital (Pratap *et al*. 2007). Many policy makers, trade analysts and development specialists today realise the potential that grape has in generating employment and earning foreign exchange for the country. Grape is an important high value commercial fruit crops, whose cultivation has been one among the most remunerative farm business venture. In Karnataka, particularly the northern districts allocating more area towards cultivation of grape.

Grape is grown for many purposes, *viz*., preparation of raisin, wine making besides using as table purpose fruit in the state and many parts of the country. Grape cultivation is believed to have originated near Caspian Sea; however, Indians know grapes since Roman times. As regards to utilisation pattern of grape, approximately (71%) of grape production is used for wine, (27%) as fresh fruit, and only about two per cent as dried fruit in the World. However, in India, (90%) of the grape is used for table purpose, even though wine making has made strides. The rest of the grape is used mostly for raisin (NHB-2017).

Grape exports from India started in the year 1991 with the initiation of economic liberalisation. The export of grapes during the year 2016-17 was of the order of about 187523.66 MT, valued at ₹ 167290.36

lakhs. The major importers of Indian grapes are UK, Netherlands, Germany, USA, UAE, Saudi Arabia, Qatar, Oman, Bahrain, Sri Lanka, Bangladesh, Mauritius, Singapore and Hongkong. Of the total exports, (90%) goes to the Middle East, eight per cent to the European Union and the rest to South East Asian countries. Though the harvesting season of grape in India starts from January and extends to October, the export season of grapes spans from January to April. During this period, South Africa and Israel are the main competitors (DGCIS annual report 2016).

Karnataka is in forefront in horticulture production and considered to be the most important state of the country and the first in country to have a separate horticulture division and achieve remarkable progress in many fronts of horticulture. Karnataka leads in the production of grapes, bananas, citrus, oranges, tomato and onions in the country. Grape has assumed an important position as commercial crop in Karnataka. The annual production of fresh grapes in Karnataka during the year 2016-17 was to the tune of 317.60 thousand tonnes from an area of 174000ha. Although the cultivation is mainly concentrated in the three districts of Vijayapur, Bagalkote and Belgaum, a large number of farmers in the neighbouring districts like Gadag, Dharwad and part of Kalburgi are switching over to grape cultivation. In fact, grape cultivation is chiefly confined to Deccan plateau in northern Karnataka because of the congenial agro-climatic conditions of the region. Therefore, the economic analysis of grape cultivation assumes importance to know the viability of investment in grape cultivation. The present study is an attempt to examine the investment pattern, cost structure, production, returns and financial feasibility in the cultivation of grapes in the state of Karnataka.

MATERIALS AND METHODS

The study was conducted in Vijayapur taluk of Vijayapur district of Karnataka. The selection of district and taluka was based on the highest area under grape cultivation. The stratified multistage random sampling procedure was adopted for the selection of district, taluka, villages and owners of grape orchards. Vijayapur district is known for grape cultivation accounting for over (58%) of the total area in the state. Grapes are cultivated in all

the five taluks of Vijayapur district. Vijayapur taluk (3810 ha) accounted for over (86%) of the district's area and was selected for the study. In the next stage, five villages were selected for the study for the purpose of selecting owners of grape orchards. In final stage a sample of 60 grape cultivators from these selected grape growing villages. The data on various investment and maintenance cost, marketing aspects such as, packing and transportation costs, etc. were collected from the respondents using a well structured schedule. The data were analysed using averages, ratios and percentages and financial feasibility tests.

Economic Life of Grape Orchards and Production Stages

The economic life of grape orchards in Vijayapur district of Karnataka is presented in Table 1. The results presented in the table reveals that the economic life of grape orchard lying the range of 20-25 years. Based on method of cultivation adopted and magnitude of production, the following four classifications were made for grape orchards. The similar results were reported by (Shah 2007).

Table 1: Economic Life of Grape Orchards

Sl. No	Economic age of orchard	Production stages
1	1 to 2 year	Gestation period [Non-bearing stage]
2	3 to 10 year	Increasing production stage
3	11 to 14 year	Stable production stage
4	15 and above year	Declining production stage

For the grape orchards which are perennial, the prorated establishment costs were computed using the method outlined by Erich A. Helfert (1983). In this sequel, both implicit and explicit costs were computed through compounding and discounting of initial investment. Amortized cost of establishment is the proportion of the total cost of establishment of grape orchards incurred in two years period to be included while estimating the cost of cultivation of every year. The item is included under fixed cost component while working out the cost estimates. The below mentioned formula used by (Sripadmini 2001), (Shamsundar 1996), (Chaitra 2002), (Rajendra 2003) was employed to estimate the amortized cost of establishment of grape orchards in the present study:

Amortized cost of establishment of grape =

$$TEC * \left\{ \frac{(1+i) AL * Xi}{(I+I) AL - 1} \right\}$$

Where,

TEC = Total net establishment cost during first 2 years.

AL = Average life of grape orchards which is taken as 25 years.

i = Discount or Interest rate of three per cent is taken in the present study.

In the case of grape orchards, the first two years which is required for the orchards to reach the economic bearing stage was considered as an establishment period. The investments made and the various costs incurred during this period put together compounded at the rate of (3%) and considered as the total establishment cost. This includes the rental value of the land, land revenue, depreciation of the fixed assets, labour, seedlings and other input costs and the costs of preparatory operations on land for planting the seedlings in establishing the orchards.

Project appraisal for grape orchards has also been attempted in this study through estimation of benefit-cost ratio (BCR), net present value (NPV), internal rate of returns (IRR) and payback period. The estimation techniques of BCR, NPV, IRR and payback period have been delineated as follows:

$$BCR = \sum_{t=1}^{n} \left(\frac{Bt}{(1+r)t} \right) / \sum_{t=1}^{n} \left(\frac{Ct}{(1+r)t} \right)$$

$$NPV = \sum_{t=0}^{n} \left(\frac{Bt - ct}{(1+r)t} \right)$$

Payback Period =

$$\frac{\text{Discounted total cost of the project}}{\text{Annual increase in income (Mean discounted benefit)}}$$

Where,

Bt = Benefit in year t,

Ct = Cost in year t,

t = 1,2,3,4, ….,n,

n = Project life in years,

$$IRR = \begin{array}{c} \text{Lower} \\ \text{discount} \\ \text{rate} \end{array} + \begin{array}{c} \text{Difference} \\ \text{between two} \\ \text{discount rate} \end{array}$$

$$\left[\frac{\text{NPV at lower discount rate}}{\text{Absolute sum of NPV's at two discount rate}} \right]$$

Internal Rate of Return is that discount rate which equates discounted benefits with discounted costs or at which NPV of the project becomes zero. The IRR should be more than the opportunity cost of capital. (Jerry A. Viscione, 1977). In this study, benefits and costs are discounted at (12%) annual rate of interest.

RESULTS AND DISCUSSION

The demand for high-value food commodities is more responsive to income changes. Expenditure elasticity for high-value food products ranged from 0.80 to 1.04, and was much higher than for any other food item (Ravi and Roy, 2006). Thus, as income increases consumers spend relatively more on high-value foods. The unfolding scenario since the early 1980s showed the area and the production of grapes to grow rapidly in all the grape growing districts of Karnataka. Not only did the acreage under grapes and the production quantum increased significantly in all the grape growing districts but the productivity of grape was also seen to increase in the state. The similar results were noticed in neighboring state of Maharashtra (Shah, 1998). Adoption of various technological measures such as increased use of drip irrigation, use of improved varieties of seeds, etc.

Perhaps the major cause of grapes to show rapid increase in acreage as well as production stems from the fact that the element of profit involved in the cultivation of grape is very high compared to other field or perennial crops. The higher amount of profit has led many farmers to undertake grape cultivation, particularly in Vijayapur and Bagalkote districts. This undoubtedly makes it necessary to look into the details of investment pattern, costs and returns structure in grape cultivation.

Socio-Economic Characteristics of Sample Cultivators

The the results on the socio- economic characteristics of the cultivators like age, family size, education, occupation, size of the holdings, including area

under grape cultivation, grape variety and plant population are presented in Table 2. The age of the respondents is one of the important factors that influence the grape production in terms of adoption of new innovations and technology. It is generally believed that respondents in older age groups hardly take up new innovations and are normally late adopters. Majority of the sample respondents were in the middle age 36 years (Table 2). The education is a very vital tool that influence to succeed in grape production. Education is important because it is used to mitigate most of the challenges faced in production and other farm activities.

The knowledge that is attained through education helps to open doors for lot of opportunities for better farm practice and adoption of new technology for better grape production. Out of sixty households, the highest (25 members) proportion of respondents completed their education upto College level followed by High School (12), Primary School (8) but still 15 respondents were Illiterate. While, the results on occupation pattern of respondents, majority of households had agriculture as their main occupation which contributes about (90%) of total households (54 households) and for remaining (10%) of households agriculture was subsidiary occupation (6 households). The family size is another important decisive factor that indicates the availability of family labour and the capacity to save and re-invest in grape production. Being grape cultivation is labour intensive and do also require high investment. Hence, family economic status and family size play a significant role in grape cultivation. In the present study, the average family size was about four members in a family.

The abundant availability of owned work force throughout the year reduces the requirement of hired labour on one hand and on the other hand reduction of burden of the share of external inputs and in turn reduces the risk of non availability of labour by means of sufficient supply of family labour force on time. The land holding pattern of households revealed that, the average size of land holding was 5.30 hectares of which 2.80 hectare was dry land and 2.50 hectare was under irrigated land. While, the area under grape cultivation was 2.16 hectare with the total plant population was 4464 plants/hectare and Thomason seedless was the major commercial, table purpose grape cultivated variety in the study area.

Table 2: Socio-Economic Characteristics of Sample Cultivators

Sl. No	Particulars	Units	Sample size n=60
1	Age	Years	36
2	Education		
a	Literate	No.	15
b	Primary	No.	8
a	High school	No.	12
b	College	No.	25
	Total	**No.**	**60**
3	Occupation		
a	Agriculture as Main occupation	No.	54
b	Agriculture as Subsidiary occupation	No.	6
4	Family size	No	4
5	Land holdings		
a	Irrigated	hectares	2.5
b	Dry land	hectares	2.8
	Average	hectares	5.30
6	Area under grapes	hectares	2.16
7	Grape varieties		Thomason seedless
8	Plant population	plants/ha	4464

Pattern of Initial Establishment Costs for Grape Production until its Start Fruiting

The cost of establishment of grape orchard up to the economic bearing period is broadly divided into initial establishment cost and maintenance cost. The initial establishment cost included costs incurred during the gestation period including the costs incurred in orchard maintenance till the time of economic bearing of orchards. During establishment period, grape orchard investment consisted of expenditure towards fencing, creation of irrigation structures like bore well or open well, pump set, electric connection, pump house, plant material, digging of pits, stone pillars, different types of trellis wire and sprayer, etc. These costs during the gestation period are apportioned for calculation of cost of cultivation during the period of the orchard. During this period of next two years cultivators need to meet maintenance expenditure on chemical fertilizers, manures, irrigation, etc. The costs incurred by the cultivators on all these items for the two years are grouped together as

cost of maintenance cost. The details on initial establishment costs pattern in grape cultivation was analyzed and results are presented in Table 3. The results revealed that initial establishment costs on pump set and bore well/open well costs (₹ 81837/ha) together contributed (21%) of total material cost. The next important item of investment cost was fencing expenses which accounted for ₹ 25423.25 (6%) followed by stone pillars, to the tune of ₹ 24014.40 (6.21%), expenditure on angles were ₹ 24512.08 which contributed to (6.33%) of total material cost and cost on drip irrigation to the tune of ₹ 19456.78 which accounted (5.03%)

of total material costs. All these items together contributed to (55%) of total initial investment costs. The other major investment costs on different types of trellis wire which constituted for about ten per cent of total material cost (₹ 39151.05), followed by cuttings, electric connection, manures, fertilizers, digging of pits and bamboo sticks all together accounted for 16.24 per cent of total material costs. The remaining items of costs like expenditure on pump house, sprayer, nuts & bolts and labours wages together accounted for 8.33 per cent. These results were in conformity with the results reported

Table 3: Investment Pattern of Grapes in Vijayapur Districts of Karnataka (₹/ha)

Sl. No.	Particulars	Unit	Qty.	Value	%
I	**Material and bore well cost**				
1	Bore well			29478.12	7.62
2	Pump set			52359.12	13.53
3	Pump house			5123.94	1.32
4	Sprayer			5007.64	1.29
5	Drip irrigation system			19456.78	5.03
6	Electric connection			10456.56	2.70
7	Fencing			25423.25	6.57
8	Preparatory tillage	Pair hrs	338	2575.00	0.67
9	Manures	Tonnes/ha	10	8600.00	2.22
10	Fertilizers	Kg/ha	620	8680.00	2.24
11	Pit marking	Man hrs	96	876.73	0.23
12	Digging of pits	Machine hrs	12	9037.40	2.34
13	Filling Pits With FYM & Fertilizers	Man hrs	494	7284.20	1.88
14	Cuttings	No/ha	4464	14553.00	3.76
15	Planting of cuttings	Man hrs	237	2964.00	0.77
16	Stone pillars	No/ha	200	24014.40	6.21
17	Training of stone pillars	Man hrs	240	3980.28	1.03
18	Bamboo sticks	No/ha	4464	11520.00	2.98
19	Errection of bamboo sticks	Man hrs	200	2980.32	0.77
20	Trellis wire				0.00
(a)	(i) 8 Gauge	Kg/ha	205	11131.36	2.88
(b)	(ii) 10 Gauge	Kg/ha	244	15036.28	3.89
(c)	(iii) 12 Gauge	Kg/ha	197	12983.41	3.36
21	Training of Trellis Wire	An days	395	5940.00	1.53
22	Binding Wire	Kg/ha	18	492.33	0.13
23	Jute	Kg/ha	43	1244.68	0.32
24	Angles	No/ha	200	24512.08	6.33
25	Clamps	No/ha	200	3581.95	0.93
26	Nut And Bolts	No/ha	397	4950.78	1.28
II	**Total**			3,24,243.60	83.79
III	Interest on working capital @8.5%			27560.71	
IV	**Total variable cost** (II+III)			351804.32	90.91
V	Management cost			35180.43	9.09
VI	**Total investment cost**			386984.75	100

Note: *Economic life of garden 25 years.*

by (Ravikumar 2011) while studying investment costs for pomegranate cultivation.

Maintenance Cost of Grape Orchards

The striking feature of a grape cultivation is that grape reaches the economical bearing stage early in the third year of establishment. Hence, during the first two years the farmers owning grape orchards have to make a fair amount of investment on establishment of healthy vines. The economic bearing period of orchards, passes through different stages of grape cultivation such as increasing, constant and decreasing stages. The maintenance cost also differs significantly among these different categories of bearing period. The maintenance cost estimated for gestation period is presented in Table 4. The maintenance cost indicated in the table included both the variable cost and fixed costs. The labour expenses as well as cost of materials utilized for grape cultivation as part of variable costs, while rental value of land, depreciation charges and interest on fixed capital together constituted major items of fixed costs.

It could be observed from the results that in the total maintenance cost, the major share was variable cost to the tune of ₹ 130165.97/ha (81.41%), while fixed costs amounted to ₹ 29723.00/ha, which accounted for 18.59 per cent of total maintenance costs. Among the variable cost, the material cost formed a major cost accounting for more than 50 per cent (₹ 80573.93) of total maintenance cost, since the crops require high amount of manure, fertilizers & micro nutrients and plant protection chemicals for better growth and development in initial stages. This was followed by labour cost which accounted for 17.82 per cent (₹ 28488.48), because during the gestation period, labour involvement will be high to perform the important activities like loosening the soil around the trunk and formation of basin, watch and ward, pruning and training and land preparation, etc. In the fixed cost, the significant share was from the rental value of land, which accounted for 15.54 per cent of total maintenance cost of grape orchards. This could be attributable to the fact that due to higher productivity associated with higher returns, farmers go for renting of land.

Table 4: Maintenance Cost of Grape Orchard up to Bearing Period (Cost ₹/ha)

Sl. No.	Particulars	Unit	I year		II year		Total	
			Qty	Cost	Qty	Cost	Cost	%
I.	**VARIABLE COST**							
A	**Labour cost**							
1	Intercultivation	pair hrs	19.28	926.25	25.00	1020.12	1946.37	1.22
2	Application of FYM, fertilizers and PPC	man hrs	1032.32	8675.00	1123.19	9125.10	17800.10	11.13
3	Weeding, Pruning and Irrigation	man hrs	652.08	3828.50	710.19	4012.01	7840.51	4.90
4	Miscellaneous (Watch and ward and etc)			444.60		456.90	901.50	0.56
5	Total labour cost (A)			13874.35		14614.13	28488.48	17.82
B	**Material cost**							
1	Manure	tonnes	19.76	11856.00	21.30	12140.10	23996.10	15.01
2	Fertilizers and Micro nutrients	kgs	1924.53	23263.14	2131.41	24156.91	47420.05	29.66
3	PPC	liters	24.7	4544.98	25.01	4612.81	9157.79	5.73
	Total material cost (B)			**39664.11**		**40909.82**	**80573.93**	**50.39**
C	A+B			53538.46		55523.95	109062.41	68.21
D	Interest on working capital @ 8.5%			4550.76		4719.536	9270.30	5.80
E	Variable cost (C+D)			58089.22		60243.49	118332.71	74.01
F	Management cost @ 10% on variable cost			5808.92		6024.349	11833.27	7.40
	Total Variable Cost (E+F)			63898.14		66267.83	130165.97	81.41
II	**FIXED COST**							
1	Rent value of land			12422.25		12422.25	24844.50	15.54
2	Land revenue			24.7		24.7	49.40	0.03
3	Depreciation			1125.2		1125.2	2250.40	1.41
4	Interest on fixed capital @ 9.5%			1289.35		1289.35	2578.70	1.61
	Total fixed cost			**14861.50**		**14861.50**	**29723.00**	**18.59**
	Total cost (I+II)			**78759**		**81129**	**1,59,888**	**100**

Farmers cultivating grape on their own land, the rental value of land was imputed at the prevailing rates in the study area. Since, the opportunity cost of land was taken into consideration for calculating the rental value of land, it was found to change over the years and rest all costs were meager. The per hectare total annual maintenance cost of grape orchard up to the bearing period was to the tune of ₹ 1,59,888.

Profitability Analysis of Grape Production

The results on profitability analysis indicating a good account of the expenses and yield from of the grape orchards are presented in Table 5. The costs incurred during the bearing period after the establishment of the grape orchard for upkeep of the plants so that good yields can be expected throughout the entire economic lifespan of the orchards. The annual cost of cultivation included

Table 5: Cost and Returns from Grape Cultivation (₹/ha)

Sl. No	Particulars	Unit	Qty	Cost	%
I	**Variable cost**				
A	**Labour cost**				
1	Intercultivation	pair hrs	38.80	1543.75	0.90
2	Application of FYM	man hrs	354.48	2840.5	1.66
3	Application of fertilizers	man hrs	294.00	3087.5	1.81
4	Application of PPC	man hrs	314.96	6483.75	3.79
5	Weeding	man hrs	196.40	1852.5	1.08
6	Pruning	man hrs	295.20	2470.00	1.44
7	Shoot thing	man hrs	121.12	1482.00	0.87
8	Irrigation	man hrs	151.31	1582.00	0.93
9	Watch & ward	man hrs	215.45	2223.00	1.30
10	Harvesting	man hrs	117.60	1235.00	0.72
11	Miscellaneous(transportation Fym, fertiliser and etc)			100.06	0.06
	Total labour cost (A)			**24900.06**	**14.56**
B	**Material cost**				
1	Manure	tonnes	22.34	12230.00	7.15
2	Fertilizers	kgs	985.5	15011.00	8.78
3	PPC	liters	17.05	3215.50	1.88
4	Micro nutrients	kgs	135.85	3151.00	1.84
5	Others(ash and Neem cack)			463.54	0.27
	Total material cost			34071.04	**19.92**
6	Marketing cost			21581.62	12.62
7	Interest on working capital @ 8.5%			6846.97	4.00
	A+B (total working cost)			87399.63	51.11
C	**Management cost (10% on total working cost)**			**8739.96**	**5.11**
	Total variable cost (A+B+C)			**96139.59**	**56.22**
II	**Fixed cost**				
	Rent value of land			12422.25	7.26
	Land revenue			24.7	0.01
	Amortized establishment cost			53602.40	31.34
	Depreciation			1125.2	0.66
	Interest on fixed capital @ 9.5%			7698.63	4.50
	Total fixed cost			**74873.18**	43.78
	Total cost (I+II)			**1,71,012.77**	100
	Yield per hectare in tonnes			25.75	
	Price per tonnes			20,000	
	Gross returns (₹/ha)			5,15,000	
	Net returns (₹/ha)			343987.23	

Note: Marketing cost including packing material, transportation, commission, labour charges.

the expenditure towards the use of labour and other material inputs per year along with fixed cost. The results revealed a total cost of cultivation of ₹ 1,71,012.77/ha, which consisted of 56.22 per cent of variable costs (₹ 96139.59/ha) . Among the various items of variable cost, the major share was of material cost (₹ 34071.04/ha), which constituted for 19.92 per cent. This could be attributable to higher expenses on chemical fertilizers, manure and plant protection chemicals. Since the grape is highly responsive crop to nutrient. Further, in recent days the diseases like powdery and downy mildew have created lot of problem hence to control these diseases the farmers have been trying with different chemicals thus the expenses on these items were found to be more.

Farmers spent ₹ 24900.06/ha towards human labour use which accounted for about 15 per cent, since the grape is labour intensive crop require higher labour involvement to perform various activities like pruning, shoot thinning, weeding, irrigation, watch and ward, drip cleaning and training of vines, land preparation, etc. Since, the consumer markets for grapes are distant from the production areas, hence marketing cost (₹ 21581.62/ha) incurred by the farmers formed 12.26 per cent of total cost of cultivation of grape The interest on working capital and management cost together accounted for about nine per cent (₹ 15586.93/ha) of total cost of cultivation. Among the fixed costs component, the amortized establishment costs formed major part (₹ 53602.40/ha) and constituted for nearly one-third (31.34%) of total cost of cultivation followed by, rental value of land (7.26%). The share of interest on fixed capital, depreciation and land revenue all together contributed for about five per cent of total cost of cultivation.

The per hectare yield of grape realized by the farmers was 25.75 tons in study area and the price received by the grape cultivators was ₹ 20,000 per tons. The estimated gross returns of ₹ 5,15,000/ha, farmers could able to realise a net returns of ₹ 343987.23 / ha after meeting the total cost of cultivation of ₹ 1,71,012.77.

Financial Feasibility Analysis of Grape Orchards

Grape is highly profitable perennial fruit crop, once orchards are well established will continues to bear up to 25 years. The maintenance cost estimated during the gestation period and economic bearing period provides only a broad overview on the level of expenditure incurred and returns realized by the sample cultivators. The retrieval of resources committed during the gestation period is impossible. Therefore, costs both during gestation and bearing period and returns have to be analysed carefully to test the worthiness of investment in grape cultivation for better decision-making. Hence, the technique of project evaluation through calculation of payback period, net present value, benefit-cost ratio, and internal rate of return were employed to know the business performance of grape enterprises. In analyzing the investment feasibility a discount rate of 12 per cent representing the opportunity cost of capital was assumed. The costs and returns from grape cultivation were discounted to estimate the Benefit-Cost ratio (B-C ratio), Net Present Value (NPV), Internal Rate of Return (IRR) and Payback period and results of financial analysis are delineated in Table 6.

The findings of the financial feasibility analysis presented in Table 6 shows a significant returns from grape cultivation. The net present value (NPV) of grape production was estimated at ₹ 652113.40 with the B-C ratio was 1.42. A noteworthy feature of a grape orchard is that, it exhibits a higher NPV and BC ratio showing high profitable nature of the crops. It is interesting to note that the payback period was 4-5 years, indicating relatively a short period to return back the investment made on grape cultivation. The internal rate of return (IRR) was noticed to be sufficiently higher and it was 34.10 per cent implying that farmers could earn more than 34 per cent returns from grape cultivation, which is almost three times the opportunity cost of capital (discount rate) assumed in the study. Thus, the results of financial analysis clearly indicated that the grape cultivation is highly profitable venture.

Table 6: Financial Feasibility of Investment in Grape

Sl. No.	Particulars	
1	NPV (Rupees/ha)	652113.40
2	IRR (%)	34.10
3	B: C Ratio	1.42
4	Pay Back Period (Years)	4.35

Note: Discount Rate @ 12%.

CONCLUSION

Grape cultivation even though a capital intensive but found to be highly profitable agricultural enterprise besides being the generator of sufficient employment opportunities. Hence, the provision of better access to capital, supply of improved technologies, quality inputs including a wide network of vibrant extension machinery would make grape cultivation much more profitable venture with assured market infrastrucre. The returns from grape cultivation are very attractive with better B-C ratio and higher NPV compared many farm commodities. Another important aspect of grape is that it is having lot of scope for value addition and has potential for exporting, if all the requirements for international trade are met with proper education on SPS measures for the grape growers.

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