



Economic Viability and Financial Feasibility of Grapes vis-à-vis Raisin in Northern Karnataka, India

Vinod Naik^{*1}, K R Nethrayini² and G S Mahadeviah²

¹Department of Economics and Public Policy,

School of Social Sciences, Central University of Himachal Pradesh, Dharamshala - 176 215, Himachal Pradesh, India

²Department of Agricultural Economics, University of Agricultural Sciences (GKVK), Bengaluru - 560 065, Karnataka, India

Received: 22 June 2020; Revised accepted: 12 August 2020

A B S T R A C T

The present study was undertaken in Vijayapura district of Northern Karnataka for the year 2018-19 with the objective of evaluating economically the value addition in grapes. The multistage sampling was adopted to select the district, talukas and villages. The study objectives were analyzed using budgeting technique and financial feasibility tools. The results of the study highlighted that, though the cultivation of grapes involved more investment but in turn it yields positive net returns to the cultivators. When farmers sold their produce by making fresh grapes in to raisins, they got additional returns of about ₹ 1,86,489.00. Based on the results of the study we can conclude that the investment on grape vineyards are financially feasible in the study area and project is strongly recommended to the farmers for continuation in future as well.

Key words: Grapes, Raisins, Multistage sampling, Net present value, Payback period

Horticultural crops being high value crops are important in raising the incomes of the farmers beside creating employment opportunities. India is bestowed with wide range of agro-climatic and bio-diversity which is ideal for growing a variety of agricultural crops, which includes large number of horticultural crops (Nethravathi 2012). Horticulture in India has gained its credibility for providing sustainable income, nutritional security and for providing employment opportunities, both in rural and urban areas. Grapes are the most widely cultivated fruit crop of the world in varying climatic zones extending from the temperate to the tropics in Himalayas and tarai region of Northern India. The grapes are consumed fresh or converted into raisin and wine.

The global grapes production was estimated to be 79.19 million metric ton in the year 2018, which was a 0.8 per cent increase in production compared to 2017. Although a 0.4 per cent decrease in the area was observed on a global level, the production continued to increase. The major grapes

producing countries include Italy, France, United States of America, Spain, and China. Italy is the largest grapes producing country in the world with an annual production of 8.2 million metric ton and accounting for 19 percent of global production. In terms of region, Europe is the largest grapes producing region in the world, accounting for more than 45 per cent of the world grapes production (Anonymous 2018).

In India, it is cultivated over an area of 140 thousand hectares with an annual production of 2914 thousand tones (Anonymous 2017). Grape cultivation in India has acquired greater significance due to its high productivity compared to many other grape producing countries in the world. Commercial viticulture in India is hardly a few decades old and major grape growing states are Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Punjab and Haryana. Among all the grape growing states, Maharashtra occupies the largest area (90,000 ha) followed by Karnataka (23,000 ha). As far as productivity is concerned Karnataka stands first followed by Maharashtra (Anonymous 2016). In Karnataka, grape is commercially cultivated in various parts of the state. During fifties, grape was introduced in North Karnataka, where conditions are quite different from that of South Karnataka. Thompson Seedless, Sharad, Tas-A-Ganesh, Sonaka and Arkavathi are the important seedless cultivars of

***Corresponding author:** Dr. Vinod Naik, Assistant Professor, Department of Economics and Public Policy, Central University of Himachal Pradesh, Dharamshala - 176 215, Himachal Pradesh

e-mail: vinod.naik@cuhimachal.ac.in | **Contact:** +91- 9482835380

grape under cultivation in the state. Tas-A-Ganesh, also known as Bangalore Blue received a geographical indication tag. Raisins are dried grapes. They are processed in many regions of the world. Raisins may be eaten raw or used in cooking, baking and brewing. Thompson Seedless and Arkavathi are best suited for raisins. About 78 per cent of grapes are used for table purpose (Nethravathi 2012). Emergence of the value chain in grapes has given a real boost to conversion of grapes into raisin. There are two main types of grapes grown namely seedless and seeded variety. When the era of “value addition” through the large-scale industrial processing of grapes began, it diversified into various products like wine, raisins, juice, jam and pulp etc. and India has huge potential for processing of grapes. In Karnataka, the past studies have focused on production and marketing of grapes. However, the studies on economics of value addition of grapes raisins are lacking. Hence, the present was taken up to focus more on the economic analysis of value addition of grapes in Vijayapura district of Karnataka.

MATERIALS AND METHODS

Multi stage sampling technique was employed for selection of districts, taluks and villages. The present study was conducted in Vijayapura district of Northern Karnataka as it is having highest area under grapes in Northern Karnataka. In the second stage, two taluks from Vijayapura district were selected based on the highest area under grape. Thus, Vijayapura and Indi taluks were selected for the study. In the third stage, two villages from each taluk were selected again based on the area under grape. For the selection of sample farmers, random sampling method was adopted and from each village fifteen farmers practicing the cultivation of grapes were selected randomly, thus the total sample size of the respondents was 60. To elicit the required data regarding value addition processes a total of 10 processing units were selected. Primary data was collected using pre-tested and well-structured interview schedule through personal interview method. The data pertained to the 2018-19 agriculture year.

The objectives of the study were analyzed using different analytical tools and techniques which are presented below.

Tabular presentation was adopted to compile the investment pattern analysis, budgeting technique was used to study cost structure, returns and profits. Simple statistical tools like averages and percentages were used to compare, contrast and interpret results. The financial analysis was carried out by following formulas like:

Net Present Value

The present value of an investment is the present value of projects net cash flows less its initial cash outflow. Net present value was estimated using the formula:

$$NPV = \sum_{t=0}^N B_t (1 + d)^{-t} - I$$

Where,

B_t = Incremental net cash flow of the project during the n^{th} year
 N = Economic life of the project
 d = Discount rate
 I = Initial cost of the investment
 t = Number of years

Benefit-Cost Ratio (BCR)

It is defined as the ratio of the present value of the project's future net cash flows to the project's initial cash outlay. It is similar to the Net present value approach and it measures the present value of returns per rupee invested.

$$BCR = \frac{\sum_{t=0}^N B_t / (1 + d)^t}{\sum_{t=0}^N I}$$

Where,

B_t = Incremental cash flow of the project during year t
 I = Initial investment
 t = Number of years
 N = Economic life of the project
 d = Discount rate

In the present study, the discount rate ‘ d ’ used for calculating Net Present Value and Benefit-Cost ratio were assumed as the opportunity cost of the capital invested in the grape cultivation.

Internal Rate of Return

It is defined as the discount rate that equates the present value of the future net cash flows from an investment project with the project's initial cash outlay. The internal rate of return is expressed mathematically as:

$$\sum_{t=0}^N B_t (1 + d)^{-t} - I$$

Where

B_t , N , I , t and d as stated earlier

IRR was calculated using the below mentioned formula:

$$IRR = \frac{\text{Lower discount rate} + \frac{\text{Difference between two discount rates}}{\text{Present worth at the lower discount rate} - \text{Absolute difference between net worth of two discount rates}}}{1}$$

Payback period

The payback period is the length of time from the beginning of the project until the net value of the incremental production stream reaches the total amount of the capital investment. It shows the length of time between cumulative net cash outflow recovered in the form of yearly net cash inflows.

RESULTS AND DISCUSSION

First year of grape orchard is the important phase during which huge capital is invested to establish the orchard. The

Economic Viability and Financial Feasibility of Grapes vis-à-vis Raisin

cost of establishment of grape orchard up to bearing (gestation period) includes not only the cost incurred in the zero year but also the cost incurred in maintaining the plants till the time of bearing that is up to one year of planting.

The details on establishment cost of per hectare grape orchard which include fixed and variable costs are presented in (Table 1). Perusal of the table revealed that, the total cost of establishment of grape orchard until the first year of bearing was ₹ 7,79,400.30. It is also observed from the data

that initial investment cost in the total establishment cost was ₹ 5,91,934.94 (75.95%). The major items contributing to investment cost were angles (12.69%), cost of trellis wire (12.23%), drip irrigation system (8.74%) and stone pillars (7.91%). Grape requires one year to bear the fruits and the maintenance costs incurred during this period worked out at ₹ 1,87,465.36 / ha, which formed 24.05% of total establishment cost.

Table 1 Establishment cost of grape orchard

Particulars	Units	Quantity	Cost (₹/ha)	Percentage
Initial investment				
Bore well	No.		41500.00	5.32
Pump set	No.		52250.00	6.70
Sprayer	No.		2563.00	0.33
Drip irrigation system	No.		68150.00	8.74
Electric connection	No.		18240.00	2.34
Preparatory tillage	Machine hours	11.25	4864.39	0.62
Manures	t	26.24	37200.00	4.77
Fertilizers	Kgs	575.00	7852.00	1.01
Pit marking	Man days	12.00	2908.44	0.37
Digging of pits	Machine hours	19.23	14441.73	1.85
Filling of pits with manure and fertilizers	Man days	58.63	1187.26	0.15
Cuttings	No.	1495.24	16283.16	2.09
Planting of cuttings	Man days	28.56	6922.09	0.89
Stone pillars	No.	311.28	61636.55	7.91
Erecting stone pillars	Man days	33.91	8218.77	1.05
Bamboo sticks	No.	1495.24	16911.16	2.17
Erection of bamboo sticks	Man days	21.64	5244.89	0.67
Trellis wires	Kgs	1298.72	95313.06	12.23
Training of trellis wires	Man days	112.00	27145.44	3.48
Binding wire	Kgs	26.00	1092.00	0.14
Jute	Kgs	48.00	1536.00	0.20
Angles	No.	305.00	98881.00	12.69
Miscellaneous			1594.00	0.20
Total (A)			591934.94	75.95
Maintenance cost up to bearing period				
I Year			187465.36	24.05
Total establishment cost (A+B)			779400.30	100.00

Table 2 Maintenance cost of grape orchard up to bearing period

Particulars	Unit	Quantity	Cost per ha	Percentage
I. Variable Cost				
A. Labour Cost				
Inter cultivation	Machine hours	11.28	4877.36	2.60
Application of manures	Man days	30.00	7271.10	3.88
Application of fertilizer	Man days	24.00	5816.88	3.10
Application of PPC	Man days	65.65	15911.59	8.49
Weeding	Man days	58.21	14108.36	7.53
Pruning	Man days	26.00	6301.62	3.36
Shoot training	Man days	17.89	4336.00	2.31
Irrigation	Man days	38.12	9239.14	4.93
Miscellaneous	Man days	12.38	3000.54	1.60
Total Labour Cost (A)			70862.59	37.80
B. Material Cost				
Manures	t	9.05	12830.00	6.84
Fertilizers	Kgs	1278.27	13051.14	6.96
Micro nutrient	Kgs	121.38	5514.29	2.94

Plant Protection Chemicals	Liters	48.09	26490.38	14.13
Total Material Cost (B)			57885.81	30.88
Interest on working capital @ 9%			11587.36	6.18
Total Variable Cost (A + B)			140335.76	74.86
II. Fixed Cost				
Rent value of land			39150.00	20.88
Land Revenue			15.00	0.01
Depreciation			2915.00	1.55
Interest on fixed capital @ 12%			5049.60	2.69
Total Fixed Capital			47129.60	25.14
Total Cost (I + II)			187465.36	100.00

The results of (Table 2) indicates that average ha⁻¹ cost for grape growing up to bearing period was ₹ 1,87,465.36 in which the share of variable costs was 74.86 per cent and that of fixed cost was 25.14 per cent. Among the variable costs, labour cost (₹ 70862.59) accounted for 37.80 per cent of total cost of maintenance up to bearing period and material cost (₹ 57,885.81) accounted for 30.88 per cent and interest on working capital (₹ 11587.36) accounted for 6.18 per cent. The major item of labour cost was on application of plant protection chemicals (₹ 15,911.59) which formed 8.49% of first year maintenance cost followed by weeding (₹ 14,108.36) and irrigation (₹ 9239.14). Of the total material cost (₹ 57,885.81) costs of plant protection chemicals (₹ 26490.38) accounted for 14.13%, followed by the cost of fertilizers (6.96%), manures (6.84%) and cost of micro nutrients (2.94%). Under the fixed costs, the major item was rental value of land (₹ 39150) which formed 20.88% of the total maintenance cost of grape orchard up to bearing period. During the establishment period, farmers incur more costs due to very expensive wages for labour operations like irrigation, weeding, application of PPC, application of manures, application of fertilizers and inter-cultivation and also due to more expenditure incurred on the inputs like manures, fertilizers and plant protection chemicals. These results were in agreement with the results obtained by Loksha (1995), Manish (2003).

Maintenance costs during bearing period are the recurring costs incurred after the establishment of grape orchard i.e. from second year onwards, for up keeping the garden so that good yield can be obtained over the economic life span of grape orchard. The maintenance cost per year includes expenditure on use of labour and other material inputs along with the fixed cost for different age groups of grape orchard are depicted in (Table 3). Total maintenance

costs of grape orchard during bearing period was ₹ 5,60,545.41 in which the share of variable costs was 70.27 per cent and that of fixed cost was 29.73 per cent. Variable costs consisted of labour cost (30.25%) and material cost (33.95%). Total material cost incurred was ₹ 1,90,325.33 in which the share of plant protection chemicals cost was 17.29 per cent followed by manures (10.44%). Fixed cost amounted to ₹ 1,66,627.59 which formed 29.73 per cent of the total annual maintenance cost of grapes orchard. Out of which apportioned establishment cost amounted to 13.90 per cent. Farmers incurred more costs on labour operations both in maintenance of grape orchard up to bearing period and during bearing period. Since shoot thinning and dipping operations followed in grapes to improve the quality which require skilled labour with special skills in these particular operations. Watch and ward labour was employed for a period of about two months after the fruit set. Birds were the major problem during day time and hence more labour was required especially during morning and evening hours to scare off birds (Nethravathi 2012). The results of the study are in line with that of (Deshmukh 2004). Overall cost of fertilizers used was high in the vineyards. This may be because grape is heavy feeder and requires more of fertilizers for sustained growth and subsequent high yields. Grape is highly prone to several pests and diseases like powdery mildew, downy mildew, anthracnose etc. slightly variation in climatic conditions bring in diseases which affect the growth and yield of grape to a great extent. Thus, regular control measures were needed to keep the vineyard free from pests and diseases. Hence, it may be seen from the (Tables 2-3) that the costs on plant protection chemicals accounted for as high as 14.13 and 17.29 per cent of respectively to the total costs in the production of grapes in vineyards.

Table 3 Maintenance cost of grape orchard during bearing period

Particulars	Unit	Quantity	Cost (₹/ha)	Percentage
I. Variable Cost				
A. Labour Cost				
Inter cultivation	Machine hours	6.81	2944.58	0.53
Application of manures	Man days	45.61	11054.50	1.97
Application of fertilizers	Man days	20.23	4903.15	0.87
Application of PPC	Man days	78.30	18977.57	3.39
Weeding	Man days	111.91	27123.63	4.84
Pruning	Man days	69.88	16936.82	3.02
Dipping	Man days	58.07	14074.43	2.51
Shoot thinning	Man days	129.51	31389.34	5.60

Economic Viability and Financial Feasibility of Grapes vis-à-vis Raisin

Irrigation	Man days	60.00	14542.20	2.59
Watch and ward	Man days	40.37	9784.48	1.75
Harvesting	Man days	81.93	19857.37	3.54
Miscellaneous	Man days	10.00	2423.70	0.43
Total Labour Cost (A)			171067.17	30.52
B. Material Cost				
Manures	t	41.27	58507.65	10.44
Fertilizers	kgs	2513.31	25660.90	4.58
Plant Protection Chemicals	Liters	175.94	96916.55	17.29
Micro nutrients	kgs	175.88	7990.23	1.43
Others			1250.00	0.22
Total Material Cost (B)			190325.33	33.95
Interest on working capital @ 9%			32525.32	5.80
Total Variable Cost			393917.82	70.27
II. Fixed Cost				
Rent value of land			39150.00	6.98
Land Revenue			15.00	0.00
Apportioned cost			77940.03	13.90
Depreciation			30157.17	5.38
Cost of repair and maintenance			1514.04	0.27
Interest on fixed capital @ 12%			17851.35	3.18
Total Fixed Cost			166627.59	29.73
Total Cost (I + II)			560545.41	100.00

The estimates of per hectare yield and returns of grape are presented in (Table 4). Perusal of the table revealed that, per hectare yield of grapes varied with age of the orchard. During first year, there was no yield and during second year, it was 25.12 ton per hectare. Thereafter, yields increased steadily up to seventh year, reached a maximum at 37.78 ton

per hectare. There were no returns during the first year of the crop. However, returns were registered during second year at ₹ 9,73,400 per hectare. Thereafter returns increased steadily and reached a maximum of ₹ 1463975 per hectare in seventh year. The above findings are in agreement with findings of Mane (1993), Manish (2003).

Table 4 Yield and returns in the grape cultivation

Years	Yield (t/ha)	Returns (₹/ha)
1	0.00	0.00
2	25.12	973400.00
3	25.91	1004013.00
4	27.93	1082288.00
5	32.38	1254725.00
6	37.73	1462038.00
7	37.78	1463975.00
8	37.61	1457388.00
9	37.57	1455838.00
10	37.55	1455063.00
Average	29.96	1160873.00

The results on the costs incurred in processing of grapes into one tonne of raisin are presented in (Table 5). It can be noted from the table that the average cost of processing one tonne of raisin was worked out to be ₹ 18250, of which the total variable cost was ₹ 12347.00 formed the major component. The fixed cost being ₹ 5903.00 of the total cost of processing cost. It can be noted from the table that, out of the total variable cost, the cost of potassium bicarbonate was found maximum (₹ 4189.00) followed by transportation of raw materials (₹ 1874.00), ethyl oil of (₹ 1741.00) and sulphur of (₹ 1693). Remaining minor variable cost items of the total cost of processing includes cost of power, fuel,

water, wages to casual labour and interest on working capital. Out of the total fixed cost, ₹ 1277.00 is incurred towards the depreciation on building and ₹ 2723.00 for equipment's while the remaining items including interest on fixed capital, salary to the permanent employees, insurance and license fee together accounted for minor share in the total cost of processing. The higher cost of processing was due to the involvement expensive chemicals as well as labour charges in the processing of grapes in to raisins. It was observed from the study that nearly ten kg of raw grapes were processed to make one kg of raisins. The results were on par with the results of (Nethravathi 2012).

Table 5 Cost of processing grapes into raisin

Particulars	Rupees (Per ton)
Variable cost	
Potassium bicarbonate	4189.00
Ethyl oil	1741.00
Sulphur	1693.00
Power, fuel and water	914.00
Transportation of raw materials	1874.00
Wages on casual labour	915.00
Interest on working capital	1019.00
Total variable cost	12347.00
Fixed cost	
Depreciation on buildings	1277.00
Equipment depreciation cost	2723.00
Salary to permanent employee	1138.00
Insurance and license fee	133.00
Interest on fixed capital	633.00
Total fixed cost	5903.00
Total processing cost	18250.00

Majority of the farmers in the region were practicing the processing of grapes in to raisins and comparative economics of fresh grapes and raisin production is given in the (Table 6). The table revealed that, the farmers were incurred additional cost of around ₹ 1,36,683.00 / hectare in the production of raisins. Whereas, the total returns received

by the farmers were found to be higher when the they sold their produce by producing raisins (₹ 14,84,044.00) rather than fresh grapes (₹ 11,60,873.00). Thus, when farmers sold their produce by making fresh grapes in to raisins, they got additional returns of about ₹ 1,86,489.00 (Ladaniya *et al.* 2005) also obtained the similar results.

Table 6 Comparative economics of fresh grapes and raisin production

Particulars	Fresh grapes	Raisins
Average yield (t/ha)	29.96	7.49
Total cost (₹/ha)	560545.00	560545.00
Cost of production of raisin	-	136683.00
Average price (₹/t)	38750.00	198150.00
Total Returns (₹/ha)	1160873.00	1484044.00
Net returns (₹/ha)	600327.00	786816.00
Additional benefit in raisin making	186489.00	

To evaluate the feasibility of investment in grape orchard, the criteria of Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR) and Pay Back Period (PBP) were used. The results of analysis are presented in (Table 7).

It may be seen from the (Table 7) that the Net Present Value of investment in case of fresh grapes and raisins was ₹ 16,40,243.00 and ₹ 23,98,019.00 respectively, in both the

cases it was positive and very high. Thus, the positive and high net present value indicated that an investment on grape orchard in Vijayapura district was financially feasible. The benefit cost ratio indicates the returns per rupee invested in grapes orchard. The table depicts benefit cost ratio of 1.56 and 1.70 for fresh grapes and raisins respectively. It can be concluded that the investment on grapes orchard was financially feasible since the BCR was more than unity.

Table 7 Financial feasibility analysis of investment on grape cultivation

Particular	Unit	Fresh grape	Raisin
Net Present Value	₹/Ha	1640243.00	2398019.00
Benefit Cost Ratio		1.56	1.70
Pay Back Period	Years	1.34	1.02
Internal Rate of Return	Per cent	42.00	51.00

The time required to recover initial investments made is indicated by the Pay Back Period in a project. The Pay Back Period for grapes orchard was 1.34 years and 1.02 years for fresh grapes and raisins respectively, which indicated that the investments made could be recovered in a relatively short span of time by the farmers. The Internal Rate of

Return (IRR) criterion measures the rate of return that can be earned by investing in grapes orchard. It also considers the re-investment opportunities which are absent in other techniques. The IRR in the study was found out to be 42.00 per cent for fresh grapes and 51.00 per cent for raisins. Thus, investment in grapes orchard was found to be feasible since

the Internal Rate of Return is higher than the opportunity cost of capital. These results are in agreement with the findings of (Sivanappan 1991) for pomegranate, orange and coconut, and (Anand *et al.* 1998) for grapes.

The investments on grapes vineyards are financially feasible in the study area and project is strongly recommended to the farmers for continuation in future as well. The processing of grapes is one of the most important activities in Vijayapura district as it has been in the forefront in the production of grapes in the state. Grapes being a

perishable commodity require immediate marketing or processing. Farmers were facing the great problem in grape marketing and they were getting very low prices for their quality grapes, these problems have been solved by raisin making. The economics of fresh grape marketing vis-a-vis value addition by making raisin indicated that additional of ₹ 1,86,489/- can be earned in production of raisin from one hectare as compared with fresh grape marketing. Thus, the farmers can think of doubling their farm income through processing of grape.

LITERATURE CITED

- Anand T N, Lakshminarayan M T, Manjunatha B N and Prasanna Kumar G T. 1998. Comparison of economics of drip and surface irrigation system in grape. *Finance Agriculture* **30**(4): 3-5.
- Anonymous. 2016. National Horticulture Board, Government of India.
- Anonymous. 2017. National Horticulture Board, Government of India.
- Anonymous. 2018. Global Grapes Market - Segmented by Geography - Growth, Trends, and Forecast (2018 - 2023). *Modern Intelligence Report*.
- Deshmukh S N. 2004. Production and marketing management of grape in Solapur district. *M. Sc. (Agriculture) Thesis*, Mahatma Phule Agriculture University, Rahuri (India).
- Ladaniya M S, Wanjari V and Mahalle B. 2005. Marketing of grapes and raisins and post-harvest losses of fresh grapes in Maharashtra. *Indian Journal of Agricultural Research* **39**(3): 167-176.
- Lokesha. 1995. Study on investment in drip irrigation: An analysis of its impact on coconut. *M. Sc. (Agriculture) Thesis*, University of Agricultural Sciences, Bangalore, Karnataka (India).
- Mane K M. 1993. Economic analysis of different methods of irrigation in grape in Marathwada region of Maharashtra. *M. Sc. (Agriculture) Thesis*, University of Agricultural Sciences, Dharwad, Karnataka (India).
- Manish L M. 2003. Comparative economics of drip vis-à-vis conventional method of irrigation for grape cultivation in Osmanabad district of Maharashtra. *M. Sc. (Agriculture) Thesis*, Mahatma Phule Agriculture University, Rahuri.
- Nethravathi P. 2012. Value chain analysis of raisin- a study in Bijapur district of Karnataka. *MBA (ABM) Thesis*, University of Agricultural Sciences, Bangalore, Karnataka.
- Sivanappan R K. 1991. Drip irrigation for coconut and orange. *Kissan World* **19**(5): 28-29.