Assessing Economics of Grape Cultivation in India

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9 July 2007

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Introduction

The land-use pattern in Indian agriculture has traditionally promoted cereal-based cropping systems. However, diversification to more productive and remunerative crops has become the new milestone to be achieved in Indian agriculture. A shift in favour of horticultural crops as a more viable and attractive alternative is a part of such diversification drive and strategy (Kaul, 1993). Many policy makers, trade analysts and development specialists today realise the potential that horticulture has in generating employment and earning foreign exchange for the country. In fact, in the past, horticultural crops received little attention from various development experts and policy pandits and, as a result, this sector remained a neglected one for long. This is despite their inherent production and export advantages. Hardly any attention was paid to country's horticultural development until the fourth five year plan. It is substantiated by the fact that the budgetary support for horticultural development in the fourth plan was a meagre Rs.5.0 lakh. However, in view of the several positive features in favour of horticultural crops, a breakthrough was achieved in horticultural development in the seventh plan when the allocation for this activity rose dramatically to Rs.24 crores from its level of 7.6 crores in the fifth plan. Nevertheless, development of horticulture became a major thrust area only in the eighty five year plan when the total plan allocation for horticultural development was stepped upto Rs.1000 crores that accounted for an increase of a whopping 4000 per cent over the seventh plan (Uppal, 1995). The eighth plan, therefore, can be considered as a milestone in the growth of horticulture in the country.

In terms of horticulture crop production, Maharashtra is considered to be the most important state of the country. This state leads the country in the production of grapes, bananas, oranges and onions. Grape has already been established as an important commercial crop in Maharashtra. Although the cultivation is mainly concentrated in the three districts of Nasik, Sangli and Solapur, a large number of farmers in the neighbouring districts like Pune, Ahmednagar and Satara are switching over to grape cultivation. In fact, grape cultivation is chiefly confined to Deccan Plateau in Western Maharashtra because of

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the congenial agro-climatic conditions prevailing in this region. About 600 hectares are added to grape acreage in Maharashtra every year (Shah, 1998). Nasik district of Maharashtra is the largest producer of grapes in the country. An earlier study conducted on horticulture industry of Maharashtra has shown significant growth in output and acreage under grapes in Maharashtra (Shah, 1998). However, the crucial question that could strike one is as to what is the economics involved in the cultivation of grapes in Maharashtra and how far the cultivation of this valued crop is viable in this state. The present study is an attempt in this direction and it comprehensively examines the cost structure and returns in the cultivation of grapes in the state of Maharashtra.

Data and Methodology

The study was conducted in Niphad taluka of Nasik district of Maharashtra. The selection of district and taluka was based on certain criteria.[1] Stratified random sampling procedure was adopted for the selection of villages and grape orchardists. A sample of five villages was selected for the study of grape orchardists. Further, it was decided to select a sample of 50 grape orchardists from these selected grape growing villages. The grape growing orchardists were then categorised as marginal (less than 1 hectare), small (1-2 hectares), medium (2-4 hectares) and large (above 4 hectares) based on land holding size of the orchardists using cumulative frequency square root technique (Dalenius and Hodges, 1950). The orchardists to be selected from each village were distributed among these four categories in proportion to the number of orchardists in each category. The number of selected grape orchardists were 4 in marginal category, 16 in small, 14 in medium and 16 in large category. The primary data on the relevant aspects were collected from the sampled orchardists for the reference year 1995-96.

The economic life of grape orchards in Nasik district was seen to hover around 20-25 years. Based on magnitude of production, the following four classifications were made for grape orchards:

Age Group	Production Stage
1-2 years	Non-bearing stage
3-10 years	Increasing production stage
11-14 years	Constant production stage
Above 15 years	Declining production stage

In fact, the cost and returns vary from orchard to orchard depending upon the age of tree/plants in the orchard. The costs and returns were computed for various categories of orchardists for each stage of production.

In order to assess the profitability and economic viability in grape cultivation, various components of costs were estimated. The details of these cost concepts are given as follows:

Cost A_1	Cost of inputs such as seed, manure, fertilisers, insecticides and pesticides + value of hired labour + value of hired as well as owned bullock labour + hired machinery charges + value of owned machine labour + depreciation on implements and for buildings + irrigation charges + land revenue and other taxes + interest on working capital + miscllaneous expenses.
Cost A_2	Cost A_1 + rent paid for leased-in land
Cost B	Cost A_2 + rental value of owned land and interest on owned fixed capital excluding land.
Cost C	Cost B + imputed value of family labour

Since orchards were in different stages of production, prorated establishment costs were computed for each stage 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 at 12 per cent annual rate of interest to arrive at prorated establishment cost.

Project appraisal for grape orchards of various categories of orchardists has also been attempted in this study with the help of 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:

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

$$\text{NPV} = \sum_{t=0}^{n} \frac{Bt - Ct}{(1+r)^t}$$

$$\text{Payback Period} = \frac{\text{Discounted Total Cost of the Project}}{\text{Annual Increase in Income (Mean Discounted Benefit)}}$$

Where, B_t = benefit in year t, C_t = cost in year t, T = 1,2,3,4, ...,n,
n = project life in years, r = rate of discount

IRR is defined as the rate which makes the present value of the expected cash inflows from an investment equal to the present value of the expected cash outflows of an investment (Jerry A. Viscione, 1977). In other words, it is the rate of interest at which

discounted benefits become equal to discounted costs or the rate at which NPV becomes zero. In this study, benefits and costs are discounted at 12 per cent annual rate of interest.

Empirical Findings

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 Maharashtra. Not only did the acreage under grapes and the production quantum increase significantly in all the grape growing districts but the productivity of this high value crop was also seen to increase in the state of Maharashtra (Shah, 1998). Adoption of various technological measures such as increasing use of drip irrigation, use of improved varieties of seeds, etc. contributed no less in giving a real boost to the production of grapes in this state.

A decomposition analysis performed using the method outlined by Vidya Sagar (1977, 1980) showed that the rise in grape production in Maharashtra was due to acreage expansion and interaction between area and yield as the effect of yield alone towards rise in production appeared to have been very low (Appendix 1).

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 this high value crop is very high as compared to other field or perennial crops grown in the state of Maharashtra. One of the studies conducted by Neelakantaiah (1995) also revealed a significant amount of profit involved in the cultivation of this valued crop in this state. The higher element of profit has led many farmers to switch over to grape cultivation, particularly in Nasik district. This undoubtedly makes it necessary to go into the details of cost and return structure of this important crop grown in this state.

Infrastructure Creation

Creation of basic infrastructure is by far the most important aspect in grape cultivation. Because of high initial investment on the infrastructure coupled with a fair amount of risk involved in its cultivation owing to prevalence of various kinds of diseases and other unforeseen calamities such as hail storm, the cultivation of grapes is generally limited to a particular class of farmers. However, in this study, apart from small, medium and large farmers, even the marginal farmers of Nasik district were seen to cultivate grapes. The per acre initial establishment cost varied significantly among these varied categories of orchardists due to differences in material used in raising the structure and differences in time of initial investment. The initial establishment costs were seen to be

incurred by the orchardists at different points of time in the past. However, majority of the sampled orchardists in Nasik district were seen to have their orchards in increasing production stage, i.e. these orchards were established during the last one decade from the reference year of this study. The initial establishment cost estimates for various categories of orchardists are brought out in Table 1.

The initial per acre establishment coast for the average category of orchardists was estimated at Rs.13,300 for the increasing production stage orchard, Rs.6984 for the constant production stage and Rs.3548 for the decreasing production stage orchard. An increase in establishment cost was seen with the increase in land holding size of the orchardists. The differences in initial investments/establishment costs were mainly because of the fact that these costs were incurred in the past and that in this study the actual amount spent towards creation of infrastructure during different years in the past has been taken into account. At current prices, the establishment cost will turn out to be very high compared to the estimated figures reported for various categories of orchards. As per the estimates reported by Neelakantaiah (1995), a farmer has to make an investment in the range of 0.80 lakh to 1.0 lakh in order to raise the infrastructure for grape orchards on one hectare farm. In order to bring forth true picture of cost during the current production years of different stages of production, prorated establishment cost has been computed using the method outlined by Erich A.Helfert (1983).

Maintenance Cost of Grape Orchards

A noteworthy feature of a grape orchard is that it comes in the bearing stage only in the third year of establishment and that in the first two years the orchardists have to make a fair amount of investment towards the upbringing of plants/trees of the non-bearing orchard. The bearing orchard, on the other hand, passes through different stages of production such as increasing, constant and decreasing phase. The maintenance cost also differs significantly among these different categories of bearing orchards. The maintenance cost estimates for non-bearing and bearing orchards for various categories of orchardists are delineated in Table 2.

The per acre annual gross maintenance cost of grape orchardists increased sharply during the phase the production rose before leveling off to a constant stage and, thereafter, it declined, that is, it increased from increasing to constant production stage and declined from constant to declining production stage (Table 2). An increase in gross maintenance cost was also seen with the increase in land holding size of grape orchardists. Upon

splitting the gross maintenance cost of production into various components, it was noticed that prorated establishment cost accounted about 50 per cent share in gross maintenance cost. The share of material input in gross maintenance cost was around 14-18 per cent in the case of bearing age orchard and about 25 per cent insofar as non-bearing age orchards for various categories of orchardists are concerned. About 8-10 per cent of the gross maintenance cost was seen to have been spent towards labour cost used to facilitate various production operations. It is to be noted that the share of labour cost and material input cost in gross maintenance cost of production declined from increasing to constant and from constant to decreasing production stage. This trend also held true in absolute terms. On the other hand prorated establishment cost increased with the increase in age of the orchard. In general, per acre gross maintenance cost was estimated at Rs.15,057 for non-bearing age orchard, Rs.41,921 for increasing production stage orchard, Rs.45,382 for constant production stage orchard and Rs.43, 888 for declining production stage orchard with an overall average of Rs.42,515 for the stage of all bearing age.

Profitability Analysis

Table 2 provides fairly a good account of the expenses of the orchardists on various items of production and maintenance costs. However, it does not reveal the returns of the orchardists over various concepts of costs. The returns of the orchardists over various concepts of costs are, therefore, computed separately for each stage of production for different categories of orchardists and these estimates along with productivity of grapes grown during different stages of production are brought out in Table 3.

An analysis drawn from Table 3 revealed invariably higher net returns over Cost C for small and large category of orchardists, particularly in the case of increasing and constant production stage orchards. As for the declining production stage orchards, the net return over Cost C was the highest for medium category of orchardists. However, in the case of all-bearing age orchards, not much of a difference was noticed. The net returns over Cost C was the least for marginal category of orchardists during all the stages of production. The marginal category of orchardists also showed the lowest productivity of grapes on their orchards. One of the reasons for lower net returns over Cost C for marginal category of orchardists could be traced in lower productivity of grapes on their orchards as compared to other categories of orchardists.

In the case of all-bearing age orchards, the per acre net returns over Cost C was worked out at Rs.40,678 for marginal category, Rs.52,148 for small category, Rs.51,389

for medium category and Rs.53,382 for large category with an overall average of Rs.52,466 for the average category of orchardists. In this sequel, the productivity of grapes was estimated at 80.90 quintals per acre on the farms of marginal category, 94.07 quintals per acre for small, 92.64 quintals per acre for medium, and 92.63 quintals per acre for large category with an overall average of 92.67 quintals per acre on the farms of average category of orchardists. Interestingly, both productivity and net returns over Cost C increased from increasing to constant production stage and declined from constant to declining production stage. In general, one acre grape orchard yielded a net annual income to the tune of Rs.52,853 during increasing production stage, Rs.58,452 during constant production stage and Rs.41,396 during declining production stage with an average of Rs.52,466 during the stage of all-bearing age. The higher returns during constant production stage is obvious to expect as the productivity of grapes was the highest during this stage for all the categories of orchardists.

Financial Analysis of Grape Orchards

The annual maintenance cost estimates presented in Tables 2 and 3 only provide a broad overview on the extent of expenditure incurred and returns accrued to sampled orchardists during various stages of production. These estimates do not reveal the extent of benefits and costs involved during the entire life cycle of the grape orchards. Therefore, in order to obtain more logical results, the sampled orchards have been appraised over their life cycle taking into account various components of costs and returns. While appraising the sampled orchards, information on all the components of cost incurred during each year from the inception of the orchard till the current stage of production were collected from each of the orchardists. These information not only encompassed establishment (infrastructure) cost incurred by the orchardists during the initial year of establishment but also annual maintenance expenses towards labour, input, etc. during each year, and also expenses incurred towards repair of iron angles, replacement cost of wire, angles, bamboo, etc. The information on production of grapes during each year along with farm gate prices were also collected from the sampled orchardists with a view to estimate benefits accruing to the orchardists during each year from the beginning of bearing-age till the current stage of production. This comprehensive information had helped us to get an insight into the year-wise costs and returns for the grape orchards. The costs and return estimates were converted on per hectare basis and they were discounted at an annual rate of interest of 12 per cent for each year. Following this procedure, the

estimates relating to discounted benefits and discounted costs were obtained for each category of orchardists. With the help of discounted benefits and costs, the Benefit-Cost ratio (B-C ratio), Net Present Value (NPV), Internal Rate of Return (IRR) and Payback period were computed for each category of orchardists. The results of financial analysis showing B-C ratio, NPV, IRR and payback period for different categories of orchardists are presented in Table 4.

The financial estimates presented in Table 4 clearly showed fairly high returns from grape orchards. The NPV of grape orchard was estimated at Rs.1,70,343 for the marginal category, Rs.1,86,916 for small, Rs.2,37,122 for medium and Rs.2,39,428 for the large category with an overall average of Rs.2,26,851 for the average category of orchardist. The B-C ratio in this respect was estimated at 1.86 for marginal, 1.91 for small, 2.15 for medium and 2.10 for the large category with an overall average of 2.07 for the average category of orchardist. These estimates clearly showed an increasing NPV and B-C ratio with the increase in land holding size of grape orchardists. The grape orchards yielded higher returns for medium and large categories as against the marginal and small categories of orchardists. Further, it was noticed that it took 9-10 years to recover cost incurred in grape orchards as the payback period turned out to be 9-10 years for various categories of orchardists. This means that until the end of increasing production stage the orchardists had recovered the total cost incurred by him in various production and maintenance operations, and from the beginning of constant production stage till the end of declining production stage the orchards yielded only benefits. The IRR was seen to be higher for medium and large categories as against the marginal and small categories of orchardists. On an average, the IRR was estimated at 37.80 per cent implying that at this rate of interest the discounted benefits became equal to discounted costs for the average category of orhardists. Thus, the results of financial analysis clearly showed high element of profit involved in grape cultivation, particularly for medium and large categories of orchardists.

Conclusions

The results obtained in respect of annual maintenance cost and returns for various categories of grape orchardists are in conformity with the financial analysis. The gross returns from grape orchards during various stages of production are noticed to be twice the cost of production for various categories of orchardists. The results of financial analysis also show a B-C ratio in grape cultivation in the range of 1.86 and 2.15 for various

categories of orchardists with an average of 2.07. Among various categories, the medium and large categories of orchardists not only show quicker payback period but they also show higher NPV and B-C ratio as compared to marginal and small categories of orchardists. The large and medium categories of orchardists are, therefore, noticed to manage their grape gardens more efficiently as compared to small and marginal categories of orchardists. However, in general, the cultivation of grapes is noticed to be a lucrative proposition for all the categories of orchardists because of substantially high element of profit involved in the cultivation of this high value crop. Due to high element of profit, the onus of technological efforts have been more favourably inclined and concentrated behind the cultivation of grapes in the state of Maharashtra. Another important aspect of this high value crop is its international competitiveness. Among various fruits and vegetables, Indian grapes are highly competitive in the world market (Gulati and others, 1994). Efforts should, therefore, be made to boost the export trade of this valued crop by enhancing its production volume.

Table 1: Initial Investment on Grape Orchards by Sample Orchardists

(Rupees/Acre)

Items	Marginal	Small	Medium	Large	Overall
Increasing Stage (3-10 years)					
1. Labour Cost [@]	1898.19	1888.28	2091.21	1974.95	1984.92
2. Tractor Hiring Charges	172.15	315.00	328.66	392.16	355.0
3. Material Input Cost					
a) FYM/Compost	193.22	207.28	223.66	152.16	182.71
b) Super phosphate and others	566.87	704.62	819.01	1113.66	942.53
c) Seeding/Sapling	680.01	822.08	993.52	893.67	875.40
d) Urea Application	152.12	267.31	277.52	301.67	285.53
e) Bamboo	1000.08	1225.78	1466.15	1333.03	1338.22
f) Irrigation and maintenance	997.33	1082.04	1285.11	1315.11	1252.60
g) PP Measures	913.11	822.03	1001.77	1133.89	1030.61
h) Iron Angles	2813.09	2616.55	3015.67	3145.45	2995.08
i) GI Wire	711.71	681.69	875.75	771.11	777.86
j) Cement	108.13	242.87	315.22	400.01	339.99
k) Sand, Rubbles, Transplantation, etc.	688.69	576.41	892.17	1118.08	938.75
Total	8824.36	9248.66	11165.55	11677.84	10959.28
Grand Total	10894.70	11451.94	13585.42	14044.95	13299.90
Constant Stage (11-14 years)					
1. Labour Cost [@]	-	1076.56	909.80	954.88	948.32
2. Tractor Hiring Charges	-	218.63	177.11	153.39	168.23
3. Material Input Cost					
a) FYM/Compost	-	121.67	112.33	79.65	95.88
b) Super phosphate and others	-	444.68	521.17	598.68	555.41
c) Seeding/Sapling	-	522.00	417.19	533.09	487.69
d) Urea Application	-	93.69	106.66	185.49	147.19
e) Bamboo	-	776.43	692.13	613.99	658.25
f) Irrigation and maintenance	-	615.15	778.61	711.31	728.63
g) PP Measures	-	311.01	329.27	668.22	506.84
h) Iron Angles	-	1516.15	1706.25	1692.61	1682.29
i) GI Wire	-	441.11	452.97	569.18	513.36
j) Cement	-	153.00	133.21	199.22	208.17
k) Sand, Rubbles, Transplantation, etc.	-	142.66	262.87	322.93	284.03
Total	-	5137.55	5512.66	6174.37	5867.74
Grand Total	-	6432.74	6599.57	7282.64	6984.29
Decreasing *Stage (above 15 years)*					
1. Labour Cost [@]	522.72	509.43	527.07	508.32	512.85
2. Tractor Hiring Charges	84.41	105.00	109.55	120.72	111.79
3. Material Input Cost					
a) FYM/Compost	74.41	89.09	72.56	60.72	70.49
b) Super phosphate and others	128.96	164.87	171.00	277.22	220.30
c) Seeding/Sapling	156.67	194.03	211.17	217.89	205.30
d) Urea Application	70.71	99.10	72.51	101.56	93.55
e) Bamboo	333.36	408.59	358.72	404.34	391.95
f) Irrigation and maintenance	322.44	360.68	278.37	288.37	307.08
g) PP Measures	324.37	329.01	273.92	367.96	340.28
h) Iron Angles	837.70	772.18	605.00	748.48	740.91
i) GI Wire	227.24	277.23	231.92	267.04	260.18
j) Cement	41.04	90.95	105.07	133.34	110.10
k) Sand, Rubbles, Transplantation, etc.	169.56	192.14	217.39	172.69	183.73

Total	2686.46	2977.87	2597.63	3039.61	2923.37
Grand Total	3293.59	3592.30	3234.25	3668.65	3548.01

Note: @ - Labour cost include labour used for ploughing, harrowing, digging and filling pits, fertilizer application, plantation of sapling, rooted cutting, urea application, fixing of bamboo, spraying for interculture operations, irrigation and maintenance, cutting iron angles, welding and fixing, pp measures, etc.

Table 2: Maintenance Cost and Returns from Grape Orchards

(Rupees/Acre)

Items	Age in Years				
	0-2	3-10	11-14	15 and above	All Bearing Age
Marginal					
1. Lobour Cost @@	1871.41	3474.30	-	3016.84	3257.60
	(14.58)	(10.08)		(7.89)	(8.98)
2. Material Input Cost					
a) FYM/Compost	601.33	1755.60	-	1528.20	1647.88
b) Fertilizer	891.44	1230.78	-	991.53	1117.45
c) Irrigation	877.44	2160.00	-	1920.00	2046.32
d) Insecticides & Pesticides	902.32	1179.53	-	831.09	1014.48
Total	3272.30	6325.91	-	5270.82	5826.13
	(25.50)	(18.36)		(13.78)	(16.07)
3. Land Revenue	7.00	7.00	-	7.00	7.00
4. Interest on Working Capital	567.73	998.07	-	862.02	933.63
5. Depreciation	509.25	611.58	-	651.29	630.39
6. Rental Value of Owned Land	5321.00	5118.00	-	5869.00	5473.74
7. Interest on Fixed Capital	1105.75	1322.41	-	1466.36	1390.60
8. Prorated Establishment Cost	-	16601.28	-	21109.82	18736.90
		(48.18)		(55.18)	(51.68)
9. Others @	178.29	-	-	-	-
G. Total	12832.73	34458.55	-	38253.15	36255.99
Small					
1. Lobour Cost @@	2085.79	3971.33	4159.13	3428.85	3903.85
	(14.83)	(10.02)	(9.45)	(7.76)	(9.61)
2. Material Input Cost					
a) FYM/Compost	688.53	2291.70	2568.30	2006.55	2268.50
b) Fertilizer	921.46	1145.28	1380.89	1133.57	1159.79
c) Irrigation	901.08	2000.00	2160.00	1920.00	1999.17
d) Insecticides & Pesticides	1101.35	1418.84	1493.86	1372.34	1417.12
Total	3612.42	6855.82	7603.05	6432.46	6844.58
	(25.69)	(18.72)	(17.27)	(14.55)	(16.86)
3. Land Revenue	7.00	7.00	7.00	7.00	7.00
4. Interest on Working Capital	597.43	1184.97	1316.05	1053.48	1174.51
5. Depreciation	553.51	705.55	691.89	621.21	692.10
6. Rental Value of Owned Land	5811.00	6322.00	6018.00	6119.00	6270.93
7. Interest on Fixed Capital	1205.67	1467.28	1722.39	1821.01	1537.32
8. Prorated Establishment Cost	-	19110.90	22515.83	24718.84	20177.25
		(48.23)	(51.13)	(55.92)	(49.69)
9. Others @	191.21	-	-	-	-
G. Total	14064.03	39624.85	44033.34	44201.85	40607.54
Medium					
1. Lobour Cost @@	2048.94	4283.48	4141.78	3615.39	4203.91
	(13.44)	(9.49)	(9.03)	(8.67)	(9.33)
2. Material Input Cost					
a) FYM/Compost	717.23	2118.30	2208.30	1835.10	2118.04
b) Fertilizer	939.71	1720.40	1579.21	1478.43	1671.53
c) Irrigation	879.12	2320.00	2240.00	2000.00	2279.18
d) Insecticides & Pesticides	1204.25	1488.13	1228.44	1028.71	1397.22
Total	3740.31	7646.83	7255.95	6342.24	7465.97
	(24.53)	(16.94)	(15.82)	(15.21)	(16.57)
3. Land Revenue	7.00	7.00	7.00	7.00	7.00

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4. Interest on Working Capital	654.41	1291.76	1165.59	1014.33	1243.70
5. Depreciation	649.45	778.21	811.81	699.78	780.07
6. Rental Value of Owned Land	6378.00	6138.00	6448.00	6399.00	6225.89
7. Interest on Fixed Capital	1604.60	1921.39	2005.75	2139.25	1955.85
8. Prorated Establishment Cost	-	23073.74 (51.12)	24017.82 (52.38)	21479.83 (51.51)	23169.91 (51.43)
9. Others [@]	163.28	-	-	-	-
G. Total	15245.99	45140.41	45853.70	41696.82	45052.30
Large					
1. Lobour Cost [@@]	2126.26 (14.02)	3793.00 (9.13)	4195.01 (9.27)	3744.41 (8.24)	3838.88 (9.01)
2. Material Input Cost					
a) FYM/Compost	666.03	1986.60	2061.15	1921.65	1990.19
b) Fertilizer	1001.98	1579.25	1724.62	1552.82	1598.57
c) Irrigation	791.23	2160.00	2000.00	2080.00	2125.33
d) Insecticides & Pesticides	1171.17	1162.74	1097.73	1055.64	1139.49
Total	3630.41 (23.93)	6888.59 (16.59)	6883.50 (15.21)	6610.11 (14.54)	6853.58 (13.75)
3. Land Revenue	7.00	7.00	7.00	7.00	7.00
4. Interest on Working Capital	660.80	1114.11	1134.46	1076.24	1112.62
5. Depreciation	696.65	813.11	870.81	719.23	810.53
6. Rental Value of Owned Land	6119.00	5828.00	6158.00	6445.00	5955.06
7. Interest on Fixed Capital	1719.42	2089.11	2149.28	2201.77	2112.30
8. Prorated Establishment Cost	-	21002.78 (50.57)	23867.11 (52.73)	24654.78 (54.24)	21896.26 (51.42)
9. Others [@]	211.07	-	-	-	-
G. Total	15170.61	41532.70	45265.17	45458.54	42586.23
Overall					
1. Lobour Cost [@@]	2088.30 (13.87)	3949.48 (9.42)	4171.45 (9.19)	3579.85 (8.16)	3937.66 (9.26)
2. Material Input Cost					
a) FYM/Compost	690.60	2079.98	2162.23	1889.83	2069.04
b) Fertilizer	965.09	1517.52	1638.61	1388.61	1520.05
c) Irrigation	842.79	2167.11	2106.08	2014.78	2139.02
d) Insecticides & Pesticides	1175.92	1299.73	1182.73	1103.59	1257.71
Total	3674.40 (24.40)	7064.34 (16.85)	7089.65 (15.62)	6396.81 (14.58)	6985.85 (16.43)
3. Land Revenue	7.00	7.00	7.00	7.00	7.00
4. Interest on Working Capital	649.75	1172.09	1162.39	1040.54	1154.38
5. Depreciation	657.86	777.88	832.43	686.71	774.93
6. Rental Value of Owned Land	6187.66	5997.62	6256.81	6305.47	6075.07
7. Interest on Fixed Capital	1603.24	1901.45	2056.66	2031.33	1941.11
8. Prorated Establishment Cost	-	21050.95 (50.22)	23805.81 (52.46)	23839.82 (54.32)	21639.49 (50.90)
9. Others [@]	188.29	-	-	-	-
G. Total	15056.50	41920.81	45382.20	43887.53	42515.49

Note: @ - Gap filling cost for non-bearing orchards (0-2 years)

Figures in parentheses are percentages to the grand total cost

@@ Labour cost include cost of machine, bullock and human labour

Table 3: Cost of Production and Returns from Various Bearing-age Grape Orchards

(in Rupees/Acre)

	Marginal	Small	Medium	Large	Overall
Increasing Production Stage (3-10 years)					
1. Cost of Cultivation					
Cost A_1	10375.51	11772.68	12843.66	11843.26	12055.98
A_2	14214.01	11772.68	12843.66	11843.26	12127.06
B	33416.50	38672.86	43976.79	40763.15	41005.91
C	34458.55	39624.85	45140.41	41532.70	41920.81
2. Yield (qtls./acre)	81.13	94.55	91.92	91.96	92.28
3. Gross Return	79102.80	93132.80	95132.80	95825.60	94773.52
4. Net Return					
- Over Cost A_1	68727.29	81360.12	82289.14	83982.34	82717.54
A_2	64888.79	81360.12	82289.14	83982.34	82646.46
B	45686.30	54459.94	51156.01	55062.45	53767.61
C	44644.25	53507.95	49992.39	54292.90	52852.71
Constant Production Stage (11-14 years)					
1. Cost of Cultivation					
Cost A_1	-	12982.06	12192.62	12191.52	12261.59
A_2	-	12982.06	12192.62	12191.52	12261.59
B	-	43238.28	44664.19	44365.91	44380.88
C	-	44033.34	45853.70	45265.17	45382.20
2. Yield (qtls./acre)	-	100.58	96.57	101.43	99.94
3. Gross Return	-	103098.88	102848.64	104671.04	103834.07
4. Net Return					
- Over Cost A_1	-	90116.82	90656.02	92479.52	91572.48
A_2	-	90116.82	90656.02	92479.52	91572.48
B	-	59860.60	58184.45	60305.13	60602.96
C	-	59065.54	56994.94	59405.87	58451.87
Declining Production Stage (above 15 years)					
1. Cost of Cultivation					
Cost A_1	8703.78	10460.71	10743.28	11310.08	10770.37
A_2	13105.53	10460.71	10743.28	11310.08	11200.98
B	37148.96	43119.56	40761.36	44611.63	42946.97
C	38253.15	44201.85	41696.82	45458.54	43887.53
2. Yield (qtls./acre)	80.57	88.16	87.21	85.30	85.03
3. Gross Return	74524.24	85952.00	89389.76	85809.44	85283.60
4. Net Return					
- Over Cost A_1	65820.46	75491.29	78646.48	74499.36	74513.23
A_2	61418.71	75491.29	78646.48	74499.36	74082.62
B	37375.28	42832.44	48628.40	41197.81	42336.63
C	36271.09	41750.15	47692.94	40350.90	41396.07
All Bearing Age					
1. Cost of Cultivation					
Cost A_1	9583.64	11661.55	12547.63	11831.80	11928.63
A_2	13688.94	11661.55	12547.63	11831.80	12033.26
B	35184.87	39646.75	43899.28	41784.87	41584.26
C	36255.99	40607.54	45052.30	42586.23	42515.49
2. Yield (qtls./acre)	80.90	94.07	92.64	92.63	92.67
3. Gross Return	76934.01	92755.38	96441.71	95967.80	94981.84
4. Net Return					
- Over Cost A_1	67350.37	81093.83	83894.08	84136.00	83053.21

A$_2$	63245.07	81093.83	83894.08	84136.00	82948.58
B	41749.14	53108.63	52542.43	54182.93	53397.58
C	40678.02	52147.84	51389.41	53381.57	52466.35

Note: Cost B also includes prorated establishment cost.

Table 4: Financial Indicators for Various Categories of Orchards

Indicators	Marginal	Small	Medium	Large	Overall
NPV (Rs./Acre)	1,70,343	1,86,916	2,37,122	2,39,428	2,26,851
BC Ratio	1.86	1.91	2.15	2.10	2.07
Payback Period (Yrs.)	10.76	10.50	9.31	9.52	9.66
IRR (%)	32.48	33.70	39.80	38.59	37.80