

**ECONOMICS OF PRODUCTION AND VALUE  
ADDITION TO WINE GRAPES IN BIJAPUR DISTRICT  
OF KARNATAKA**

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# 1. INTRODUCTION

The wine industry in India is projected to grow at more than 30 per cent annually in next decade, the quantum jump from 2 million liters of wine production to 13 million litres in 2007. With the wine consumption in Karnataka recording a steady rise in the last few years, several wineries have evinced interest to invest in the state, even as five wineries would be fully operational by the end of the year. While two wineries are coming up at Devanahalli near Bangalore, one each in Koppal, Kolar, and Belgaum districts, at least three companies have shown interest in setting up wineries in the state. Following the spurt in the number of wineries, the Karnataka State Department of Horticulture is expecting the area under wine grape cultivation to increase from 700 acres at present to around 2,000 acres by the end of 2009.

The wine sales in the Karnataka, which was around 4.9 lakh liters in 2003-04, have exceeded 14 lakh liters during 2007-08, the sales figures include imported (both from outside the state and the country) wines and those produced in Karnataka. In Karnataka, more than 12 varieties of grapes are used for wine making. Cabernet sauvignon, pinot noir, merlot, pinnotage, shiraz, zinfandel, cihardonnay, chenin blanc and others are being cultivated by farmers who have contracts with the wineries. These varieties are mostly grown in Bijapur, Belgaum, Koppal, Baglkot, Bangalore rural and urban, and Chikkaballapur districts. Karnataka is the second largest producer of wine, next to Maharashtra. Many factors, such as the increasing consumption of wine and promotion of wine as a healthier drink, when compared to other varieties of alcohol have kindled interest for wineries to invest in Karnataka. If table grapes fetch Rs. 6 to Rs. 15 a kg to the farmer who harvests around 15 tonnes per acre, the wine varieties fetch Rs. 35 to Rs. 40 a kg and five to six tonnes can be harvested from each acre. These varieties require less water, and are grown organically.

## Grape

Historically, grapevine (*Vitis vinifera* L.) is grown mostly for wine making in the world over. In India on the contrary remarkable success has been achieved in table grape production and yield levels of fresh grapes are among the highest in the world. At present in India grape is grown over an area of 60,000 ha with an annual production of 1.6 million tonnes.

Wine has been made in India as early as 5,000 years ago. It was the early European travellers to the courts of the Mughal emperors Akbar, Jehangir and Shah Jehan in the sixteenth and seventeenth centuries A.D. who reported tasting wines from the royal vineyards. Both red (Kandhari) and white wines (Bhokri, Fakdi, Sahebi etc.) were produced. Under British influence in the nineteenth century, vineyards were established in Kashmir and at Baramati in Maharashtra and a number of Indian wines were exhibited and favourably received by visitors to the Great Calcutta Exhibition of 1884. However, Indian vineyards were totally destroyed for unknown reasons in the 1890s.

Wine grape cultivation as commercial proposition.

The cultivation of grape when compared to other perennial horticultural fruits is much more complicated and risky. The heavy initial investment on the supporting structure, coupled with high annual maintenance cost makes its cultivation, the exclusive domain of affluent few. However its high economic values in terms of quick and heavy net returns attract many enthusiastic growers towards this enterprise. Given assured financial support together with good managerial capacity, wine grape growing can be one of the most profitable and highly sought after enterprise.

Although exact figures are not available regarding the current area and production of wine grapes in India it is estimated around 1000 hectares in Maharashtra and about 200 hectares near Bangalore and 80 hectares in Bijapur, Karnataka.

In northern Karnataka, Bijapur is the leading district with respect to both area and production of wine grapes. The total area and production of wine grapes in Bijapur is 80 hectares and 1200 tonnes respectively. Most of the wine grape varieties are grown in Karnataka. The most popular red varieties in cultivation are Shiraz, Cabernet Sauvignon, and Zinfandel. The most popular white wine grapes are Chenin Blanc, Sauvignon Blanc,

The wine grapevine is usually propagated by hard wood cutting and transplanted in October after rooting in nursery. It requires a deep, loamy soil with good structure and should be well drained and aerated. A pH of 6.0 is preferred and the soil must be practically salt free.

It is a heavy feeder and gives good response to manures and fertilizers and timely intercultural operations. It is highly labour intensive crop. However, marketing is the main limiting factor, the crop comes to harvest in 15-18 months after planting.

#### Wine production as commercial proposition

Due to limited domestic consumption of wine and non availability of standard wine varieties to produce good quality wines of international standards, much emphasis was not given for research during previous decades in India. Commercial wine grape production, however in India has begun only since 1980's. Although exact figures are not available regarding the current area and production of wine grapes in India it is estimated around 1000 hectares in Maharashtra and about 200 hectares near Bangalore and 80 hectares in Bijapur, Karnataka. Among these vineyards 80 per cent are yielding another 20 per cent are in establishment stage. In Maharashtra, wine grapes are grown in 3 regions, such as Pune-Narayangaon, Nasik and Sangli-Solapur areas. It is expected when all these vineyards start yielding in about 2-3 years, around 15,000 tonnes of wine grapes will be ready for crushing each year yielding on an average of 90 lakh litres of wine annually. There is a steep annual growth rate of about 20% in the present turnover of around Rs. 200 crores. Besides, demand for imported wine is increasing day by day in India. About 38 private wineries have come up in the country, 36 exist in Maharashtra and two in Karnataka and one in Goa. The total investment on wineries of Maharashtra was Rs. 77.75 crores in 2004 and raised to Rs. 109.17 crores in 2005.

These private wineries were initially established under joint set-up with European collaborations, preparing wine from standard varieties. The most popular red varieties in cultivation are Shiraz, Cabernet Sauvignon, Pinot Noir and Merlot and for Rosae still wines, Zinfandel is used. The most popular white wine grapes are Chenin Blanc, Sauvignon Blanc, Ugni Blanc, Viognier, Chardonnay and Riesling.

To meet the domestic demand and for exporting wines from India, good quality wines comparable to standard wines of Europe and USA have to be produced. To give impetus to the grape processing and wine industry in Maharashtra and for the benefit of farmers, the state announced a comprehensive 'Wine Policy' in 2001 and recently in September, 2005 it has established 'Maharashtra Grape Board' especially to develop marketing channels for grape products in our country. Keeping in mind the welfare of the farmers of Karnataka and with an intention to develop wine production and marketing and also to provide suitable incentives in the direction, the government has enforced the 'Karnataka Grape Processing and Wine Policy-2007.'

Both the Indian wine market and the indigenous wine industry are in their nascent stages, but growing by leaps and bounds. Fifteen years ago there was no locally made wine that was drinkable. Now there are three significant wine makers, all family-owned businesses, the Chougules, the Grovers and the Samants. There is also great interest in wine makers from France, Italy, Australia, South Africa, America, and Chile to enter the Indian market.

During the year 2005, the total annual production of wine in India was 6.214 million litres, out of this 5.4 million litres was produced in Maharashtra alone that comprises 2.54 million litres of red wines, 2.69 million litres of white wines, 0.15 million litres of sparkling and 0.036 million litres of rosae wines. This is a very small fraction as compared to world's annual production of 32,000 million litres. The country also imports 72,000 wine cases (9 litres/case) in a year where 32,000 cases are bottled in origin and remaining 0.36 m litres are imported in bulk flexi bags and subsequently bottled by Indian wineries. Besides this, about 12,000 – 15,000 wine cases are sold through gray market.

The biggest consumption up to 80% is however confined to major cities like Mumbai (39%), Delhi(23%), Bangalore (9%) and the foreign tourist dominated state of Goa (9%), where as Rest of India has only 20% consumption. Some Indian wine makers have also started importing foreign made wine and bottling and selling it here in India. Among the importers ; ITDC (Indian Tourism Development Corporation), Sansula, Brindco and E&J Gallo predominate. The Indian market is way behind major wine drinking countries. The per capita

consumption in India is only 0.07 litre/person/year as against 60-70 litres in France and Italy, 25 litres in US and 20 litres in Australia and even China has 0.4 litres.

#### Importance of the present study

Bijapur is the leading grape cultivating district in Karnataka. Wine grape production is mainly concentrated in Bijapur taluk and there is emerging trend in other talukas of Bijapur district. The district is known for cultivation of horticultural crops in general and fruit crops in particular. The fruits grown in the district are known for their qualities.

The analysis of the costs and returns from wine grape production and investment pattern in wineries are the two important aspects of research, which can guide the producer in the readjustment and proper management of resources and to bring down the cost of production at farm level without affecting the output and it also guide the investor allocate resources to establish winery.

Majority of the farmers in the study area are growing Cabernet Sauvignon, Zinfandel, Shiraz and Chenin Blanc varieties. The high remuneration in growing wine grapes has attracted the farmers to cultivate wine grapes. Accordingly, the farmers are cultivating the wine grapes and there is considerable increase in wine grape area as well as quantum of wine grapes produced. The wine grape growers in the study area are facing marketing problem and hence are looking for good marketing facilities.

As the wine grape production involves heavy initial establishment and subsequent high maintenance expenses, its economic analysis is of great importance but the studies conducted on economics of wine grape production and investment pattern in wineries are very few. The present study is an effort in this direction of having an integrated study of all economic aspects of production and processing of wine grapes and to identify the constraints faced by the wine grape producers and winery with an overall view of exploring the possibilities for bringing about the required improvement.

#### Objectives of the present study

The study was conducted in Bijapur district of Karnataka with the following specific objectives.

#### Specific objectives of the study

1. To estimate cost and returns in wine grape production
2. To study the investment pattern in wineries
3. To study the value addition in wine grapes
4. To identify the constraints in wine grape production and winery

The hypotheses outlined for the study were:

1. Wine grape production is profitable
2. The investment in wineries is financially feasible
3. Wine grape producers and wineries are facing a number of problems

## 2. REVIEW OF LITERATURE

A review of the research work done in the past relating to the present study has been presented in this chapter. The number of studies conducted on wine grapes are very few and hence the studies on economic analysis of other fruit crops have been reviewed. The review of literature is presented under the following sub heads.

- 2.1 Cost and returns in wine grape production
- 2.2 Investment pattern in winery
- 2.3 Value addition in wine grapes
- 2.4 Constraints in wine grape production and winery

### 2.1 Cost and returns in wine grape cultivation

Bergonzi *et al.* (1992) compared the production of wine grapes by using two low vine-training systems: the double Guyot system is very difficult to operate using mechanical equipment, whereas the spurred cordon system can be successfully mechanized. Results showed that the two systems have identical cost patterns; the greatest costs for both systems were rooting cuttings (26%) and the fixing of stakes (41%). The overall cost of double Guyot system is slightly lower than for the cordon system; it is the wiring costs which cause this difference. The greater costs of the cordon system are amply compensated by the opportunities for mechanization which the system offers.

Hauser (1996) discussed the general advantages of farm mechanization as a way of reducing labour costs in South Tirol, Germany. He pointed out that though operating costs per ha vary very little with farm area, fixed costs per ha become very high for small farms and in this case hiring or sharing is a lower cost option. The organization of a machine cooperative in the South Tirol wine growing area and of a farm helper service in Wurttemberg are briefly described, Psychological and technical problems of machine sharing or hiring are discussed and equipment suitable for the South Tirol wine growing area is suggested.

Chitra *et al.* (1997) in the study on economics of ber production in and around Hyderabad city of Andra Pradesh found that, the total costs of establishment in the first year were 7,913 per hectare. The total cost incurred during the maintenance was Rs. 3,483 per hectare. The total cost of cultivation worked out to Rs. 16,737 per hectare. The results of the study indicated profits were relatively higher in ber cultivation.

Krishna Rao *et al.* (1997) conducted a study on Profitability of Mango cultivation in drought prone areas of Anantpur district of Andra Pradesh. The results of economic analysis indicated that the investment on mango garden in the region was profitable proposition. The establishment cost per hectare of mango garden during first four years were Rs.3,748, Rs.2,029, Rs.2,012, Rs.2,452 respectively. The annual maintenance cost, i.e., from fourth years onwards worked out to be Rs.5, 169. per hectare. The cost of production per hectare of a mango garden was Rs.17, 828 and the gross returns realized from the output of mango worked out to Rs.22, 083 per hectare. The net returns obtained from the output were Rs.16,194 per hectare.

Flowell *et al.* (2000) analysed the Cabernet Sauvignon wine variety. With average prices and weather conditions, the net present value per acre was \$15 816 after 19 years, the internal rate of return was 32.27%, and the payback period was 4 years and 8 months. Increased production risk associated with higher critical temperatures at which fruiting buds are killed reduced the net present value of the average net returns by approximately \$2343 per acre and the internal rate of return by almost 4%. The payback period was lengthened by 3 months. When the price was lowered by one standard deviation, the net present value of the discounted future average net returns were reduced by approximately \$3000 per acre per year. The internal rate of return was decreased by almost 5%, and the payback period was longer by almost 4 months. The marketing or price risk had a larger impact than the production risk from low winter-time temperatures on the financial returns.

McGrath (2000) conducted a study in 1999 by sending questionnaire to 31 New

Zealand premium wine producers requesting details on vineyard establishment, management and production. The information collected was then used to calculate the costs of production of five quality wine grapes and compare them to 'average' viticulture costs. Results indicated that the costs were significantly higher than average production costs.

Guledgudda *et al.* (2002) conducted study on economics of banana cultivation and its marketing in Haveri district of Karnataka, reported that the variable cost incurred by producer was Rs. 54,502.81 per hectare which was accounted to 65 per cent of total cost. Among variable costs, the human labour was found to be the major item of cost, which accounted to 18 per cent. On an average farmers got 175 quintals of banana yield as main product valued at Rs. 1, 54,375 and farmers have realized Rs. 30,000 by selling suckers, the gross returns from banana cultivation were Rs. 1, 84,375 per hectare. The net returns realized by farmers were Rs. 1, 00,545.96 with a B: C ratio of 2.19.

Shivanad (2002) studied the cost and return structure in banana in North Karnataka and concluded that cultivation of banana in the study area is highly profitable and on an average banana growers obtained net returns of Rs 85,260 per hectare per year which is about Rs 2, 61.726 for cycle of three years period.

Plahuta *et al.* (2006) conducted a study on production of wine grapes using two different genetically modified organisms (grapevine fan leaf virus and polysaccharide-degrading wine yeast) based on empirical cost estimations and real experimental data. Cost analysis indicated that genetically modified organisms are currently not very effective in reducing costs for viticulture and winemaking. Only in the case where infestation of grape fan leaf virus was very intensive, better results were obtained in the case of genetically modified vine. Legislation has a strong influence as compliance incurs additional costs (identity preservation, labelling) in the case of GMO technology.

Sefo *et al.* (2006) in their study on economics of production of wine grape sorts on eight family farms in 2001 and 2002 in canton region included the analysis of the most important results of grape production, viz., total crop production, total production costs, worth of production, production costs, realization costs and profitability coefficient. In 2002, production value increased by 33.1% compared to that of in 2001, the increase is the result of an insignificant growth in crop production and a significant increase in the selling price. In total production costs, direct expenses were 87-90%, and indirect were 10-13% per family farm. The average production cost of 1 kg of grapes was 0.72 KM in 2001 and 0.71 KM/kg in the succeeding year. The selling price has shown a tendency of growth, it was 30% higher in 2002 compared to that of in 2001. The average profitability coefficient was 1.43 in 2001 and 1.85 in 2002. The increase is a result of an insignificant growth in the crop production per acreage, and a significant increase in the selling price.

Conradie *et al.* (2006) conducted a study on two panels of wine grape farms (34 in Robertson and 36 in Worcester) for 2003 and 2004 and a cross section of 37 table grape farms in De Doorns for 2004 by fitted stochastic frontier. The panel of wine grape farms is the best model as tests show that De Doorns is different. Output is explained by land, labour and machinery and efficiency is affected by labour quality, age and education of the farmer, location, the percentage of non-bearing vines and expenditures on electricity for irrigation. There is evidence of a small degree of increasing returns to scale.

Leumann *et al.* (2007) conducted a study on 100 wine grape growers across Switzerland in 2005 and compared with the cost of production data from 2000. There was low production cost due to improved labour use and generation change with new younger growers taking over, well-mechanised systems. Other major changes were decreased interest rates and financing costs, longer standard depreciation assuming a 23-year yield phase, increased labour costs (up 10%) and decreased hand labour (-5%). And further it is concluded that major further savings are limited, because of production costs are only 30% of the final bottled wine, the competitiveness is also linked to other measures.

## 2.2 Investment pattern in wineries

Vreeland *et al.* (1992) studied the profitability and financial feasibility of small premium winemaking plants in New York State based on assumptions about grape and bottle prices, inflation, growth strategy and debt. Capital asset costs to build and equip a winery ranged from \$164 000 (or \$27.31 per gallon) to \$1.566 million (or \$15.66 per gallon) for the 6000 and

100 000 gal wineries, respectively. Average total cost per bottle (750 ml) decreased from a high of \$3.68 at 6000 gallon to \$2.99 at 100 000 gallon, assuming a grape cost of \$600 per tonne. While capital asset costs per gal and average total cost per bottle declined with winery size, market channel discounts overwhelm these economies of size. The internal rates of return decrease with capacity because, as winery capacity expands, proportionately larger market channel discounts are required to move the product.

Dillion *et al.* (1993) analysed the economics of grape juice production by wineries ranging in capacity from 5,000 to 100,000 gallons of wine annually found that juice production at 5% of winery capacity could be a profitable supplement for wineries in the 10,000- to 100,000gallon range. Additional investment needed for cold press juice processing by wineries with 5,000 to 100,000 gallons of fermenting capacity is \$18,250 to \$48,750 for pasteurization equipment. The cost of a small heat exchanger was added for hot press juice processing, adding \$2,750 to \$6,250 for the same winery capacities. This process will produce up to 200 gallons of juice per ton of grapes. Cold pressing grapes will yield 160 to 170 gallons of juice per tonne.

Castaldi and Folwell (1995) studied the economics and financial requirements of five different sized Washington wineries. Results indicate that even a small winery (10 000 gal) will require an investment cost for land, buildings and equipment of several hundred thousand dollars. On a percentage basis, the cost of the winery building itself accounted for the largest proportion of the total investment cost. Total investment costs on a per gallon basis declined with winery size. For larger wineries, many of the individual equipment investment categories increased at an increasing rate with winery size caused by a shift away from labour to capital intensive production practices. The major production cost items that wineries faced were labour and grapes. The larger the winery the larger its labour costs. Total production costs consisted primarily of variable costs. Economies of scale were shown to exist as wineries increased in size, however, smaller and smaller cost savings were observed. As winery size increased marketing costs rose, absorbing or offsetting some of the cost savings resulting from cost economies.

Castaldi *et al.* (1995) analysed the financial feasibility of various winery sizes in USA. Small wineries can produce positive net present values (NPV) and acceptable internal rates of return (IRR) if the correct cost and revenue situations exist. The NPV increased steadily with winery size whereas the IRR first increased with winery size, attained a peak at the 300 000 gallon size, and then slightly decreased for the 900 000 gallon winery. In general, the smaller the winery the less sensitive is its profitability, NPV, and IRR to fluctuations in grape prices. The biggest factor affecting these three measures of financial returns was the premium wholesale case price. Grape prices influenced profitability, NPV, and IRR to a greater degree as winery size increased. The smaller the winery the more sensitive it was to fluctuations in tasting room prices.

LinYeJin and Kao Te Cheng (1999) analyzed the establishment of private wine factory in Taiwan. During 1996, the Taiwan Tobacco & Wine Monopoly Bureau terminated their contract for purchasing wine grapes, causing some farmers to change from grape cultivation to other crops. They analyzed the potential for establishment of private wine production with estimates of expenses made. A payback period evaluation showed that for investment of NT\$95.83 million for construction of a factory, the payback period would be about 3 years (3.5 years if the land cost of NT\$32 million is included). Thus it is concluded that from an economic standpoint, it is feasible to establish a wine factory.

Flowell *et al.* (2001) used an economic-engineering approach to estimate the investment and operating costs in 300 000 gallon wineries, using data on the wine industry in Washington State, USA. Buildings, fermentation and cellar equipment dominated the investment costs. The main operational cost was the cost of grapes, followed by labour, taxes and interest.

Folwell *et al.* (2001) worked out the Investments and operating costs in wineries producing premium table wines ranging in size from 2000 to 500 000 cases (one case=12 bottles of 750 ml capacity). They reported that initial investment costs ranged from \$451 170 (US dollars) to \$26 225 720. Cost economies were found, with the average total operating cost for the 2000-case winery being \$101.67 per case and for the 500 000-case winery only \$38.88 per case. All of the wineries produced positive cash flows by the third year, the net present value of the investment over a 10-year period was positive for all the wineries under

200 000 cases. Results showed that wineries of 200 000 cases and more were more sensitive to product and input price changes than were the smaller wineries.

Fickle *et al.* (2005) studied the total investment costs for the wineries. They ranged from \$560,894 for the smallest winery to \$2,339,108 for the largest winery. Investment costs included all of the initial costs to construct and operate a winery, including equipment costs, construction costs, and land costs. For all wineries constructed, the plant and office costs were the highest percentage of total investment costs. The 10,000 case winery's investment costs had 55.12 percent in plant and office costs. Cooperage accounted for the second largest investment cost. The 10,000 case winery had the largest percentage of cooperage costs at 22.20 percent, while the 2,000 case winery had the Smallest at 9.26 percent.

### 2.3 Value addition in wine grapes

Maxa and leisser (1995) used model calculations with current Austrian price to calculate marketing margins for three stages of wine production from grape processing to bottling. The calculations show that the production of grapes for sale is not economic, with a return of only 1.44% and a capital gain of 44% over 20 years; cask wine production shows a return of 2.60% and a capital gain of 160%; and production of bottled wine a return of 4.19% and a capital gain of 319%.

Srinivas *et al.* (1996) in their study on the economics of processing of cashewnut in Andhra Pradesh, indicated that the processors have to bear the processing cost of Rs. 124.22 per 80 kg of raw nuts. Out of the total cost, Rs. 50.77 was raw material cost, which formed 40.89 per cent and labour cost was Rs. 72.81 which accounted for Rs. 58.61 per cent of total processing cost.

Mahesh and Nagaraja (2002) reported that the value addition of cashew (*Anacardium occidentale*) kernel baby bits (CKBB) was attempted by coating with cane sugar, honey and salt. Optimum coating occurs at 100 degrees C for 5 min at 70% concentration for cane sugar and honey, and 5% for salt. Sweetened (70%) and vanillin (0.1%) flavoured CKBB are the most preferred. De-fatting of CKBB enhances the per cent coating. Coating of cashew kernels of different grades with cane sugar at 70% is dependent on the surface area. Cashew apple juice could be coated on the CKBB. Acceptability of cashew apple juice coated baby bits (BB) improves with the addition of cane sugar at 70% concentration. Permitted colours and cane sugar compete with each other during coating.

Madhuri and Kamini Devi (2003) found that in watermelon, the rind constituted 33% of the whole fruit weight. Value added preserved products like pickles, tutti fruity, vadiyams and cheese were prepared using the white portion of watermelon rind. The quality of products in terms of physical parameters was evaluated. All products were subjected to sensory evaluation test using a panel of 20 judges. Results showed that mean sensory scores for product attributes were high. There was no change in mean scores after one month storage.

Gungor and Gungor (2004) studied the economics of wine production and marketing by small family producers in northwest Turkey, based on data obtained from 12 holdings during the 2001-02 production period. The average production cost of quality wines is calculated at 1.026 euro per bottle and the selling price is 2.43 euro per bottle. For table wines, production cost is 0.662 euro per bottle and the selling price is 1.086 euro per bottle. Marketing strategies are discussed in relation to the marketing mix (product, price, promotion

Deorukhakar *et al.* (2007) conducted a study in Sindhudurg district of Maharashtra, India, to study cost and returns structure in kokum (*Garcinia indica*) processing units and to estimate value addition as well as employment potential in kokum processing units. The data from 30 kokum processing units were collected with the help of specially-designed schedules. The data pertained to the 2003-04 production season. The study revealed that the total cost of processing of one-quintal fruits for kokum syrup was Rs. 2440.88/-, that for kokum agal was Rs. 867.90/-, and that for kokum rind was Rs. 1102.18/-. The gross returns obtained after processing one-quintal kokum fruits into kokum syrup was Rs. 3780.52/-, whereas gross returns from kokum agal and kokum rind was Rs. 1344.24 and Rs. 1707.10, respectively. Net returns obtained were Rs. 1339.63/-, Rs.476.33/- and Rs.604.91/- from kokum syrup, kokum agal and kokum rind, respectively

## 2.4 Constraints in wine grape production and winery

Grismer *et al.* (1997) studied the Wine production in California, USA. They focused that wine production generates wastewater with a high solids concentration and acidic pH. This effluent, variable in solids content and quantity, is often discharged into wastewater lagoons where it quickly becomes anaerobic and creates odour and disposal problems. They described initial work on the use of a low-cost and low-energy intensive wetland treatment system treating winery effluent to a standard where water may be reused. Measurements were made of the removal efficiency of a subsurface flow system with respect to suspended solids and chemical oxygen demand (as a function of depth and distance from the effluent source). Both of these variables were removed within the first few metres of the influent source. This study uses some of the results to illustrate processes associated with subsurface flow wetland treatment of wastewater.

Govinda Reddy *et al.* (1997) identified the problems of mango growers in Srinivasapur region of Karnataka. The major constraints faced by mango growers at the production level were lack of knowledge on the application of balanced fertilizers (88 per cent of respondents) followed by lack of awareness on drip irrigation (84 per cent) technology, heavy rain and wind during flowering and fruit development stage (82 per cent), non-availability of credit (80 per cent), non-availability of labour (78 per cent), high cost of inputs (74 per cent), lack of knowledge on proper plant protection chemicals (63 per cent), lack of knowledge on technical guidance (43 per cent), high incidence of pests and diseases (36 per cent) and the availability of quality grafts (26 per cent). The major constraints in mango exports were lack of near by processing units, storage facilities, pre-cooling units, knowledge in chemical treatments of units, regulated markets and improved harvest. Other problems were exploitation by middlemen, lack of grading etc.

Gunjate (1997) reported problems of cashew plantation management at regional fruit research station, Vengurla, Maharashtra, he observed that some problems in cashew plantation management were non-availability of right kind of inputs, inadequate funds, non-availability of suitable farm equipments and machinery, non-availability of qualified and experienced personnel. He concluded that it is necessary to make available the grafts of the choicest variation in all the regions. Replanting the gaps should be done as early as possible and it should never be left beyond second year. The prophylactic sanitary measures recommended found to be quite effective against stem and root borers.

Aloysius and Lee (2001) examined the evolution of a wine region Geographe, Australia. They collected information from 53 winery owners through series of surveys, questionnaires and personal interviews. In particular the development and management of wine tourism was studied. Three groups of variables: orientation differences, financial and entrepreneurial constraint, and current strategy were discussed as being important in the decision to diversify into wine tourism, or not. It is found that the development of wine tourism has been under-exploited at present. Suggestions for an all-encompassing, strategic development plan for the region are reported.

Oda (2001) examined the current status of the wine industry in California, USA, which has shown remarkable growth. Some guidelines for developing future research in this area are developed and 10 research themes are presented: the consumption of wine, and the background culture, history, and technology; industry organization for wine grapes and wine production; vineyard and winery management, and their relation to agricultural development; custom crush and custom crush option, and their influence on the wine industry and development of such forms of individual management; the role and the positioning of wine university extension programmes and research institutes and their effect on the wine industry; wine making and trade and their influence on the wine industry; sensory evaluation for wine and its influence on the wine industry; laws and regulations concerning production, marketing, and consumption of wine and their influence on the wine industry; rural development and the wine industry; and land use planning, environmental problems, and the wine industry.

Guledgudda *et al.* (2002) conducted a study on economics of banana cultivation and its marketing in Haveri district of Karnataka. The study identified production problems like lack of technical know-how, scarcity of labour, pest and diseases, lack of adequate credit facility, and scarcity of water. The farmers in the study area expressed also marketing problems like involvement of intermediaries, lack of storage facilities and inadequate transportation.

Shivanad (2002) studied the performance of banana plantations in northern Karnataka. The study revealed, as perceived by the farmers the major problems in cultivation of banana were severe incidence of *Musa sercospora* disease in all the districts of northern Karnataka, the disease lead to heavy crop losses. Erratic onset of monsoon was another problem in Belgaum district affecting banana plantations. In Gulbarga district the non availability of labour and high labour wages and non availability of technical assistance for improved cultivation of banana pose severe problem in production of banana. In marketing of banana farmers were facing the problem of delayed payments of sale proceeds, high cost of transportation of produce, wide price fluctuations and high commission charges.

Beames (2003) reputed the challenges facing the further development of the wine tourism industry in Australia. Problems identified include: the product focus of the wine industry; the current cottage industry mentality of wine tourism; a lack of inter-industry cooperation between the wine industry and the tourism industry; the need to create an overall tourist experience; the issues of getting local planning and development consent; the lack of investment funds; and the lack of available data, information and research on wine tourism. Suggestions for new product development are made.

Correia *et al.* (2004) evaluated the performance of wine routes in Portugal, for this they used Bairrada Wine Route as a case study and attempted to make the first evaluation of the route. They collected data from winery managers about a number of issues. These included their initial objectives when their wineries joined the route; the problems and constraints that they have faced since then; and the level of satisfaction with the route, especially regarding the investments made and jobs created. Additionally, the study examined the winery managers' views on: the actual management model for the route; the advantages for their business; current signage; partnerships and collaborations developed; and levels of demand. The study also gathered perspectives on the future of the route. The study was carried out in two stages. During the preliminary stage exploratory interviews were used and meetings attended in order to get an overview of the subject. During the second stage of data collection in-depth interviews with managers were conducted as well as observations at the wineries

Madigan (2004) reported that domestic wine consumption in India is growing 20% a year and there are signs that India could become a significant market for Australian wines in the near future. However, it is going to take time to learn more about the marketplace and there are several hurdles to overcome, including an horrendous tax system, a complex bureaucracy, limited logistics and warehouse facilities, and a general low awareness of wine.

Raifer (2004) reported that Bunch stem necrosis is a disorder causing serious problems in the cultivation of wine grape cv. Cabernet Sauvignon in South Tyrol. As known from many experiments and from practical experience, bunch stem necrosis cannot be cured sufficiently with conventional treatments. To date, the underlying mechanism causing this disease could not be clearly determined. However, numerous factors influencing the incidence of bunch stem necrosis were identified. First, it has been shown that an elevated and unbalanced supply with mineral favours the outcome of the disease. Second, there is a connection between the disease and the quality of flowers and fruit settings. Cabernet Sauvignon shows massive blossom drop during flowering. Thus it was speculated that there might be a link between this observation and susceptibility of this cultivar to bunch stem necrosis. However, there is evidence that not only the nutrient's supply but also their availability in the soil need to be analysed in more detail to be able to avoid this disease.

Zulini *et al.* (2004) studied the use of biological control agents (BCAs) in organic pest management and the present situation of organic viticulture in Trentino were documented with a survey done in the collaboration with the Organic Growers Association of Trentino (ATABIO). The incidence and severity of diseases in organic vineyards and the existing problems and constraints in the non-chemical control of grapevine pests were evaluated. Downy mildew was found to be the main problem, followed by powdery mildew and mites. Grey mould is a problem only in extremely wet areas, but can be managed with agronomical techniques. Weeds are a serious problem during the early stages of new vineyards. In general, pests and diseases are not severe constraints for organic growers in Trentino and they are mainly controlled with sulfur, copper, pyrethrum and mating disruption. BCAs would be more frequently applied if information on their application and efficacy will be available from valid experimentation.

Gowda and Gowda (2005) conducted a survey among grape growers (100 growers of Thompson Seedless grapes and 100 growers of Bangalore Blue grapes) in Karnataka, India, to determine the reasons for partial adoption and non-adoption of sustainable grape farming practices. Important reasons cited for non-adoption and partial adoption were: lack of knowledge; lack of technical guidance; non-applicability; financial problem; and non availability of farm inputs.

Berruto *et al.* (2006) proposed a new method for bottling plant while establishing winery which is more difficult one. The bottling plant has been assumed as a single-machine job shop where wine orders of different amounts and due dates must be processed. In order to limit the complexity introduced by the large number of variables and constraints, the sequencing has been obtained by means of a two-step procedure based on mixed-integer linear programming algorithms. The optimization takes into account, for each wine type, data on production rates, storage levels, minimum batch size, labour and storage costs, and risk due to not having the minimum storage and having lost sales. The method operates on a finite time horizon, typically four weeks, with recursive rescheduling each week.

Gyore and Radocz Kocsis (2006) analysed the competitiveness of major wine-producing countries in terms of strengths and weaknesses in production and trade. A ranking list of wine-producing countries was prepared. Included in the ranking were: France, Italy, Spain, Hungary, USA, Australia, Chile, Argentina, and South Africa. The USA ranked first in competitiveness. This was due to an advantageous mixture of varieties, efficient land utilization, large-scale production, strong brand names and the popularity of its wines. A developing and open internal market with significant growth potential also enhances production. The low US dollar also contributes to the USA's strength. In last place was Hungary. This was because of serious structural problems and lack of efficiency. Other problems hampering competitiveness are: product adulteration, unpopular wines, and lack of resources for marketing coupled with an unfavourable exchange rate.

Viana and Rodrigues (2006) studied the industries facing difficulties fitting-in with the traditional accounting framework. This is the case of the port wine industry, which is characterized by its high quality product and long-lived inventories. For this he used a questionnaire survey to determine the accounting practices and problems in the port industry, by selecting Portugal, Spain, and Australia. The main research hypothesis is that port companies face the same problems as other wine firms in the world: time is a port wine accounting problem. The data used were gathered from 32 shippers. It was found that some of these wine accounting problems were not felt in the industry and that port wine companies have their own accounting practices, such as a unique cost formula.

Mccleary and Lee (2007) reported that wine industry has had rapid growth worldwide over the last couple of decades. This growth has been particularly rapid in the State of Virginia over the last few years. While the impact of revenue and employment generated from the sale of wine is of obvious benefit to an area's economy, the potential generation of dollars from tourists whose major or secondary purpose for visiting an area is to visit wineries is also of great importance for many wine-producing areas. With the wine industry consisting of products with over 100 000 different brands, it is difficult for smaller wineries, particularly in wine areas less popular than California or Bordeaux, to gain market exposure and access. Therefore, many wineries rely on cellar door sales generated primarily from tasting rooms and tours, and on localized distribution. Winery tourism thus serves an important role not only in generating tourism revenue, but also in building brand recognition and consummating on-the-spot sales. This article reports the distribution methods and tasting room policies of Virginia wineries and provides a summary of what Virginia wineries consider to be their biggest problems.

### 3. METHODOLOGY

This chapter deals with the characteristics of the area selected for the study, the methods adopted in the selection of the samples, the nature and sources of data, and the various statistical tools and techniques employed in analyzing the data.

The methodology is presented under the following headings:

- 3.1 Description of the study area
- 3.2 Sampling procedure
- 3.3 Nature and sources of data
- 3.4 Analysis of data
- 3.5 Definitions of terms and concepts used

#### 3.1 Description of the study area

Karnataka is the eighth largest state in India with an area of 190 lakh ha. It is situated between 11.5° & 19.0° N latitude and between 74° and 78° E longitude in the southern plateau. The State receives the average annual rainfall of about 1139 mm both from southwest and north-east monsoons. The important crops grown in the state are jowar, ragi, maize, bajra and wheat among cereals; redgram, greengram, tur and bengalgram among pulses; groundnut, sunflower and safflower among oilseed crops and cotton, sugarcane and tobacco among commercial crops.

Karnataka comprises of 29 districts, of which 12 districts are located in Northern part of the state, Bijapur district in Northern Karnataka was chosen for the study purposively due to higher concentration of area under grapes.

Bijapur district is situated well in the interior of the Deccan peninsula and lies between north latitude 15° 20' and 17° 28'. It is bounded on the north by Solapur District of Maharashtra and on the north-east by Gulbarga district, on the east, south and west surrounded by Raichur, Dharwad and Belgaum districts respectively.

Total geographical area of Bijapur district is 10.53 lakh hectares comprising 1,977 hectares covered by forest, 8.39 lakh hectares net area under cultivation and remaining not available for cultivation. It could be noted that, 1.89 lakh hectares out of 8.39 lakh hectares of net cultivated area is utilized for cultivation more than once. Net area irrigated in the District accounts for 27% of net area under cultivation

The climate of the district is generally dry. The large variations in the rainfall, from year to year, both in amount and in its distribution through the seasons make the district prone to drought and famines. The average annual rainfall of the district is 668.2mm, the temperature ranges from 14.8° c. to 43° c.

There are two main types of soils namely black and red soil. The average water holding capacity is medium to high. A major portion of the district is covered by deep black soil which has a greater moisture retention capacity. The soils are slightly alkaline and are poor in organic matter constituents. The main food crops are jowar, bajra, wheat and gram. Among the commercial crops ground nut, sesamum, linseed, cotton, safflower and sunflower are more popular.

The medium rainfall, dry and healthy weather are considered to be the ideal conditions for growing horticulture crops. Bijapur district in Karnataka has all these ideal conditions for cultivation of horticulture crops. Major horticulture crops grown in Bijapur district are grapes, pomegranate and lemon.

In Karnataka, Bijapur is the leading district with respect to both area and production of grapes. The total area and production of grapes in Bijapur district is 3305 hectares and 49075 tonnes respectively. Out of which area and production of wine grapes is about 80 hectares and 1200 tonnes respectively.

## 3.2 Sampling procedure

### 3.2.1 Selection of the study area

The medium rainfall, dry and healthy weather are considered to be the ideal conditions for wine grape cultivation. The area under wine grape cultivation in Bijapur district is around 80 ha of 3305 ha total area under grape cultivation. However, the large scale cultivation of wine grape is concentrated in Bijapur taluk. Hence, Bijapur district is selected purposively for the study.

In order to study the economics of production of wine grapes, wine grape producing farmers in Bijapur district were selected purposively. In addition, to study the value addition in wine grapes a case study approach was followed by selecting the winery existing in Bijapur town.

### 3.2.2 Selection of the sample respondents

Wine grape cultivation is emerging trend and practiced through out the district. Wine grape growers were selected purposively spread over in the district. Thus the total size of the sample selected for the study was 60.

## 3.3 Nature and sources of data

### 3.3.1 Primary data

The data needed for the study were collected from the respondents by personal interview method using pre-tested schedule. Majority of the respondents did not maintain records of the expenditure and income from wine grape cultivation. Hence, data collected was based on the memory of the respondents. At the time of interview, personal bias of the sample farmers was minimized by convincing them about the genuineness of the purpose for which the data were collected. The data collected from the selected respondents were to fulfill the objectives of the study. Data were based on the entire operations in establishing and maintaining the wine grape orchards and the consequent costs and returns. Similarly, the data on investment pattern in winery and the cost and returns occurred in production of wine were collected by personal interview method with the help of structured schedule. Similarly the constraints faced by wine grape growers and winery were collected through opinion survey.

## 3.4 Analytical tools and techniques employed

To fulfill the specific objectives of the study, based on the nature and extent of data, the following analytical tools and techniques were adopted.

1. Tabular presentation
2. Financial analysis
3. Garrett's ranking technique

### 3.4.1 Tabular presentation

Tabular presentation was adopted to compile the general characteristics of the sample farmers, determine the resource structure, cost structure, returns, profits and opinion of farmers regarding the problems in production. Simple statistical tools like averages and percentages were used to compare, contrast and interpret results properly.

### 3.4.2 Financial analysis

The techniques used for the financial analysis were:

1. Net Present Value (NPV)
2. Benefit-Cost Ratio (B: C Ratio)
3. Internal Rate of Return (IRR) and
4. Pay Back Period (PBP)

#### 3.4.2.1 Net Present Value (NPV)

It is believed to be a more meaningful measure of the long-term investment proposal and useful in comparing the other investment proposals. Net present value represents the discounted value of the net cash inflows to the project. In the present study, a discount factor

of 9.5 per cent was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by

$$NPV = \sum_{i=1}^n Y_i(1+r)^{-i} - I$$

Where,

- $Y_i$  = Refers to the net cash inflows in the year n
- $r$  = Refers to the discount rate
- $I$  = Initial investment
- $i$  = Years of life period 1, 2, . . . . . n.

In order to consider the investment worthiness, the net present value should be positive and of higher magnitude before alternative opportunities considered.

#### 3.4.2.2 Benefit Cost Ratio

The Benefit Cost Ratio (BCR) was worked out by using the following formula

$$\text{B:C ratio} = \frac{\text{Discounted net cash flows}}{\text{Initial investment}}$$

$$= \frac{\sum_{i=1}^n Y_i(1+r)^{-i}}{I}$$

#### 3.4.3.3 Internal Rate of Return (IRR)

The rate of discount at which the net present value of the project is equal to zero is Internal Rate of Return (IRR) to the project. The net cash inflows were discounted to determine the present worth following the interpolation technique.

The method of interpolation followed is as under:

$$\text{IRR} = \text{Lower discount rate} + \frac{\text{Difference between Present worth of cash flows at lower discount rate}}{\text{Absolute difference between present worth of cash flows stream at the two discount rates}} \times \text{the two discount rates}$$

#### 3.4.3.4 Pay Back Period (PBP)

Pay back period represents the length of time required for the stream of cash proceeds produced by the investment to be equal to the original cash outlay. i.e. the time required for the project to pay for itself. In the present study, pay back period was calculated by successively deducting the initial investment from the net returns until the initial investment is fully recovered.

#### 3.4.3 Garrett's ranking technique

Constraints faced by farmers in wine grape production were prioritized by using Garrett's ranking technique in the following manner:

$$\text{Percentage position} = \frac{100 * (R_{ij} - 0.50)}{N_j}$$

Where,

$R_{ij}$  = Rank given for the  $i^{\text{th}}$  item by the  $j^{\text{th}}$  individual, and

$N_j$  = Number of items ranked by the  $j^{\text{th}}$  individual.

The percentage position of each rank was converted into scores using Garrett table. For each constraint, scores of individual respondents were added together and were divided by total number of respondents for whom scores were added. Thus, mean score for each constraint was ranked by arranging them in the descending order.

### 3.5 Definition of terms and concepts used

The terms and concepts used in the study and the procedure used to calculate the cost of different items are given below:

#### 1. Planting material

The planting material used (rooted cuttings) was valued at the current market rate.

#### 2. Hired human labour

Hired human labour was estimated in terms of 8 hours of work per day. The women labour days were converted into men days on the criteria that one woman day is equal to 0.5 man days on the basis of wage rate equivalence. Similar methodology was adopted by Gummagolamath (1993). The prevailing wage rates were Rs. 100 per day for male labour and Rs. 50 per day for female labour.

#### 3. Machine power

It is measured in hours. Here one hour means one hour of work by a tractor and a man required to operate this tractor. It was valued at the rate of Rs. 650 per hour.

#### 4. Farm Yard Manure (FYM)

Farm yard manure was charged as per the prevailing market rates during the period of study in the study area.

#### 5. Fertilizers

The fertilizer cost was calculated at the actual price paid by farmers.

#### 6. Irrigation

The main source of irrigation in the study area is bore well. For study purpose apportioned establishment cost of irrigation structure was taken and it included the cost of boring, cost of submersible pump set and cost of drip irrigation system.

#### 7. Implement charges

The amount of depreciation for implements was calculated by the straight-line method i.e., by dividing the original cost less junk value of the implement by its expected life. This was apportioned to individual crop in proportion to the acreage under the crop.

#### 8. Land revenue and other taxes

These were charged according to the actual payments incurred by the cultivators.

#### 9. Rental value of land

Rental value of land was calculated as per the rate prevailing for irrigated land in the study area.

#### 10. Interest on fixed capital

Interest on fixed capital was calculated at the rate of 13 per cent on fixed capital at which the banks charge for the long-term loan.

11. Interest on working capital

Interest on working capital was charged at the rate of 11 per cent per annum, which was the rate at which the farmers used to get short-term loans.

12. Gross income

It is the value of total quantity of wine grapes produced at the prices where the product is sold.

13. Net returns

This was defined as the difference between gross returns and total cost incurred by farmers.

14. Receiving equipment

It is used to break the grape skin and helps in juice extraction.

15. Cellar equipment

It is used for racking transferring wine from one container to another container.

16. Material handling

It is very important in winery for handling of large containers, heavy equipments.

17. Refrigeration system

It is required for maintaining constant temperatures in entire wine cellars, ensure that wine is kept at the perfect conditions for storage.

18. Fermentation and storage

Fermentation and storage tanks are used for fermentation and storage of wine.

19. Cooperage

It is used for aging of wine to add aromas.

20. Tasting room

Wine sales take place in tasting room other than whole sale, for this purpose it is maintained.

21. Bottling equipment

It is used for wine filling, corking and labelling.

22. General Manager.

Coordinates all the winery operations, maintenance of winery and staff throughout the year.

23. Wine maker

Key person in production of wine.

24. Assistant wine maker

Assist the wine maker in lab duties, quality control, wine production and inventory management

25. Sales Manager

Regulates all marketing and sales efforts.

26. Ware house keeper

Conducts all storage and shipping functions.

## 4. RESULTS

The data collected for the study from various sources were analysed using appropriate techniques. The results of the analysis are presented in this chapter under the following headings.

- 4.1 General characteristics of the sample farmers
- 4.2 Cost and returns in wine grape cultivation
- 4.3 Financial feasibility of investment in wine grape cultivation
- 4.4 Investment pattern in wineries
- 4.5 Production of wine
- 4.6 Cost and returns in production of wine
- 4.7 Problems faced by wine grape producers and winery

### 4.1 General characteristics of the sample farmers

An understanding of general characteristics of the sample farmers is expected to provide a bird's eye view of the general features prevailing in the study area. Therefore, an attempt has been made in the study to analyze some of the important characteristics of the sample farmers. The general characteristics of the respondents are presented in Table 4.1

From the table, it could be seen that the average age of the wine grape growers was about 43 years and the main occupation of them was agriculture. It could be further observed that majority of the respondents were literate (83 per cent), having their education ranging from primary to college level. The remaining 17 per cent of the growers were illiterates.

From the Table it could also be seen that the average size of the family was about six and average land holding was 4.1 ha, of which 1.6 ha was irrigated and remaining 2.5 ha was dry land. And average area under wine grape cultivation is around 1.58 ha.

The wine grape varieties grown in the study area are cabernet, Shiraz, zinfandel, chenin Blanc and the average no of plants per ha is 1980

### 4.2 Cost and returns in wine grape cultivation

#### 4.2.1 Establishment cost of wine grape orchard

The establishment cost per ha of wine grape orchard was estimated, considering the quantity of inputs and labour used and their respective market price and wages prevailed in the study area. The details of the findings on the establishment cost are presented in Table 4.2.

The establishment of wine grape orchard needs one year, the establishment costs in vine yard are classified into initial investment and maintenance cost up to bearing period. The investment cost includes cost of bore well, pumpest, pump house, sprayer, drip irrigation, electric service, cuttings, stone pillars, bamboo sticks, different gauge trellis wire, binding wire, jute, angles, clamps, nut and bolts. The per hectare total cost of establishment of wine grape orchard was Rs. 3, 94,377.44.

It was observed from the table that the share of investment cost in the total establishment cost was Rs. 2, 80,378.05 (71.09 per cent). The value of trellis wire of different gauge was the major item of establishment cost (Rs. 42311.35) accounting for 10.73 per cent. The next major items contributing for investment cost were angles (Rs. 34512.08 accounted for 8.75 per cent), bore well (Rs. 29743.67 accounted for 7.54 per cent), stone pillars (Rs. 22453.86 accounted for 5.69 per cent), drip irrigation system (Rs. 20456.78 accounted for 5.19 per cent), pump set (Rs 19452.84 accounted for 4.93 per cent), bamboo sticks (Rs.14949 accounted for 3.79 per cent), cuttings (Rs. 12870 accounted for 3.26 per cent), digging of pits (Rs.11238.5 accounted for 2.85 per cent), electric connection (Rs. 10456.56 accounted for 2.65 per cent), fertilizers (Rs. 9600 accounted for 2.43 per cent), manures (Rs. 7500 accounted for 1.90 per cent), nut and bolts (Rs.7205.78 accounted for 1.83 per cent), pump house (Rs.6583.94 accounted for 1.67 per cent), filling pits with FYM & fertilizers (Rs. 6175 accounted for 1.57 per cent), clamps (Rs.5581.95 accounted for 1.42 per cent), training of trellis wire (Rs. 4940 accounted for 1.25 per cent), erection of stone pillars (Rs. 3000 accounted for 0.76 per cent), planting of cuttings (Rs. 2964 accounted for 0.75 per cent),

Table 4.1 General characteristics of sample farmers

Sl. No.	Particulars	Unit	Sample size
			n=60
1	Age	Years	43.26
2	Education		
	Illiterate	No.	10
	Primary	No.	5
	High school	No.	15
	College	No.	30
	Total	No.	60
3.	Occupation		
	Agriculture as Main occupation	No.	54
	Agriculture as Subsidiary occupation	No.	6
4	Family size	No	5.88
5	Land holdings		
	Irrigated	Hectares	1.6
	Dry land	Hectares	2.5
	Total	Hectares	4.1
6	Area under wine grapes	Hectares	1.58
7	Wine grape varieties		cabernet, shiraz, zinfandal and chenin blanc
8	Plant population of wine grapes	Plants/Ha	1980

erection of bamboo sticks (Rs. 2000 accounted for 0.51 per cent), sprayer (Rs 1967.64 accounted for 0.50 per cent), preparatory tillage (Rs. 1852.5 accounted for 0.47 per cent), jute (Rs.1244.68 accounted for 0.32 per cent), pit marking (Rs. 691.6 accounted for 0.18 per cent) and binding wire ( Rs.626.33 accounted for 0.16 per cent) respectively.

The wine grape requires one year to bear the fruits. The maintenance cost incurred during this period was Rs.113999.39 per hectare (28.91 per cent).

#### 4.2.2 Maintenance cost of wine grape orchard up to bearing period

It is observed from the Table 4.3 that the average per ha cost incurred by wine grape growers up to bearing period was Rs. 113999.39 of which variable cost was Rs. 83901.79 (73.60 per cent) and fixed cost was Rs. 30097.6 (26.40 per cent).

The total variable cost consisted of labour cost and material cost. Labour cost (Rs. 27748.7) accounted for 24.34 per cent of total cost of maintenance up to bearing period and material cost (Rs. 49580.14) accounted for 43.49 per cent.

The major item of labour cost was on application of plant protection chemicals (Rs.7410) which formed 6.50 percent of total establishment cost followed by application of fertilizers (Rs.5000), which formed 4.39 per cent, application of FYM (Rs.4940), which formed 4.33 per cent, pruning (2.60 per cent), weeding (2.17 per cent), irrigation (1.95 per cent) and inter cultivation (1.63 per cent).

Of the material cost of Rs.49580.14, fertilizers (Rs.21736) accounted for 19.07 per cent, followed by manures (13.00 per cent), cost of micro nutrients (5.96 per cent), cost of plant protection chemicals (4.98 per cent), interest on working capital (5.77 per cent) and others (0.48 per cent).

Under the fixed costs the major item was rental value of land ( Rs. 25422.25) which formed 22.30 per cent followed by interest on fixed capital (2.13 per cent), depreciation (1.95 per cent), and land revenue (0.02 per cent).

Table 4.2. Establishment cost of wine grape orchard

(Rs. /ha)					
Sl. No.	Particulars	Unit	Qty	Cost	%
A.	Initial investment				
1	Bore well			29743.67	7.54
2	Pump set			19452.84	4.93
3	Pump house			6583.94	1.67
4	Sprayer			1967.64	0.50
5	Drip irrigation system			20456.78	5.19
6	Electric connection			10456.56	2.65
7	Preparatory tillage	Pair days	7.41	1852.5	0.47
8	Manures	Tonnes/ha	10	7500	1.90
9	Fertilizers	Kg/ha	800	9600	2.43
10	Pit marking	Man days	9.88	691.6	0.18
11	Digging of pits	Machine hrs	17.29	11238.5	2.85
12	Filling Pits With FYM &Fertilizers	Man days	61.75	6175	1.57
13	Cuttings	No/ha	1980	12870	3.26
14	Planting of cuttings	Man days	29.64	2964	0.75
15	Stone pillars	No/ha	200.07	22453.85	5.69
16	Training of stone pillars	Man days	30	3000	0.76
17	Bamboo sticks	No/ha	1980	14949	3.79
18	Errection of bamboo sticks	Man days	20	2000	0.51
19	Trellis wire				
	i. 8 Gauge	Kg/ha	205.01	11431.36	2.90
	ii. 10 Gauge	Kg/ha	244.53	16036.28	4.07
	iii.12 Gauge	Kg/ha	197.6	14843.71	3.76
20	Training of Trellis Wire	an days	49.4	4940	1.25
21	Binding Wire	Kg/ha	18.52	626.33	0.16
22	Jute	Kg/ha	43.96	1244.68	0.32
23	Angles	No/ha	200.07	34512.08	8.75
24	Clamps	No/ha	200.07	5581.95	1.42
25	Nut And Bolts	No/ha	397.67	7205.78	1.83
	Total			280378.05	71.09
B	Maintenance cost up to Bearing period				
	1 Year			113999.39	28.91
	Total Establishment Cost (A+B)			394377.44	100.00

#### 4.2.3 Maintenance cost of wine grape orchard during bearing period

Maintenance costs were the recurring costs incurred after the establishment of vine yard i. e., from second year onwards for upkeep of vines so that good yield can be obtained over the economic life span of vines. The maintenance cost included the expenditure towards the use of labour and other material inputs per year along with the fixed cost for different age group of wine grape orchard.

It is observed from the table 4.4 that the average cost of labour per ha was amounted to Rs. 50520.21 which formed 27.16 per cent of the total maintenance cost. The major contribution to this cost was made by the cost of application of plant protection chemicals (Rs. 12967.5) which formed 6.97 per cent followed by application of fertilizers (3.32 per cent), application of FYM (3.05 per cent), pruning (2.66 per cent), watch & ward (2.39 per cent), weeding (1.99 per cent). Inter cultivation, shoot thinning, irrigation, harvesting and miscellaneous costs constituted for 1.66 per cent, 1.59 per cent, 1.59 per cent, 1.33 per cent, and 0.60 per cent of the total maintenance cost respectively.

Table 4.3. Maintenance Cost of wine grape orchard up to bearing Period (for 1 year)

(Rs. /ha)

Sl. No.	Particulars	Unit	Qty	Cost	%
I.	VARIABLE COST				
A	Labour cost				
1	Intercultivation	Pair days	7.41	1852.5	1.63
2	Application of FYM	Man days	49.4	4940	4.33
3	Application of fertilizers	Man days	50	5000	4.39
4	Application of PPC	Man days	29.64	7410	6.50
5	Weeding	Man days	24.7	2470	2.17
6	Pruning	Man days	19.76	2964	2.60
7	Irrigation	Man days	37.05	2223	1.95
8	Miscellaneous			889.2	0.78
	Total labour cost (A)			27748.7	24.34
B	Material cost				
1	Manure	TONNES	19.76	14820	13.00
2	Fertilizers	Kgs	1811.33	21736	19.07
3	PPC	LITERS	24.7	5681.22	4.98
4	Micro nutrients	Kgs	113.2	6792.5	5.96
5	Others			550.42	0.48
	Total material cost (B)			49580.14	43.49
	interest on working capital @ 8.5%			6572.95	5.77
	Total Variable Cost (A+B)			83901.79	73.60
II	FIXED COST				
1	Rent value of land			25422.25	22.30
2	Land revenue			24.7	0.02
3	Depreciation			2225.2	1.95
4	Interest on fixed capital @ 9.5%			2425.45	2.13
	Total fixed cost			30097.6	26.40
	Total cost (I+II)			113999.39	100.00

Table 4.4. Maintenance cost of wine grape orchard during bearing period

(Rs. /ha)

SI No	Particulars	Unit	Qty	Cost	%
I	Variable cost				
A	Labour cost				
1	Intercultivation	Pair days	12.35	3087.5	1.66
2	Application of FYM	Man days	56.81	5681	3.05
3	Application of fertilizers	Man days	61.75	6175	3.32
4	Application of PPC	Man days	51.87	12967.5	6.97
5	Weeding	Man days	37.05	3705	1.99
6	Pruning	Man days	49.4	4940	2.66
7	Shoot thing	Man days	29.64	2964	1.59
8	Irrigation	Man days	49.4	2964	1.59
9	Watch & ward	Man days	74.1	4446	2.39
10	Harvesting	Man days	24.7	2470	1.33
11	Miscellaneous			1120.21	0.60
	Total labour cost (A)			50520.21	27.16
B	Material cost				
1	Manure	TONNES	29.64	22230	11.95
2	Fertilizers	Kgs	2099.5	25194	13.54
3	PPC	LITERS	37.05	8521.5	4.58
4	Micro nutrients	Kgs	135.85	8151	4.38
5	Others			602.54	0.32
	Total material cost			64699.04	34.78
	Interest on working capital @ 8.5%			9793.63	5.26
	Total variable cost (A+B)			125012.88	67.20
II	Fixed cost				
	Rent value of land			25422.25	13.66
	Land revenue			24.7	0.01
	Apportioned establishment cost			28780.53	15.47
	Depreciation			2548.64	1.37
	Interest on fixed capital @ 9.5%			4254.25	2.29
	TOTAL FIXED COST			61030.37	32.80
	TOTAL COST (I+II)			186043.25	100.00

The total material cost accounted to Rs. 64699.04, to which cost of fertilizers made major contribution *i.e.* 13.54 per cent (Rs.25194) followed by FYM (11.95 per cent), plant protection chemicals (4.58 per cent), micronutrients (4.38 per cent), interest on working capital (5.26 per cent) and others (0.32 per cent).

The fixed cost amounted to Rs.61030.37, out of which apportioned establishment cost amounted to 15.47 per cent followed by rental value of land (13.66 per cent), interest on fixed capital( 2.29per cent), depreciation (1.37 per cent), and land revenue (0.01 per cent).

#### 4.2.4. Yield and return structure in wine grapes

Per hectare yields of wine grapes are presented in the table 4.5. The yield of wine grapes varied with the age of vine. During the first year, the yield was zero. During second year, the yield was 5.43 tonnes and returns were Rs.2, 11,770. During third year, the yield increased to 10.86 tonnes and returns also increased to Rs. 4, 34,400. During fourth year, the yield was 13.58 tonnes and returns were Rs. 5, 43,200. During fifth year, the yield was 15.34 tonnes and returns were Rs. 5, 98,260. The yield was maximum in 6<sup>th</sup> year and it remained same up to 13<sup>th</sup> year, during this period the yield was 16.05 tonnes and returns for these years increased from Rs 6, 01,875 in sixth year to. Rs. 6, 38,790 in thirteenth year. During 14<sup>th</sup> and 15 year, the yields slightly decreased *i.e.*15.08 and 14.52 tonnes and returns were Rs. 5, 95,660 and Rs. Rs. 580800 respectively.

#### 4.2.5 Cash flows of wine grapes

The costs incurred and returns obtained in wine grape cultivation are presented in table 4.6.

The annual costs increased from Rs. 1, 13,999 in first year to Rs. 2, 73,452 in the thirteenth year. The costs decreased slightly in the 14<sup>th</sup> year and 15<sup>th</sup> year. There were no returns from the orchard during first year. The orchard started yielding returns from the second year. The returns went on increasing year after year. They increased from Rs. 2, 11,770 in the second year to Rs. 6, 38,790 in the 13th year. The returns decreased slightly during 14<sup>th</sup> and 15<sup>th</sup> year. The net cash flows were negative in the first year. The net cash flows were positive in the second year and they went on increasing up to 13<sup>th</sup> year. The net cash flows which were Rs. 25727 in the second year increased to Rs. 3,65,338 in the 13<sup>th</sup> year. The net cash flows decreased in the 13<sup>th</sup> and 14<sup>th</sup> year *i.e.* Rs 3,25,424 and Rs. 3,12,348 respectively.

### 4.3 Financial feasibility of investment in wine grape orchards

To evaluate the feasibility of investment in wine grape orchard, the criteria such as Net Present Value, Benefit - Cost Ratio, Internal Rate of Return and Payback Period were used. The results are presented in the Table 4.7.

#### 4.3.1 Net Present Value

The annual net cash inflows were discounted at 9.5 per cent to obtain the present value of net benefit in wine grape orchard. The initial investments made in wine grape orchard were deducted from the present value of the net benefits.

It may be seen from the table 4.7, that the net present value of benefits in wine grape orchard were about Rs.1626956

#### 4. 3. 2 Benefit-Cost Ratio

This criterion indicates the returns per rupee invested in wine grape orchard. The benefit cost ratio was 2.2.As wine grape orchard had a benefit cost ratio of more than unity, it can be concluded that the investment in wine grape orchard is financially feasible.

#### 4.3.3 Internal Rate of Return (IRR)

This criterion measures the rate of returns that can be earned by investing in vineyard of wine grapes. It also considers the reinvestment opportunities which are absent in other techniques. The internal rate of return was 42.33 per cent.

Table 4.5. Yield and return structure in wine grapes

Sl no	Particulars (year)	Yield (t/ha)	Returns (Rs./ha)
1	1	0	0
2	2	5.43	211770
3	3	10.86	434400
4	4	13.58	543200
5	5	15.34	598260
6	6	16.05	601875
7	7	16.05	613110
8	8	16.05	617925
9	9	16.05	621135
10	10	16.05	625950
11	11	16.05	629962
12	12	16.05	633975
13	13	16.05	638790
14	14	15.08	595660
15	15	14.52	580800

Table 4.6. Cash flows of wine grapes

Year	Cash outflow	Cash inflow	Net cash flow	D.F at 9.5%	Discounted net cash flows
0	280378	0	-280378		
1	113999	0	-113999	0.913	-104081.09
2	186043	211770	25727	0.834	21456.32
3	219593	434400	214807	0.761	163468.13
4	245338	543200	297862	0.695	207014.09
5	250432	598260	347828	0.635	220870.78
6	254789	601875	347086	0.58	201309.88
7	259456	613110	353654	0.529	187082.97
8	263789	617925	354136	0.483	171047.69
9	265432	621135	355703	0.441	156865.02
10	267254	625950	358696	0.403	144554.49
11	269265	629962	360697	0.368	132736.50
12	271562	633975	362413	0.336	121770.77
13	273452	638790	365338	0.307	112158.77
14	270236	595660	325424	0.28	91118.72
15	268452	580800	312348	0.256	79961.09
	Total				1907334.11

Table 4.7 Financial feasibility of investment made in wine grape cultivation

Sl no	Particulars	Unit	Value
1	Net Present Value (@ 9.5 %)	Rs/ha	1626956
2	Benefit Cost Ratio (@ 9.5 %)		2.2
3	Pay Back Period	Years	3.2
4	Internal Rate of Return	percent	42.33

The investments in wine grape orchards were found to be feasible, since the internal rate of return was higher than the opportunity cost of capital of 9.5 per cent.

#### 4.3.4 Pay Back Period (PBP)

The time required to recover the initial investments made is explained by payback period in a project. It was seen that the payback period was 3.2 years.

### 4.4 Investment pattern in winery by equipment category

Investment costs of winery by equipment category are presented in the table 4.8. From the table, it could be seen that investment costs of winery by equipment category are classified in to following sub headings.

#### 4.4.1 Building for Plant and office equipments

The total cost involved in establishing the office and building for plant was Rs. 17863200. The costs of building for plant was the major contributor to the total cost of building for plant and office equipments i.e. Rs. 16500000 which formed 92.37 per cent followed by Furnishings 5.67 per cent, land 1.34 per cent and computers 0.62 per cent.

#### 4.4.2 Receiving equipment

Receiving equipment costs were about Rs. 4807500, out of which cost of membrane press was the major one (Rs. 1638000) constituting 34.07 per cent. Followed by picking bin, poamce and stem conveyor, stemmer/ crusher, must pump and must lines constituting 26.37 per cent, 14.98 per cent, 14.85 per cent, 8.74 per cent and 1.0 per cent respectively.

#### 4.4.3 Cellar equipment

Cellar equipment cost amounted to Rs. 3337610. The value of transfer pump made major contribution to the total cellar equipment cost i.e. 70.27 per cent (Rs. 2345210) followed by barrel washer (13.48 per cent.), plate and frame filter (7.01 per cent), tank mixer (6.31 per cent) and transfer hose, pressure washer and air compressor constituted 1.89 per cent, 0.67 per cent, and 0.37 per cent respectively.

#### 4.4.4 Material handling

Material handling cost amounted to Rs. 2508450. The cost of pick up made major contribution to the total material handling costs i.e. 44.62 per cent (Rs. 11192500) followed by fork lift, rotator implement, pallet jack, and hand craft with 44.35 per cent, 7.57 per cent, 2.74 per cent, and 0.72 per cent respectively.

#### 4.4.5 Refrigeration system

Refrigeration system cost amounted to Rs 9452450.

Table 4.8. Investment pattern in winery by equipment category

1	Building for Plant & Office equipments	No's	Unit Cost (Rs.)	Total cost (Rs.)	%
	Land	3 acres	80000	240000	1.34
	Building for plant			16500000	92.37
	Furnishings			1012500	5.67
	Computers			110700	0.62
	Total			17863200	100.00
2	Receiving Equipment				
	Picking bin	150	8450	1267500	26.37
	Stemmer/ crusher	1	714000	714000	14.85
	Membrane press	1	1638000	1638000	34.07
	Must pump	1	420000	420000	8.74
	Must lines	300	160	48000	1.00
	Pomace and stem conveyor	1	720000	720000	14.98
	Total			4807500	100.00
3	Cellar Equipment				
	Tank Mixer	1	210450	210450	6.31
	Transfer Pump	1	2345210	2345210	70.27
	Transfer Hose	500	126	63000	1.89
	Barrel Washer	1	450000	450000	13.48
	Plate & Frame Filter	1	234000	234000	7.01
	Air Compressor	1	12450	12450	0.37
	Pressure Washer	1	22500	22500	0.67
	Total			3337610	100.00
4	Material Handling				
	Pallet Jack	6	11450	68700	2.74
	Hand Craft	15	1200	18000	0.72
	Fork Lift	1	1112500	1112500	44.35
	Rotator Implement	1	190000	190000	7.57
	Pick Up	1	1119250	1119250	44.62
	Total			2508450	100.00

#### 4.4.6 Fermentation and storage

Fermentation and storage costs were about Rs. 8511900, out of which costs of fermentation tanks of various capacities made major contribution to total Fermentation and storage costs i.e. 28.76 per cent, 25.38 per cent, 19.67 per cent, followed by two different capacities of storage tanks (13.59 per cent), fermentation bins (7.90 per cent), tank washer (2.38 per cent) and tank stands (2.33 per cent).

#### 4.4.7 Cooperage

Cooperage costs were about Rs. 15000000, to which costs of oak barrels made major contribution i.e. 84.40 per cent (Rs.12600000), followed by racks, silicon bungs, and fermentation bungs constituting 14.40 per cent, 0.8 per cent, and 0.8 per cent respectively.

#### 4.4.8 Tasting room

Tasting room costs were about Rs. 207907. The cost of commercial dish washer made major contribution to total tasting room costs i.e. 61.40 per cent (Rs.127650) followed by stem ware, refrigerator and wine cooler constituting 25.97 per cent, 8.08 per cent and 4.55 per cent respectively.

5	Refrigeration system	1		9452450	100.0
6	Fermentation & Storage				
	Fermentation Tanks (i)	6	360000	2160000	25.38
	(ii)	8	306000	2448000	28.76
	(iii)	6	279000	1674000	19.67
	Storage Tanks (i)	6	157275	943650	11.09
	(ii)	2	106200	212400	2.50
	Fermentation Bins	10	67275	672750	7.90
	Tank Stands	30	6620	198600	2.33
	Tank Washer	1	202500	202500	2.38
	Total			8511900	100.00
7	Cooperage				
	Oak Barrels	500	25200	12600000	84.00
	Racks	800	2700	2160000	14.40
	Silicon Bungs	800	150	120000	0.8
	Fermentation Bungs	800	150	120000	0.8
	Total			15000000	100.00
8	Tasting Room				
	Refrigerator	1	16805	16805	8.08
	Wine Cooler	1	9452	9452	4.55
	Commercial Dish Washer	1	127650	127650	61.40
	Stem Ware	300	180	54000	25.97
	Total			207907	100.00
9	Bottling equipment		2500000	2500000	100.00
	Total Establishment cost			64189017	

Table 4.9. Investment pattern in winery by equipment category - percentages to the total investment cost.

SI No	Equipment Category	Value	%
1	Building for Plant & Office equipments	17863200	27.83
2	Receiving Equipment	4807500	7.49
3	Cellar Equipment	3337610	5.20
4	Material Handling	2508450	3.91
5	Refrigeration System	9452450	14.73
6	Fermentation&Storage	8511900	13.26
7	Cooperage	15000000	23.37
8	Tasting Room	207907	0.32
9	Bottling Equipment	2500000	3.89
	Total	64189017	100.00

#### 4.4.9 Bottling equipment

Bottling equipment cost amounted to Rs. 2500000.

#### 4.4.10 Investment pattern in winery by equipment category percentages to the total investment cost

It is observed from the Table 4.9 that total investment costs in winery by equipment category were Rs. 64189017. to which costs of plant and office establishment made major contribution i.e. Rs. 17863200, forming 27.83 per cent followed by cooperage (23.37) percent, refrigeration system (14.73 per cent), fermentation and storage (13.26 per cent), receiving equipment (7.49 per cent), cellar equipment (5.20 per cent), material handling (3.91 per cent), bottling equipment (3.89 per cent) and tasting room (0.32 per cent).

### 4.5 Costs incurred for production of wine during first year for 22000 cases (198000litres)

Though the installed capacity of winery is to produce 44500 cases i.e. 400500 litres per year the winery could produce only 22000 cases i.e. 198000 litres during first year. The cost incurred on various items in producing the wine were collected from the winery and analysed and the results of the same are presented in the table 4.10.

The total cost incurred in producing 22000 cases of wine during first year after establishment of winery were Rs. 541.95 lakhs of which variable costs were Rs. 451.78 lakhs (83.36 per cent) and fixed costs were Rs. 90.16 lakhs (16.64 per cent).

The variable cost consisted of labour cost (Rs. 9.74 lakhs) and material cost (Rs. 258.65 lakhs). The salaries of general manager made major contribution to the total labour cost i.e. Rs. 2.16 lakhs which formed 0.40 per cent of the total production cost followed by salary of wine maker (0.33 per cent), salary of sales manager (0.22 per cent), salary of assistant wine maker (0.19 per cent), salary of office manager (0.17 per cent) and salary of ware house keeper (0.13 per cent).

The salaries of watch man, accountant, driver, clerk and part time labour constituted negligible amount to the total labour cost.

The major item under material cost was cost of raw material i.e. wine grapes Rs. 131.25 lakhs which formed 24.22 per cent of the total cost of wine preparation. Other major items of material cost were cost of bottles (Rs. 68.75 lakhs), cost of labels (Rs.35.75 lakhs) and cost of corkers (Rs. 16.50 lakhs). Cartoons, Tarutarc acid, yeast, potassium metabisulphate, ascorbic acid, calcium carbonate, and pectic enzyme powder constituted negligible amount to the total material cost.

The excise tax was (Rs. 148.00 lakhs) accounted to 23.31 per cent of the total cost of wine production.

The major items of fixed costs were interest on borrowed capital (Rs. 65.00 lakhs), apportioned establishment cost (Rs. 18.34 lakhs), insurance premium (Rs. 6.0 lakhs) and licence fee (Rs. 0.83 lakhs). Constituting 11.99 per cent, 3.38 per cent, 1.11 per cent and 0.15 per cent respectively.

#### 4.5.1 Costs incurred for production of wine from second year on wards for 44500 cases (400500 litres)

During second year after its establishment the winery utilised the installed capacity fully producing 44500 cases i.e. 400500 litres of wine. And is assumed that the winery will utilise the installed capacity fully to produce wine during all the remaining years of its life period.

The total costs incurred during the second year for producing 44500 cases i.e. 400500 litres of wine were Rs. 1028.48 lakhs which consisted of variable cost (Rs.938.32 lakhs) and fixed costs (Rs. 90.16 lakhs). The variable cost consisted of labour cost (Rs. 9.75 lakhs) and material cost (Rs. 559.05 lakhs). In the labour cost, salaries of general manager made major contribution to the total labour cost i.e. Rs. 2.16 lakhs which formed 0.21 per cent followed by salary of wine maker (0.18 per cent), salary of sales manager (0.12 per cent),

Table 4.10. Cost incurred for production of wine during first year for 22000 cases (198000 liters)

Sl. No.	Particulars	UNIT	QTY	cost ( Rs. in lakhs)	(%)
I	Variable Cost				
	A LABOR COST				
	Full time labour				
	General manager	No	1	2.16	0.40
	Wine maker	No	1	1.80	0.33
	Assistant wine maker	No	1	1.02	0.19
	Warehouse keeper	No	1	0.72	0.13
	Sales manager	No	1	1.20	0.22
	Office manager	No	1	0.90	0.17
	Accountant	No	1	0.54	0.10
	Clerk	No	1	0.36	0.07
	Driver	No	1	0.42	0.08
	Watch man	No	1	0.60	0.11
	Sub total		10	9.72	1.79
	Part time labour				
	Wage basis	No	15	0.02	-
	sub total		15	0.02	-
	Total labour cost		25	9.74	1.80
	B. Material cost				
	Wine grapes	tonnes	375	131.25	24.22
	Yeast	Kg	15	0.38	0.07
	Potassium Metabisulphite	Kg	100	0.25	0.05
	Tarutaric acid	Kg	75	0.49	0.09
	Ascorbic acid	Kg	10	0.19	0.04
	Calcium carbonate	Kg	100	0.28	0.05
	Pectic enzyme powder	Kg	5	0.02	-
	Bottles	no	275000	68.75	12.69
	Corkers	no	275000	16.50	3.04
	Labels	no	275000	35.75	6.60
	Cartoons	no	22500	4.50	0.83
	Others			0.30	0.06
	Total material cost			258.65	47.73
	Excise tax			148.00	27.31
	interest on working capital @8.5 %			35.39	6.53
	Total variable cost (A+B)			451.78	83.36
II	Fixed cost				
	Insurance			6.00	1.11
	License fee			0.83	0.15
	Interest on borrowed capital			65.00	11.99
	Apportioned establishment cost			18.34	3.38
	Total fixed costs			90.16	16.64
	Total cost (I+II)			541.95	100.00

Table 4.11. Cost incurred for production of wine from second year onwards for 44500 cases (400500 liters)

Sl. No.	Particulars	UNIT	QTY	cost (Rs. in lakhs)	%
I	Variable Cost				
	A LABOR COST				
	Full time labour				
	General manager	No	1	2.16	0.21
	Wine maker	No	1	1.80	0.18
	Assistant wine maker	No	1	1.02	0.10
	Warehouse keeper	No	1	0.72	0.07
	Sales manager	No	1	1.20	0.12
	Office manager	No	1	0.90	0.09
	Accountant	No	1	0.54	0.05
	Clerk	No	1	0.36	0.04
	Driver	No	1	0.42	0.04
	Watch man	No	1	0.60	0.06
	Sub total		10	9.72	0.95
	Part time labour				
	Wage basis		30	0.03	-
	sub total		30	0.03	-
	Total labour cost		40	9.75	0.95
	B. Material costs				
	Wine grapes	tonnes	870	304.50	29.61
	Yeast	Kg	30	0.75	0.07
	Potassium Metabisulphite	Kg	200	0.50	0.05
	Tarutanic acid	Kg	150	0.98	0.09
	Ascorbic acid	Kg	20	0.38	0.04
	Calcium carbonate	Kg	200	0.56	0.05
	Pectic enzyme powder	Kg	10	0.04	0.00
	Bottles	no	550000	137.50	13.37
	Corkers	no	550000	33.00	3.21
	Labels	no	550000	71.50	6.95
	Cartoons	no	45000	9.0	0.88
	Others			0.35	0.03
	Total material cost			559.05	54.36
	Excise tax			296.00	28.78
	interest on working capital @ 8.5 %			73.51	7.15
	Total variable costs(A+B)			938.32	91.23
II	Fixed cost				
	Insurance			6.00	0.58
	License fee			0.83	0.08
	Interest on borrowed capital			65.00	6.32
	apportioned establishment cost			18.34	1.78
	Total fixed costs			90.16	8.77
	Total cost (I+II)			1028.48	100.00

salary of assistant wine maker (0.10 per cent), salary of office manager (0.09 per cent), and salary of ware house keeper (0.07 per cent). The salaries of watch man, accountant, driver, clerk and permanent labour constituted negligible amount to the total labour cost.

The material cost amounted to Rs. 559.05 lakhs. The cost of raw material i.e. wine grapes made major contribution to the total material cost i.e. (Rs. 304.50 lakhs) followed by bottles (Rs. 137.50 lakhs), labels (Rs. 71.50 lakhs), corks (Rs. 33.00 lakhs) and cartons (Rs. 9.0 lakhs). Tartaric acid, yeast, potassium metabisulphate, calcium carbonate, ascorbic acid and pectic enzyme powder constituted negligible amount to the total material cost.

The excise tax was (Rs. 296.00 lakhs) accounted to 28.78 per cent of the total cost of wine production.

The fixed cost amounted to Rs.90.16 lakhs of which major item was interest on borrowed capital (65.00 lakhs), apportioned establishment cost (Rs.18.34 lakhs), insurance premium (Rs.6.00 lakhs), and licence fee (Rs.0.83 lakhs).

## 4.6 Costs and returns in production of wine from wine grapes

### 4.6.1 Wine sales and return structure of winery over the years

The quantity of wine sold and returns obtained by the winery during different year are presented in the table 4.12. During the first year the winery could produce and sell 22000 cases at a price of Rs. 4200 per case earning a gross return of Rs. 924.00 lakhs. During second year the winery utilised fully the installed capacity and produced 44500 cases of wine. These were sold at a price of Rs. 4260 per case earning a gross return of Rs. 1895.70 lakhs.

It is assumed that the winery will produce to its fullest capacity during the remaining years of its life (35years) i.e. 44500 cases per year up to 35 years. The returns from the sale of wine during each year are calculated by multiplying 44500 cases of wine with the expected price during each year. The expected price for each year is arrived at by increasing the previous year price by rupees 60. Thus the returns from sale of wine will go on increasing from Rs. 1922.40 lakhs in third year to Rs. 2776.80 lakhs in 35<sup>th</sup> year.

### 4.6.2 Cash flows of winery

The cash out flows and cash inflows in winery are presented in the Table 4.13. The initial investment i.e. cash out flows during zero year were Rs. 641.89 lakhs. The winery under study is of two years old. During first year of its operation the cost incurred was Rs. 541.95 lakhs and it increased to Rs. 1028.48 lakhs during second year as the winery could utilise fully the installed capacity to produce wine. From third year onwards up to 35 years cash out flows are assumed to increase by Rs. 10,00,000 every year.

The cash inflows in winery during first year were Rs.924.00 lakhs. The cash inflows in winery during second year increased to Rs. 1895.70 lakhs almost double the cash inflows of first year, during second year the winery produced wine to its fullest capacity. From third year onwards the cash inflows are estimated figure. The wine production in the winery assumed to be its fullest capacity from third year onwards to 35<sup>th</sup> year as was in the second year of its operation. The cash inflows during these years i.e. from third year to 35<sup>th</sup> year are estimated by multiplying the quantity of wine sold (produced) with the expected price during each year.

Thus the cash inflows in winery during this period increased from Rs. 1922.40 lakhs in third year to Rs. 2776.80 lakhs in the 35<sup>th</sup> year.

### 4.6.3. Financial feasibility of investment in winery

To analyse the financial feasibility of investment in winery, the criteria such as net present value, benefit cost ratio, internal rate of return and payback period were used. The results are presented in the table 4.14.

#### 4.6.3.1 Net Present Value (NPV)

The annual net cash inflows were discounted at 13 per cent to obtain the present value of net benefit in winery. The initial investment made in winery was deducted from the present value of the net benefits.

Table 4.12. Wine sales and return structure of winery over the years

Sl no	Period (year)	Wine sales: no of cases (1case=9liters)	Rs /case	Total value ( Rs. in lakhs)
1	1	22000	4200	924.00
2	2	44500	4260	1895.70
3	3	44500	4320	1922.40
4	4	44500	4380	1949.10
5	5	44500	4440	1975.80
6	6	44500	4500	2002.50
7	7	44500	4560	2029.20
8	8	44500	4620	2055.90
9	9	44500	4680	2082.60
10	10	44500	4740	2109.30
11	11	44500	4800	2136.00
12	12	44500	4860	2162.70
13	13	44500	4920	2189.40
14	14	44500	4980	2216.10
15	15	44500	5040	2242.80
16	16	44500	5100	2269.50
17	17	44500	5160	2296.20
18	18	44500	5220	2322.90
19	19	44500	5280	2349.60
20	20	44500	5340	2376.30
21	21	44500	5400	2403.00
22	22	44500	5460	2429.70
23	23	44500	5520	2456.40
24	24	44500	5580	2483.10
25	25	44500	5640	2509.80
26	26	44500	5700	2536.50
27	27	44500	5760	2563.20
28	28	44500	5820	2589.90
29	29	44500	5880	2616.60
30	30	44500	5940	2643.30
31	31	44500	6000	2670.00
32	32	44500	6060	2696.70
33	33	44500	6120	2723.40
34	34	44500	6180	2750.10
35	35	44500	6240	2776.80

Table 4.13. Cash flows in winery (Rs. in Lakhs)

Year	Cash outflow	Cash inflow	Net cash flow	DF @ 13%	Discounted net cash flows
0	641.89	0.00	-641.89		
1	541.95	924.00	382.05	0.884	337.74
2	1028.48	1895.70	867.22	0.783	679.03
3	1038.48	1922.40	883.92	0.693	612.56
4	1048.48	1949.10	900.62	0.613	552.08
5	1058.48	1975.80	917.32	0.542	497.19
6	1068.48	2002.50	934.02	0.480	448.33
7	1078.48	2029.20	950.72	0.425	404.06
8	1088.48	2055.90	967.42	0.376	363.75
9	1098.48	2082.60	984.12	0.332	326.73
10	1108.48	2109.30	1000.82	0.294	294.24
11	1118.48	2136.00	1017.52	0.260	264.55
12	1128.48	2162.70	1034.22	0.230	237.87
13	1138.48	2189.40	1050.92	0.204	214.39
14	1148.48	2216.10	1067.62	0.180	192.17
15	1158.48	2242.80	1084.32	0.159	172.41
16	1168.48	2269.50	1101.02	0.141	155.24
17	1178.48	2296.20	1117.72	0.125	139.71
18	1188.48	2322.90	1134.42	0.110	124.79
19	1198.48	2349.60	1151.12	0.098	112.81
20	1208.48	2376.30	1167.82	0.086	100.43
21	1218.48	2403.00	1184.52	0.076	90.02
22	1228.48	2429.70	1201.22	0.067	80.48
23	1238.48	2456.40	1217.92	0.060	73.08
24	1248.48	2483.10	1234.62	0.053	65.43
25	1258.48	2509.80	1251.32	0.047	58.81
26	1268.48	2536.50	1268.02	0.041	51.99
27	1278.48	2563.20	1284.72	0.036	46.25
28	1288.48	2589.90	1301.42	0.032	41.65
29	1298.48	2616.60	1318.12	0.028	36.91
30	1308.48	2643.30	1334.82	0.025	33.37
31	1318.48	2670.00	1351.52	0.022	29.73
32	1328.48	2696.70	1368.22	0.020	27.36
33	1338.48	2723.40	1384.92	0.017	23.54
34	1348.48	2750.10	1401.62	0.015	21.02
35	1358.48	2776.80	1418.32	0.013	18.44
	TOTAL				6928.16

Table 4.14. Financial feasibility of investment in winery

Sl. No.	Particulars	Unit	Value
1	Net Present Value (@13%)	Rs in lakhs	6286.27
2	Benefit Cost Ratio (@13%)		2.5
3	Pay Back Period	Years	1.4
4	Internal Rate Of Return	Percent	96

It may be seen from the table 4.14 that the net present value of benefit in winery were Rs. 6286.27 lakhs

#### 4.6.3.2 Benefit – Cost Ratio

This criterion indicates the returns per rupee invested in winery. The benefit cost ratio was 2.5. As the benefit cost ratio is more than unity, it can be concluded that the investment in winery is financially feasible.

#### 4.6.3.3. Internal Rate of Return (IRR)

This criterion measures the rate of returns that can be earned by investing in winery. It also considers the reinvestment opportunities which are absent in other techniques. The internal rate of return was about 96 per cent.

The investments is found to be feasible in winery, since the internal rate of return is higher than the opportunity cost of capital of 13 per cent.

#### 4.6.3.4 Pay Back Period (PBP)

The time required to recover the initial investments made in winery is explained by payback period. It is seen that the payback period was 1.4 years.

## 4.7 Constraints faced by wine grape producers and winery

Opinion survey was conducted to know the constraints faced by the farmers in wine grapes production and winery in the production of wine; the results are presented in the Table 4.15 and 4.16 respectively.

### 4.7.1 Constraints in wine grapes production

Opinion survey was conducted to know the constraints faced by the farmers in wine grapes production and the results are presented in the table 4.15.

Garret test is applied by giving ranks for constraints; high initial investment cost was the major problem expressed by the most of the farmers, so this problem got assigned first rank followed by high cost of labour (II), irregular electric supply (III), in adequate credit supply by financial institutions, (IV), high cost of transportation (V) , absence of regulated market (VI) , non availability of labour in time ( VII), High cost of borrowing (VIII), Distant market (IX), High cost of PPC Chemicals (X), Lack of storage Facilities (XI), Lack of irrigation facilities (XII), Fluctuation in market prices (XIII), Timely Payment for sale (XIV), Non availability of Fertilizer in Time (XV), High cost of planting material (XVI), Non availability of planting material in Time (XVII) .

### 4.7.2 Constraints faced by winery.

Opinion survey was conducted with winery officials, to know the problems faced in winery in the production of wine. The problems expressed by them are presented in the table 4.16.

They are Marketing of wine, High excise duties, High electricity Bills, high Production costs, Higher packaging costs Especially Bottle, cartoons, Export Problem, High Transportation Costs, Shortage of Skilled Man Power, Strict Regulations and Control on Wine, Water Scarcity were the problems faced by the winery.

Table 4.15. Constraints faced by the farmers in production of wine grapes

Sl. No.	Constraints	Mean	Rank
A	Production constraints		
1	Non Availability of Planting Material in Time	65.67	XVII
2	Non Availability of Fertilizer in Time	67.35	XV
3	Lack of Irrigation Facilities	74.08	XII
4	Non Availability of Labour in Time	78.08	VII
5	Irregular Electric Supply	79.83	III
B	Marketing constraints		
6	High Cost of Transportation	78.52	V
7	Fluctuation in Market Prices	73.25	XIII
8	Absence of Regulated Market	78.17	VI
9	Distant Market	76.85	IX
10	Lack of Storage Facilities	75.17	XI
11	Delayed Payment For Sale	68.12	XIV
C	Economic constraints		
12	High Cost of Planting Material	66.37	XVI
13	High Cost of PPC Chemicals	76.85	X
14	High Cost of Labour	80.13	II
15	High initial Investment	81.17	I
16	Inadequate Credit Supply By Financial Institutions	79.17	IV
17	High Cost of Borrowing	77.55	VIII

Table 4.16 Constraints faced by the winery

SI No	Problems
1	Marketing Problem
2	High Excise Duties
3	High Electricity Bills
4	Production Costs are High
5	Higher Packaging Costs Especially Bottle, cartoons.
6	Export Problem
7	High Transportation Costs
8	Shortage of Skilled Man Power
9	Strict Regulations And Control On Wine
10	Water Scarcity

## 5. DISCUSSION

The results of the investigation presented in the preceding chapter are discussed in detail in this chapter. The main focus here is to throw a light on some of the causes responsible for the major trends observed in the findings. This kind of analysis is hoped to identify such of the policy measures and execute corrections that can be implemented to overcome the constraints encountered by wine grape growers and winery. Keeping objectives of the study in view the results are discussed under the following heads:

- 5.1 General characteristics of sample farmers
- 5.2 Cost and returns in wine grape cultivation
- 5.3 Financial feasibility of investment in wine grape cultivation
- 5.4 Investment pattern in wineries
- 5.5 Production of wine
- 5.6 Cost and returns in production of wine
- 5.7 Problems faced by wine grape producers and winery

### 5.1 General Characteristics of Sample Farmers

The general characteristics of the farmers in the study area are presented in the Table 4.1. From the Table it could be observed that, the average age of the wine grape growers was about 43 years and the main occupation of them was agriculture and only six farmers out of sixty farmers were having subsidiary occupation.

So far as the literacy is concerned it was observed that majority of the respondents were literates (83 per cent), having their education ranging from primary to college level. Wine grapes being a high investment enterprise has been perceived by these respondents mostly due to their education. This might have enabled the respondents to allocate the manageable size of the area under wine grapes to get higher returns over other crops. The remaining 17 per cent of growers were illiterates.

From the Table it could also be seen that the average size of the family was about six and average land holding was 4.1 ha, of which 1.6 ha was irrigated and remaining 2.5 ha was dry land. And average area under wine grapes cultivation was around 1.58 ha and the average no of plants per ha was 1980. The commonly grown wine grape varieties in the study area are cabernet, Shiraz, zinfandel chenin Blanc.

### 5.2 Cost and returns in wine grape cultivation

#### 5.2.1 Establishment cost of wine grape orchard

The investment pattern in wine grapes is similar to the one found in any plantation or orchards. Heavy investment is needed for establishing a wine grape orchard. The cost of establishing a wine grape orchard up to bearing included not only the cost incurred in the zero year that is at the time of planting but also the cost incurred in maintaining the plants till the time of bearing that is up to one year of planting.

For establishing wine grape orchard investment has to be made on bore well, pump set, pump house, sprayer, drip irrigation system, electrification, preparatory tillage, manures, fertilizers, pit marking, digging of pits, filling pits with FYM & fertilizers, cuttings, planting of cuttings, stone pillars, erection of stone pillars, bamboo sticks, erection of bamboo sticks, different gauge trellis wire, binding wire, training of trellis wire, jute, angles, clamps, nut and bolts.

The costs of establishing of wine grape orchard was higher (Rs. 3, 94,377.44 per ha). It is mainly because of the high cost of trellis wire of different gauge (10.73 per cent) and angles (8.75 per cent). The investment on bore well (7.54 per cent), stone pillars (5.69 per cent), drip irrigation system (5.19 per cent) and pump set (4.93 per cent) were the other major items of establishment cost.

During the establishment period of one year farmers incurred costs to maintain wine grape orchards. The maintenance cost incurred during this period was Rs. 113999.39 per ha of which variable cost was Rs. 83901.79 and fixed cost was Rs. 30097.6.

The total variable cost consisted of labour cost and material cost. Labour cost (Rs. 27748.7) accounted for 24.34 per cent and material cost (Rs. 49580.14) accounted for 43.49 per cent of the maintenance cost.

From the table 4.3 it is observed that the major item of labour cost was on application of plant protection chemicals (6.50 per cent), application of fertilizers (4.39 per cent) and application of FYM (4.33 per cent). It is mainly because wine grape cultivation involved intensive practices of application of plant protection chemicals, farm yard manure and chemical fertilizers.

Among material cost, the cost of fertilizers (19.07 per cent), manures (13.00 per cent), and micro nutrients (5.96 per cent) constituted more than 44.03 per cent of the total establishment cost. Interest on working capital forms 5.77 per cent.

Further, the major item of fixed costs was incurred by rental value of land, it alone accounted for 22.30 per cent to the total maintenance cost.

### 5.2.3 Maintenance cost of wine grape orchard during bearing period

The maintenance cost of wine grape orchard during bearing period that is from second year onwards increased in each year as shown in the Table 4.4. The total per year maintenance cost of wine grape orchard was Rs.1, 86,043.25. The slight difference was observed in labour cost (Rs.50520.21) during this period due to high requirement of labour for maintenance of wine grape orchard during bearing period. The difference in material cost was due to high use of Fertilizers, FYM, PPC and micro nutrients during bearing period.

In wine grape cultivation several inputs like labour, manures, fertilizers, plant protection chemicals and micro nutrients are used. The most labour consuming operations were application of plant protection chemicals, pruning and application of fertilizers.

Labour cost for application of plant protection chemicals constituted 6.97 per cent of total maintenance cost. It is due to the fact that wine grape is susceptible to various pests and diseases (but it is low compared to table grapes.) which affect the growth of vines. Hence regular plant protection measures were under taken which required more of human labour.

The second major items of labour cost were application of fertilizers (3.32 per cent) and application of FYM (3.05 per cent). The fertilizers were applied in split doses of 2-4 times in April- September period as well as October- March period. Farm yard manure were also applied in two doses, one after April pruning and another in October pruning.

The third major share (2.66 per cent of total maintenance cost.) in labour cost was accounted by pruning. Pruning is an equally important operation; it was a seasonal operation that strives to regulate the vegetative growth necessary to induce the production of fruiting bunches. Summer pruning done during April was intended to induce vegetative growth. Winter pruning under taken during October intended to induce the production of buds on the spurs. The operation needed considerable attention since the time of pruning determines the successive bearing time of the vines.

The other labour consuming operation is watch and ward (2.39 per cent). For watch and ward human labour employed for a period of two and half months after fruit setting.

Weeding also contributed significantly to the labour cost (1.99 per cent), the number of weeding's ranged from 4-5 during April - September period as it was rainy season, while the range was 2- 3 times during October- March period.

The bullock labour was used only for inter cultivation (1.66 per cent) to prevent weed growth in between the rows.

The other labour consuming operations were shoot thinning (1.59 per cent) and irrigation (1.59 per cent). Shoot thinning is required for removal of undesirable berries such as bird picked berries, short berries, over ripened and green coloured berries. Irrigation is required for wine grape cultivation through the year to achieve uniform growth of vines.

The labour required for harvesting is dependent upon the quantity of wine grape on particular plot. The harvesting operation consumed 24.7 man days (1.33 per cent of total establishment cost).

Fertilizer application was commonly practiced by wine grape growers in the study area. They used different types of complex fertilizers like 17:17:17, 19:19:19 and DAP. The amount of fertilizers applied to the crop was 2099.5 Kgs, FYM 29.64 tonnes and micro nutrients 135.85 Kgs. This high dosage of fertilizers and FYM was because wine grape is a heavy feeder and requires more of nutrients for sustained growth and to achieve subsequent yield levels.

Conspicuously the wine grape orchard requires large quantities of micro nutrients unlike the other crops. The farmers are quite aware of this phenomenon and were able to appreciate the role of micro nutrients on the quantity and quality of wine grapes.

The wine grape growers sprayed their crop as and when there was occurrence of pests and diseases. On an average, ten plant protection sprays were given to the crop in a year and again it dependent on severity of infestation.

#### 5.2.4 Yield and return structure in wine grapes

Per hectare yields of wine grapes are presented in the table 4.5. The yield of wine grapes varied with the age of vine. During the first year the yield was zero. From second year onwards the yields increased up to fifth year. The yield reached maximum in the sixth year and remained same up to 13<sup>th</sup> year because the yield rate changes with the age of grape wine. The yields decreased from 14<sup>th</sup> year onwards.

The returns obtained during second year were. Rs. 2, 11,770 and they went on increasing up to 13<sup>th</sup> year. From 14<sup>th</sup> year onwards the returns started decreasing.

#### 4.2.5 Cash flows of wine grapes

From the Table 4.6 it is evident that the average annual cost per hectare in wine grape orchard in the second year that is during bearing period was Rs.1,86,043 and it went on increasing up to 13<sup>th</sup> year, then declined to Rs.2,70,236 and Rs. 2,68,452 in 14<sup>th</sup> year and 15<sup>th</sup> year respectively.

The returns from the wine grape orchard started flowing from second year till 15<sup>th</sup> year. With the increase in the age of grape vine returns from it also increased up to 13<sup>th</sup> year. And the returns declined slightly during the last two years of its life. Accordingly net cash flows which were negative in the first year started increasing from second year and till 13<sup>th</sup> year. But due to old age the net returns decreased slightly in the 14<sup>th</sup> and 15<sup>th</sup> year.

### 5.3 Financial feasibility of investment in wine grape orchards

Wine grape is a plantation crop, once established continues to bear up to 15 years. Returns are expected only after one year of planting. Till then heavy investment is required. Once the resources are committed retrieval is impossible. Further, this needs vast resources and income is spread over a number of years. Therefore, costs and returns have to be analyzed carefully to test the worthiness of investment in wine grape enterprise. This analysis helps farmers in decision making. Hence, the techniques of project evaluation such as Net Present Value, Benefit -Cost ratio, Pay Back Period and Internal Rate of Return were employed in wine grapes.

In analyzing the investment feasibility, the establishment costs, maintenance costs and gross returns from the main crop were considered at 9.5 percent discount rate representing the opportunity cost of capital.

Net Present Value (NPV) criterion helps to evaluate the benefits accrued and costs incurred during the project life. One advantage of NPV is that it gives an idea about surplus and varies with level of investment and discount rates. In this study it is an absolute measure by discounting the net cash inflows. The NPV of wine grape orchard per hectare at 9.5 per cent discount rate were Rs. 1626956.11.

The formal selection criterion of NPV is to accept all the projects with positive values. Applying this principle, net present value of wine grape clearly indicated financial feasibility of investment.

Benefit-Cost Ratio is another tool for appraising the worthiness of investment and it helps to ascertain the profitability of an enterprise. In wine grape cultivation, initial investment

to be made to establish the orchard and maintenance costs was to be incurred during subsequent years of establishment. During these years of maintenance, the cash outflows or costs exceed the cash inflows or returns and therefore the costs in these years be met out of returns obtained from the subsequent years.

The decision in B-C ratio frame work is to select the projects where the ratio is more than one. The B-C ratio was 2.2 in wine grape orchards at 9.5 percent discount rate which satisfies the rule indicating the worthiness of investment on wine grape orchard .The B-C ratio indicates expected returns for each rupee of investment in wine grape enterprise.

Internal Rate of Return is suggested to be very suitable measure for evaluating the profitability of investment on different projects. The IRR is the rate of discount at which the present worth of project is zero or the discounted costs are equal to the discounted returns. It is superior over the other measures since it takes into consideration the reinvestment opportunities of enterprises during the life span.

The formal selection criterion of IRR is to accept the projects with IRR more than the opportunity cost of capital. The internal rates of return were 42.33 per cent for wine grape orchard. The IRR represents the maximum rate of interest at which the growers can borrow from lending agencies and invest on wine grape orchard. In other words, it is the average earning power of money invested on wine grape orchard during its life span. Since IRR was more than the opportunity cost of capital it clearly indicated that investment on wine grape orchard is a financially feasible.

The Pay Back Period refers to the time required for the net benefits from the project to equal the cost of the project. In the present study it worked out to be 3.2 years for wine grape orchard.

## 5.4 Investment pattern in winery by equipment category

The investment pattern in winery is similar to the one found in any processing unit or industry. Heavy investment is needed for establishing a winery. The cost of establishing a winery included the cost incurred in the zero year that is at the time of establishing winery for required standards.

The resultss presented in the table 4.8 and 4.9 on the investment costs of winery by equipment category and percentages to the total investment cost are explained under following headings.

### 5.4.1 Building for Plant and office equipments

The costs involved in establishing building for plant and office equipments (Rs. 17863200.) were the major contributor (27.83 per cent) to the total cost of establishing winery. The reason for this was building for plant and office equipments is primary step for establishing winery. This cost includes cost on building for plant (92.37 per cent), furnishings (5.67 per cent), land (1.34 per cent) and computers (0.62 per cent).

### 5.4.2 Cooperage

The second most significant investment cost in winery is cooperage. Cooperage costs forms 23.37 per cent to the total establishment cost of winery. (Rs. 15000000), in which cost of oak barrels constitute 84.0 per cent and racks for keeping oak barrels constitute 14.40 per cent to the total cooperage cost. Oak barrels are used for aging of wine to add aromas. Investment made on oak barrels depends on winery and individual wine making practices and it is mostly used for white wine.

### 5.4.3 Refrigeration system

Refrigeration system cost forms 14.73 per cent to the total establishment cost of winery. (Rs. 9452450). It is required for maintaining constant temperatures in entire wine cellar to ensure that wine is kept at the perfect conditions for proper aging.

#### 5.4.4 Fermentation and storage

Fermentation and storage costs (Rs. 8511900) form 13.26 per cent of the total establishment cost of winery. Fermentation process takes long time, for this purpose fermentation tanks and storage tanks of various capacities are used. These tanks are usually made up of jacketed stainless steel and cost of these tanks alone constituted 87.4 per cent to the total cost of fermentation and storage. Fermentation bins (7.90 per cent), tank washer (2.38 per cent) and tank stands (2.33 per cent) were the other items of investment costs to the total cost of fermentation and storage equipment.

#### 5.4.5 Receiving equipment

Receiving equipment costs (Rs. 4807500) form 7.49 per cent of the total establishment cost of winery. Of these costs cost of membrane press (34.07 per cent) and crusher (14.85 per cent) to gather constituted more than 48 per cent of the receiving equipment costs. These are used to break the grape skin and helps in juice extraction. Costs of picking bins (26.37 per cent), pomace and stem conveyor (14.98 per cent) must pump (8.74 per cent) were the other items of investment to the total cost of receiving equipment.

#### 5.4.6 Cellar equipment

Cellar equipment costs (Rs. 3337610) form 5.20 per cent of the total establishment cost of winery. The cost of transfer pump constituted 70.27 per cent of cellar equipment cost, it is used for racking and transferring wine between containers and for this good pump is essential. Costs of barrel washer (13.48 per cent), plate and frame filter (7.01 per cent) and tank mixer (6.31 per cent) were the other items of investment cost to the total cellar equipment costs.

#### 5.4.7 Material handling

Material handling costs (Rs. 2505450) form 3.91 per cent of the total establishment cost of winery. These costs were important in winery for handling of large containers, heavy equipments. Of this cost, cost of fork lift (44.35 per cent) and pick up (44.62 per cent) to gather constituted more than 89 per cent. Costs of Rotator implement (7.57 per cent), pallet jack (2.74 per cent) and hand craft (0.72 per cent) were the other investment costs to the total material handling costs.

#### 5.4.8 Tasting room

Tasting room equipment costs (Rs. 207907) form 0.32 per cent to the total establishment cost of winery. Wine sales took place in tasting room, for this purpose they maintained following equipments. Major item under tasting room equipment was cost of commercial dish washer (Rs. 126750), which forms 61.40 per cent of the total cost of tasting room equipment. Cost of commercial dish washer (25.97 per cent), cost of refrigerator (8.08 per cent) and cost of wine cooler (4.55 per cent) were the other items to the total cost of tasting room equipment.

#### 5.4.9 Bottling equipment

Bottling equipment cost (Rs.2500000) form 3.89 per cent to the total establishment cost of winery. It performs filling, corking and labelling operations.

### 5.5 Costs incurred for production of wine during first year for 22000 cases (198000litres)

Though the installed capacity of winery is to produce 44500 cases i.e. 400500 litres per year the winery could produce only 22000 cases i.e. 198000 litres during first year. The cost incurred on various items in producing the wine were collected from the winery and analysed and the results of same are presented in the table 4.10.

The total cost incurred in producing 22000 cases of wine during first year after establishment of winery were Rs. 541.95 lakhs of which variable costs were Rs. 451.78 lakhs (83.36 per cent) and fixed costs were Rs. 90.16 (16.64 per cent).

The variable cost consisted of labour cost (Rs. 9.74 lakhs) and material cost (Rs. 258.15 lakhs).

Labour costs were classified into different types based on positions held by labourers for specific work. Among full time labour costs, salaries of general manager made major contribution to the total labour cost (Rs. 2.16 lakhs) because he coordinates all the winery operations, maintenance of winery and staff thorough out the year.

The Second major share in labour cost is Salary of wine maker (Rs.1.8 lakhs). Wine maker was key person in production of wine, lab management and quality control. Salary of sales manager was (Rs. 1.2 lakhs) was another major item of labour cost. He regulates all marketing and sales efforts. The assistant wine maker assists the wine maker in lab duties, quality control, wine production and inventory management.

The office manager maintains financial record keeping and general office duties. Ware house keeper conducts all storage and shipping functions. These employees were paid reasonably.

The salaries of watch man, accountant, driver, clerk and part time labour costs were required during crushing time and they constituted negligible amount to the total labour cost.

In production of wine several inputs like wine grapes, chemicals and additives, bottles, corkers, labels, cartoons are used.

The major item under material cost was cost of raw material i.e. wine grapes Rs. 131.25 lakhs which formed 24.22 per cent of the total cost of wine preparation.

The wine grapes are important raw material for production of wine. Average of 375 tonnes of wine grapes are required for the production of 22000 cases (i.e. 198000litres) of wine. Average prices of wine grapes per tonne prevailed in the market were taken i.e. Rs. 35000 per tonne.

The next major share in material cost were cost of bottles (Rs. 68.75 lakhs) which formed 12.69 per cent of the total cost of wine preparation.. Average of 275000 bottles are required for 22000 cases (i.e. 198000litres) of wine. These bottles were imported from France and average cost of per bottle was Rs. 26.

Cost of labels was Rs. 35.75 lakhs. On an average 275000 labels are required for 22000 cases i.e. 198000litres of wine and the average price per label was Rs. 13.

Cost of corkers was Rs. 16.50 lakhs. On an average 275000 corkers are required for 22000 cases i.e. 198000 litres of wine and the average price per corker was Rs.6.

Cartoons (0.83 per cent), Tarutaric acid (0.09 per cent), yeast (0.07 per cent), potassium metabisulphate (0.05 per cent), calcium carbonate (0.05 per cent), ascorbic acid (0.04 per cent), and pectic enzyme powder constituted negligible amount to the total material cost.

The excise tax was Rs. 148.00 lakhs; it is because they have to pay Rs.74 per litre of wine every year

The major items of fixed costs were costs of interest on borrowed capital were (Rs. 65.00 lakhs) and costs of apportioned establishment were (Rs. 18.34 lakhs).

#### 5.5.1 Costs incurred for production of wine from second year on wards for 44500 cases (400500 litres)

During second year after its establishment the winery utilised the installed capacity fully producing 44500 cases i.e. 400500 litres of wine. And is assumed that the winery will utilise the installed capacity fully to produce wine during all the remaining years of its life period.

The total costs incurred during the second year for producing 44500 cases i.e. 400500 litres of wine were Rs.1028.48 lakhs almost double the total costs in first year. This consisted of variable cost (Rs. 938.32 lakhs) and fixed costs (Rs. 90.16 lakhs.). The variable cost consisted of labour cost (Rs. 9.75 lakhs) and material cost (Rs. 559.0 lakhs).

Labour costs were classified into different types based on positions held by labourers for specific work. During second year full time labour requirement remained same as we observed in the first year because they are pre requisite for production of wine irrespective of quantity of wine produced. Only part time labour used in winery during crushing will change and it is depend on winery capacity, which constitute negligible amount to the total cost of wine preparation. And these costs are assumed to remain same during subsequent years also.

In production of wine several inputs like wine grapes, chemicals and additives, bottles, corkers, labels, cartoons are used.

The major item under material cost was cost of raw material i.e. wine grapes. It was Rs. 304.50 lakhs more than double the wine grape costs in first year. It is because the winery utilised the installed capacity fully producing 44500 cases i.e. 400500 litres of wine.

The next major share in material cost was cost of bottles (Rs. 137.50 lakhs) which formed 13.37 per cent of the total cost of wine preparation. Average of 550000 bottles are required for 44500 cases (i.e. 400500 litres) of wine. These bottles were imported from France and average cost per bottle was Rs. 26.

Cost of labels was Rs. 71.50 lakhs, on an average of 550000 labels are required for 44500 cases (i.e. 400500 litres) of wine and the average price per label was Rs. 13.

Cost of corkers was (Rs. 33.00 lakhs), on an average of 550000 corkers are required for 44500 cases (i.e. 400500 litres) of wine and the average price per corker was Rs.6.

Cartoons (0.88 per cent), Tarutanic acid (0.09 per cent), yeast (0.07 per cent), potassium metabisulphate (0.05 per cent), calcium carbonate (0.05 per cent), ascorbic acid (0.04 per cent), and pectic enzyme powder constituted negligible amount to the total material cost.

The excise tax was Rs. 296.00 lakhs; it is because they have to pay Rs.74 per litre of wine every year.

The major items of fixed costs were costs of interest on borrowed capital were (Rs. 65.00 lakhs) and costs of apportioned establishment were (Rs. 18.34 lakhs).

## 5.6 Costs and returns in production of wine from wine grapes

### 5.6.1 Wine sales and return structure of winery over the years

The quantity of wine sold and returns obtained by the winery during different years are presented in the table 4.12. During the first year the winery could produce 22000 cases (i.e.198000 litres) of wine. During second year the winery could utilise fully the installed capacity and produced 44500 cases of wine.

It is assumed that the winery will produce to its fullest capacity during the remaining years of its life (35years) i.e. 44500 cases per year up to 35 years.

The returns obtained during first year were Rs. 924.00 lakhs and they increased to Rs. 1895.70 lakhs during second year almost double the returns obtained in first year.

The returns from the sale of wine during each year are calculated by multiplying 44500 cases of wine with the expected price during that year. The expected price for each year is arrived at by increasing the previous year price by Rs.60/-. Thus the returns from sale of wine will go on increasing from Rs. 1922.40 lakhs in third year to Rs. 2776.80 lakhs in 35<sup>th</sup> year.

### 5.6.2 Cash flows of winery

From the Table 4.13 it is evident that the average annual cost for production of wine during first year was Rs. 541.95 lakhs and it is increased to Rs. 1028.48 lakhs during second year. The difference in cost between these years is mainly because winery could not utilise the installed capacity fully to produce wine in the first year. It utilised half of its capacity and produced only 22000 cases of wine where as in the second year it produced 44500 cases making full use of its installed capacity. From third year on wards cash out flows are assumed to increase year after year up to 35<sup>th</sup> year. Though production of wine from third year to 35<sup>th</sup>

year is assumed to be same the returns are increasing because of increase in expected price each year.

The net cash flows obtained in winery during first year were Rs. 382.05 lakhs. The net cash flows in winery during second year increased to Rs. 867.22 lakhs almost double the net cash flows of first year, during second year the winery produced wine to its fullest capacity.

The wine production in the winery assumed to be its fullest capacity from third year onwards to 35<sup>th</sup> year as was in the second year of its operation. Thus the net cash inflows in winery increased from Rs. 883.92 lakhs in third year to Rs. 1418.32 lakhs in the 35<sup>th</sup> year.

### 5.6.3. Financial feasibility of investment in winery

Winery is an industry or processing unit, once established continues to generate returns up to 35 years. For establishing winery high initial investment is required. Once the resources are committed retrieval is impossible. Further, this needs vast resources and income is spread over a number of years. Therefore, costs and returns have to be analyzed carefully to test the worthiness of investment in winery enterprise. This analysis helps wine producers in decision making. Hence, the techniques of project evaluation such as Net Present Value, Benefit -Cost ratio, Pay Back Period and Internal Rate of Return were employed in winery enterprise.

In analyzing the investment feasibility, the establishment costs, maintenance costs and gross returns from the winery were considered at 13 percent discount rate representing the opportunity cost of capital.

Net Present Value (NPV) criterion helps to evaluate the benefits accrued and costs incurred during the project life. One advantage of NPV is that it gives an idea about surplus and varies with level of investment and discount rates. In this study NPV was calculated to indicate the money that would be generated by a project at a given discount rate. It is an absolute measure by discounting the net cash inflows. The NPV of winery enterprise at 13 per cent discount rate were Rs. 6286.27 lakhs.

The formal selection criterion of NPV is to accept all the projects with positive values. Applying this principle, net present value of winery enterprise clearly indicated financial feasibility of investment in winery.

Benefit-Cost Ratio is another tool for appraising the worthiness of investment and it helps to ascertain the profitability of an enterprise. In production of wine, initial investment were to be made to establish the winery and maintenance costs were to be incurred during subsequent years of establishment. During these years of maintenance, the cash outflows or costs exceed the cash inflows or returns and therefore the costs in these years be met out of returns obtained during the subsequent years.

The decision in B-C ratio frame work is to select the projects where the ratio is more than one. The B-C ratio was 2.5 in winery at 13 percent discount rate which satisfies the rule indicating the worthiness of investment on winery enterprise. The B-C ratio indicates expected returns for each rupee of investment in winery enterprise.

Internal Rate of Return is suggested to be very suitable measure for evaluating the profitability of investment on different projects. The IRR is the rate of discount at which the present worth of project is zero or the discounted costs are equal to the discount returns. It is superior over the other measures since it takes into consideration the reinvestment opportunities of enterprises during the life span.

The formal selection criterion of IRR is to accept the projects with IRR more than the opportunity cost of capital. The internal rates of return were 96.00 per cent for winery enterprise. The IRR represents the maximum rate of interest at which the wine producers can borrow from lending agencies and invest on winery enterprise. In other words, it is the average earning power of money invested on winery during its life span. Since IRR was more than the opportunity cost of capital it clearly indicated that investment on winery enterprise is financially feasible.

The Pay Back Period refers to the time required for the net benefits to equal the cost of the project. In the present study it worked out to be 1.4 years for winery enterprise.

### 5.7.1 Constraints in wine grapes production

An informal discussion with the sample farmers revealed that the wine grape cultivation has lot of problems. Opinion survey was conducted to know the constraints faced by the farmers in wine grapes production and results of opinion survey are presented in the table 4.15.

Garret test was applied by giving ranks for constraints; high initial investment cost was the major problem expressed by the most of the farmers so this problem got assigned first rank, the small farmers faced problems in getting credit facilities from institutional agencies. This was followed by high cost of labour (II), since wine grape cultivation requires skilled labour for specific operations during bearing period. Irregular electric supply (III) was another major problem, wine grape requires water throughout the year, so the irregular electric supply affects the irrigation of crop. Inadequate credit supply by financial institutions, (IV), farmers do not get sufficient credit in time from financial institutions were also perceived as major problems in wine grape cultivation.. High cost of transportation (V) was also a problem, for transportation of wine grapes immediately after harvesting require refrigerated vans and the produce should be reach winery within four to five hours after harvesting otherwise winery officials reject the produce.

Another problem i.e. absence of regulated market ranked VI. For marketing of wine grapes they do not have any local markets. Non availability of labour in time was a problem ranking VII, wine grape is a more labour intensive crop there was a problem of availability of the labour especially during pruning, the peak time of harvesting and some of the other operations and hence labourers demand high wage rate.

Distant market (IX), for marketing of wine grapes farmers heavily depend on Maharashtra and Bangalore which are far away from the growing region.

High cost of PPC Chemicals (X), since wine grapes are susceptible to pests and diseases they require regular plant protection measures.

Lack of irrigation facilities (XII), Fluctuation in market prices (XIII), Delayed Payment for sale (XIV), Non availability of Fertilizer in Time (XV), High cost of planting material (XVI), Non availability of planting material in Time (XVII) were the other problems faced by wine grape producers.

### 5.7.2 Constraints faced by winery

Opinion survey was conducted with winery officials, to know the problems faced in winery in the production of wine. The problems expressed by them are presented in the table 4.16.

Marketing of wine was perceived as a number one problem, wine consumption getting popularity in recent days and in India alcohol consumers do not go for this high cost wine, they prefer locally available and cheaper drinks. High excise duties on wine is another major problem for them. The government charges Rs. 74 per litre of wine every year.

High electricity Bills is another problem in winery. It is because for industries government charge high price electricity (commercial rates) compared to agriculture and other operations.

Production costs of wine are high, according to winery officials .it is mainly because of high price of raw material i.e. wine grapes. They also feel that packaging costs are high in winery. Bottles are imported from France and other packaging material *i.e.* corks, labels are costly.

They also face Problem in exporting wine made out of wine grape. In international market wine consumers do not prefer with Indian origin. Hence government interventions are necessary for export of wine.

High Transportation Costs, Shortage of skilled manpower, Strict Regulations and Control on Wine, and Water Scarcity indirectly affects the wine production.

## 6. SUMMARY AND POLICY IMPLICATIONS

The wine industry in India is projected to grow at more than 30 per cent annually in the next decade, the quantum jump from 2 million liters of wine production to 13 million litres in 2007. The wine sales in the Karnataka, which was around 4.9 lakh liters in 2003-04, have exceeded 14 lakh liters during 2007-08. The sales figures include imported (both from outside the state and the country) wines and those produced in Karnataka.

In Karnataka, more than 12 varieties of grapes are used for wine making. Cabernet sauvignon, pinot noir, merlot, pinotage, shiraz, zinfandel, chardonnay, chenin blanc and others are being cultivated by farmers who have contracts with the wineries. These varieties are mostly grown in Bijapur, Belgaum, Koppal, Bagalkot, Bangalore rural and urban, and Chikkaballapur districts. Karnataka is the second largest producer of wine, next to Maharashtra. Many factors, such as the increasing consumption of wine and promotion of wine as a healthier drink, when compared to other varieties of alcohol have kindled interest for wineries to invest in Karnataka. If table grapes fetch Rs. 6 to Rs. 15 a kg to the farmer who harvests around 15 ton an acre, the wine varieties fetch Rs. 35 to Rs. 40 a kg and five to six tonnes can be harvested from each acre. These varieties require less water, and are grown organically.

As is well known, India with its diversity of soils and climate is advantageously placed for producing practically all varieties of tropical and sub tropical fruits. A wine grape (*vitis vinifera*) is one of these fruits. It belongs to the family vitacea. The fruit is rich in energy giving sugars and some useful minerals like phosphorus, iron and vitamins like vitamin B<sub>1</sub> and vitamin B<sub>2</sub>. Wine is refreshing drink, a stimulant to kidneys and a laxative. In India it is predominantly grown in states like Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Punjab and Haryana.

In Karnataka, grapes is grown on commercial scale and occupies about 9700 hectares with production of 1.67 lakh tonnes and the area under wine grapes is about 285 hectares and it is expected that it will increase to 810 hectares by the end of 2009.

The predominant wine grapes growing districts in Karnataka are Bijapur, Bagalkot, Belgaum, Koppal, Bangalore rural, Chikkaballapur and Kolar. In Bijapur district wine grapes is being grown on commercial scale; the area under wine grapes in the district is 80 hectares, with production of 1280 tonnes.

The economics of wine grape production is indispensable since there is no proper farm business data on its cost of production. The accurate figures on establishment cost, operating cost and input requirements of wine grape orchard would be greatly helpful to the wine grape growers in general and wine grape growers of Bijapur district in particular for making decisions related to wine grape enterprise. This information will be of immense use to farm financing institutions.

Value addition in wine grapes is part and parcel of wine grape production. There is no proper data on investment pattern in winery, various inputs and chemicals involved in the production of wine. The accurate figures on establishment cost of winery, operating cost and input requirements of wine production would be greatly helpful to winery officials.

The specific objectives of the study were:

1. To estimate cost and returns in wine grape production
2. To study the investment pattern in wineries
3. To study the value addition in wine grapes
4. To identify the constraints in wine grape production and winery

Selection of sample farmers

Wine grape cultivation is practiced through out the district. However, the large scale cultivation of wine grape is concentrated mainly in Bijapur taluk. The area under wine grape cultivation in Bijapur district is about 80 ha of 3305 ha of total area under grape cultivation. Hence, Bijapur district is selected purposively for the study. Wine grape growers were selected purposively spread over in the district. Thus, the total size of the sample selected for the study was 60. In addition, to study the value addition in wine grapes a case study approach was followed by selecting the winery existing in Bijapur town.

## Analytical techniques

For analysing the data collected during the study, tabular presentation method, financial analysis and garrett's ranking technique were employed.

The tabular presentation was employed for estimating the cost and returns structure of wine grape orchard and winery.

In order to know the financial feasibility of investment in wine grape cultivation and winery the measures of project evaluation namely, Net present Value (NPV), Benefit Cost Ratio (BCR), Pay Back Period (PBP) and Internal Rate of Return (IRR) were employed.

Constraints faced by farmers in wine grape production were prioritized by using Garrett's ranking technique.

### Findings

The cost of establishment per hectare of wine grape orchard was found to be Rs.3,94,377.44 of which initial investment cost constituted 71.09 per cent and maintenance cost during establishment period constituted 28.91 per cent. It was observed that during first year, the plants give no returns. Returns start from the second year and continue up to fifteen years of its age which is taken as the economic life of the wine grape orchard.

The total cost of cultivation of wine grape per hectare was found to be Rs.186043.25 of which variable cost constituted 67.20 per cent and fixed cost constituted 32.80 per cent. The variable cost was composed of material cost (34.78 per cent of total cost of cultivation) and labour cost (27.16 per cent of total cost of cultivation). The major components of fixed cost were apportioned establishment cost (15.47 per cent of total cost of cultivation) and rental value of land (13.26 per cent).

The per hectare average quantities of inputs used in wine grape cultivation were 447.07 man days of labour, 29.64 tonnes of farmyard manure, 2099.5 kgs of fertilizers. On an average, the farmers sprayed the crop 52 times and irrigated the crop 49 times in a year. The average yield obtained per hectare in wine grape orchard was 14 tonnes and the average returns obtained from wine grape orchard were Rs. 529787.

The study indicated that wine grape cultivation required high dosage of fertilizers and FYM for sustained growth and to achieve subsequent yield levels. The wine grape cultivation is labour intensive requiring 447.07 man days. The most important labour consuming operations were application of plant protection chemicals, pruning and application of fertilizers.

In the wine grape orchard the NPV was Rs.16,26,956, the BCR was 2.2, PBP was 3.2 and the IRR was 44.77 per cent thus indicating the feasibility of investment in wine grape orchard

The total cost of establishing a winery was found to be Rs. 641. 89 lakhs. The major item of winery cost is building for plant and office equipment (Rs.17863200) which constituted 27.83 per cent, followed by cooperage (23.37 per cent), refrigeration system (14.73 per cent), fermentation and storage (13.26 per cent), receiving equipment (7.49 per cent), cellar equipment (5.20 per cent), material handling (3.91 per cent) and bottling equipment (3.89 per cent).

It was observed that, though the installed capacity of winery is to produce 44500 cases i.e. 400500 litres per year the winery could produce only 22000 cases i.e. 198000 litres during first year.

During second year after its establishment the winery utilised the installed capacity fully producing 44500 cases i.e. 400500 litres of wine. The total costs incurred during the second year for producing 44500 cases i.e. 400500 litres of wine were Rs. 1028.48 which consisted of variable cost (Rs. 938.32 lakhs) and fixed costs (Rs, 90.16 lakhs). The variable cost consisted of labour cost (Rs. 9.75 lakhs) and material cost (Rs. 559.05 lakhs).

In the labour cost salaries of employees was the major item.

The cost of raw material i.e. wine grapes made major contribution to the total material cost i.e. (Rs. 304.50 lakhs) followed by bottles (Rs. 137.50 lakhs), labels (Rs. 71.50 lakhs), corks (Rs. 33.00 lakhs), cartoons (Rs. 9.0 lakhs).

The excise tax made major contribution to the total variable cost i.e. (Rs.296.00 lakhs).

The interest on borrowed capital made major contribution to the fixed cost i.e. (Rs.65.00 lakhs), followed by apportioned establishment cost (Rs.18.34 lakhs), insurance premium (Rs.6.0 lakhs), and licence fee (Rs. 0.83 lakhs).

The returns obtained during first year were Rs. 924.00 lakhs and they increased to Rs. 1895.70 lakhs during second year almost double the returns obtained in first year.

The returns from the sale of wine during each year are calculated by multiplying 44500 cases of wine (the maximum capacity of winery) with the expected price during that year. The expected price for each year is arrived at by increasing the previous years price by Rs.60/-. Thus the returns from sale of wine will go on increasing from Rs. 1922.40 lakhs in third year to Rs. 2776.80 lakhs in 35<sup>th</sup> year.

In the winery NPV was 6286.27 lakhs, the BCR was 2.5, PBP was 1.40 and the IRR was 96.00 per cent. Thus indicating the feasibility of investment in winery.

From the discussion with the sample farmers it was found that most of the farmers had the problem of high initial investment cost, non availability of credit in time, non availability of labour in time, high cost of labour and irregular electric supply in the production of wine grape.

The major problems in marketing of wine grapes were lack of transportation facilities, high cost of transportation, absence of regulated markets and fluctuations in price.

Opinion survey was conducted for winery officials, to know the problems faced in winery in the production of wine. The problems expressed by them are marketing problem, high excise duties, high electricity bills, high production costs, higher packaging costs especially bottle, cartoons. Export Problem, high transportation costs, shortage of skilled man power, strict regulations and control on wine and water scarcity were the problems faced by the winery.

## Policy implications

Based on the findings of the study following policy implications are drawn.

1. As the investment in wine grape orchards is financially feasible, the farmers, who wish to switch over to the establishment of wine grape orchard, may do so even if they have to borrow for establishing the orchards at the prevailing rates of interest from financial institutions.
2. As the initial investment in establishing wine grape orchard is high the farmers interested in establishing wine grape orchard need to be provided with the required funds by the financial institutions.
3. The wine grape producers in the study region are facing the problem of market for their produce. As there is only one winery in the region farmers have to take their produce to the wineries located in Maharashtra, far away from the production centre. Hence, there is need to establish wineries in the region.
4. The investment in winery is financially feasible. The entrepreneurs should come forward to establish wineries in the study region to process the wine grape produced by the farmers. The establishment of wineries will help to expand the area under wine grape cultivation in the region which has congenial climate for its cultivation.
5. Wineries are facing the problem of skilled and trained man power to operate the processing operations in the wineries. Wine institute for training the man power to work in the winery need to be established in the region. The state government has already taken a decision in this regard but the speedy implementation of the decision is the need of the hour.

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# APPENDIX

## Interview schedule

UNIVERSITY OF AGRICULTURAL OF SCIENCES, DHARWAD  
Department of Agricultural Economics  
College of Agriculture, Dharwad

“Economics of Production and Value Addition to Wine Grapes in  
Bijapur District of Karnataka”

Date: \_\_\_\_\_

Schedule

No: \_\_\_\_\_

### I. General Information:

#### A. 1.name of the respondent:

2. Age

3. Education:

4. Village:

5. Taluk:

6. Main occupation:

7. Subsidiary occupation:

#### B. Family information:

Sl. NO	No	Engaged in agriculture	Others	Total
1. Male				
2. Female				
3. Children.				
Total				

#### C. Land holdings

SL. No	Particulars	Irrigated	Unirrigated	Land revenue	Land Rent
1.	Leased in				
2.	Own				
3.	Area under wine grapes				
4.	Total				

D. Sources of Irrigation

Sl. No.	Particulars	No	Area covered	Crops
1.	Well			
2.	Tube well			
3.	Others			

E. Inventory of Implements, Machinery and Live Stock

Sl. No.	Item	No	Year of purchase	Purchase value (Rs)	Average life (Yrs)	Annual repairs (Rs)	Junk value (Rs)
1.	Implements a. Iron plough b. wooden plough c. Seed drill d. hoes e. harrows f. bullock cart g. others						
2.	Machinery a. Tractor b. Sprayer c. Duster d. pumpset						
3.	Livestock a. cows b. Buffaloes c. Bullocks d. Sheep e. Goat f. others						













Sl. No	Operations	3 <sup>rd</sup> year						4 <sup>th</sup> year					
		Human labour (man days)				Bullock labour (pair days)	Machine labour (hrs)	Human labour (man days)				Bullock labour (pair days)	Machine labour (hrs)
		Family		Hired				Family		Hired			
		Men	Women	Men	Women			Men	Women	Men	Women		
1.	Pruning												
2.	Intercultivation												
3.	Weeding												
4.	Manuring												
5.	Fertilizer application												
6.	PPC application												
7.	Irrigation												
8.	Girdling												
9.	GA treatment												
10.	Harvesting												
11.	Thinning												
12.	Watch and ward												
13.	Topping or pinching												

C. Gross Returns

Sl. No.	Particulars	Year of Establishment and production						
		1	2	3	4	5	6	7-20
1.	Yield per acre(tons)							
2.	Market price(Rs)							
3.	Total revenue(Rs)							

- A. Production constraints Yes/no
- a. Non availability of planting material in time.
  - b. Non availability of fertilizer in time.
  - c. Lack of irrigation facilities.
  - d. Non availability of labour in time
  - e. Any others specify.
- B. Marketing constraints
- a. Lack of Transportation facilities.
  - b. High cost of Transportation.
  - c. Fluctuation in market prices.
  - d. Absence of regulated markets.
  - e. Distant market.
  - f. Lack of grading and packaging.
  - g. Lack of storage facilities.
  - h. Timely payment for sale.
  - i. Any others specify.
- C. Economic constraints
- a. High cost of planting material.
  - b. High cost of pesticides.
  - c. High cost of labour.
  - d. Non-availability of credit in time.
  - e. In adequate credit supply by the financial institutions.
  - f. High cost of barrowing.
  - g. Any others specify.
- D. Technical constraints
- Lack of knowledge about
- a. Wine grape production
  - b. Fertilizer application
  - c. Planting material treatment.
  - d. Identifying the disease.
  - e. Identifying pests.
  - f. Plant protection.

B. Schedule for investment pattern in wineries

1. General information regarding winery

a) Name of the factory:

b) Type of ownership:

Individual/Partnership/Co-operative/Any other

c) Name of owners:

i) Age: \_\_\_\_\_ yrs.

ii) Education: \_\_\_\_\_

d) Location:

i) Block:

ii) Village:

e) Years of establishment :

f) Category of preservation factory: Large/Small/Cottage/Home scale

2. Capital investment in winery (fixed cost)

Sr. No.	Item	No./Qty	Year of Purchase	Purchase Price (Rs.)	Present value (Rs.)	Life	Depreciation rate
1	Land						
2	Building						
3	Storage						
	i. Raw material						
	ii. Processed product						
4	Machinery and equipments						
5	Salary to permanent						
6	Employees(Rs)						
7	Capital(Rs)						
8	(a) own						
9	(b) borrowed						
10	Interest on borrowed capital						
11	License fee (Rs)						
12	Insurance premium						
	Others						

### 3. Variable costs

Sl. No	Particulars	No/quantity	Rs/unit	Amount(Rs)
1.	Grapes			
2.	Packaging			
3.	Bottling			
4.	Taxes and Dues			
5.	Full time labour			
6.	Part time labour			
7.	Marketing			
8.	Utilities			
9.	Office supplies			
10.	Others			
	a)			
	b)			

### 4. Labour utilization in winery

	male		Female	
	No	Salary/Month	No	Salary/Month
Skilled a) Technical 1. operator1 2. operator2 3. maintenance man 4. 5.				
Office staff 1. permanent clerk 2. steno 3. accountant 4. others				



5. Input required during season:

a.) Raw material

(1) -Cash, (2) -Credit, (3) –Pre-harvest contract, (4) - Others

b) Input costs- Chemicals, Additives, Preservatives etc.

SL.No.	Particulars	Total Qty	Price	Tax	Transport cost	Loading charges	Unloading Charges	Source From whom	Type of purchase (1),(2),(3),(4)
1	Sugar								
2	Acids								
3	coagulate								
4	Preservatives								
5.	Chemicals								
	Others								

(1) -Cash, (2) -Credit, (3) –Pre-harvest contract, (4) – Others

c) Packing material

Sl.No.	Particulars	Unit	Total Qty	Price	Tax	Transport cost	Loading charges	Unloading Charges	Source From whom	Type of purchase (1),(2),(3),(4)
1	Bottle	No.								
2	Glass jar	No.								
3	corkers	No.								
4	Labels	Kg								
5	Any others									
6										

(1) -Cash, (2) -Credit, (3) –Pre-harvest contract, (4) - Others

Have you avail institutional finance for meeting variable cost? Yes/No

If Yes, Amount..... Source..... Interest rate.....

6. Quantity processed during season (wine)

Sl No	particulars	Unit/ltr	No/Qty	Price/case	Total return(Rs)	When sold	Agency sold	Type of sale (1) (2)	Method of payment (i), (ii), (iii)
1.	Jan								
2.	Feb								
3.	Mar								
4.	April								
5.	May								
6.	June								
7.	July								
8.	Aug								
9.	Sept								
10.	Oct								
11.	Nov								
12.	Dec								

(1) –Direct, (2) – Preprocessing contract

(i) – Spot, (ii) – Credit, (iii) – Both.

Are you making profit over fixed cost / total cost? Y/N

7. What is the percentage and nature of spoilage in your processing unit ?

Sl. No.	Product	Percentage of spoilage	Nature of spoilage
1.	Grapes		
2.	Wine		

8. According to you what are the reasons of spoilage?

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9. Did you borrow money for this business? Yes/No

If yes, state the purpose, source and amount borrowed. -----

SL.No.	Purpose	Source	Amount (Rs.)
1.	Purchase of equipments		
2.	Purchase of raw material		
3.	(Grapes, chemicals, preservatives etc.)		
	Payment of labour charges		
4.	Any other		

10. Installed capacity is fully utilized or not?

11. Constraints

What constraints do you face in wine grape production and wineries?

SL. No.	Problems	Solution/Suggestions
1	Raw material	
2	Transport	
3	Marketing	
4	Govt. policy .1 Infrastructure 2 Electricity,Water,Road 3 Taxes and Duties 4 Need for incentives 5	
5	Finance	
6	Technical Assistance	
7	Labour	
8	Adoption of improved processing practices	
9	Any others	

# **ECONOMICS OF PRODUCTION AND VALUE ADDITION TO WINE GRAPES IN BIJAPUR DISTRICT OF KARNATAKA**

NAVEEN B. S.

2009

Dr. L. B. KUNNAL  
Major Advisor

## **ABSTRACT**

The area under wine grapes in Bijapur district is increasing over the years. Since there is no proper farm business data on its cost of production, the study on economics of production and value addition to wine grapes was conducted in Bijapur district of Karnataka. Primary data was collected from 60 wine grape growers spread over in the district. In addition, to study the value addition in wine grapes a case study approach was followed by selecting winery existing in Bijapur town. For analysis of data tabular presentation method and financial analysis were adopted.

The per hectare total cost of establishment was Rs. 3,94,377.44. The total maintenance cost during bearing period was Rs. 1, 86,043.25. The average yield of wine grape orchard was 14.00 tonnes per hectare per year and average returns were Rs. 5,29,787.

Financial feasibility analysis showed that, NPV for wine grape orchards was Rs. 16,59,443.32 per hectare at 9.5 per cent discount rate. The BC ratio at 9.5 per cent discount rate was 2.2, the payback period was about 3.20 years and the IRR was found to be 44.77 per cent. The investment in wine grape orchard was found to be financially feasible.

The total cost of establishment of winery was Rs. 641.89 lakhs. Winery produces 400500 litres of wine every year and average maintenance cost was Rs.1174.86 lakhs and average annual returns were Rs. 2295.90 lakhs. In the winery NPV was 6286.27 lakhs, the BCR was 2.5, PBP was 1.4 years and the IRR was 96.00 per cent, thus indicating the feasibility of investment in winery.

Opinion survey was conducted to know the problems in the production of wine grapes and wine. High initial investment cost and high cost of labour were the major problems in production of wine grapes. Similarly, marketing of wine and high excise duties were the major problems in winery.