Grapes

1. Introduction :

Grapes (*Vitis vinifera*) belonging to the Vitaceae family, originated in Western Asia and Europe. It was introduced to India by the Persian invaders in 1300 A. D. Grapes is a non-climacteric fruit that grows on the perennial and deciduous woody climbing vine. Grapes is a cross pollinated vine with simple, lobed, cut or toothed leaves (seldom compound) with racemes of greenish flowers, the fruit consisting of watery or fleshy pulp, stones and skin, four-seeded.

Grapes can be eaten as fresh or used for making jam, juice, jelly, vinegar, wine, grape seed extracts and grape seed oil. Approximately 71% of world grape production is used for wine, 27% as fresh fruit, and 2% as dried fruit. However, in India, 90% of the grape is used for table purpose, even though wine making has made strides. The rest of the grape is used mostly for raisin.

2. International scenario :

Grapes occupy a predominant position in terms of world fruit production, accounting for about 16% of the global fruit production. The total world production of grapes is estimated to be about 68.9 million tonnes, next only to citrus and bananas and is followed by apples. The major grape producing countries are Italy, France, Spain, U.S.A, Turkey, Argentina, Iran, Portugal, South Africa and Chile. The area and production of grapes in some of the major grape growing countries is given in Table 1.

Table 1. Area and Production of grapes in major producing countries (2006)

Name of the country	**Area ('000 ha)**	**Production ('000 t)**
Spain	1200.0	6401
France	842.0	6692
Italy	755.0	8325
India	60.2	1546
World	7399.5	68952

Source : FAOSTAT The world trade in fresh grapes during 2006 is to the extent of 32.60 lakh tonne valued at Rs.22979 crore.

3. National Scenario :

The annual production of fresh grapes in India during the year 2006-2007 was to the tune of 16.67 lakh tonne from an area of 63600 ha. India ranks first in productivity (25.69 t/ ha) against the world productivity of 9.32 t/ha and also in terms of highest recorded yield of 100 t/ha. Cultivation of grapes in the country is very much localized, being confined primarily to four states , viz., Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu, which together account for more than 90 percent of the area and production. The statewise area, production and productivity of grapes during is given in Table 2 below.

Table 2. State wise area, production and productivity of grapes (2006-07)

Sl. No.	State	Area ('000 ha)	Production ('000 t)	Productivity (t/ha)
1	Andhra Pradesh	2.50	51.80	20.72
2	Karnataka	10.80	199.00	18.43
3	Maharashtra	45.40	1284.20	28.29
4	Punjab	1.10	30.70	27.91
5	Tamilnadu	2.80	91.60	32.71
6	Other states	1.00	10.40	10.40
	All India	63.60	1667.70	26.22

Source : NHB database Grape exports from India started in the year 1991 with the initiation of economic liberalisation. The export of grapes during the year 2006-07 was of the order of about 85897 t (which amounted to only 5.1 % of total production) fetching an export earning of Rs. 301.92 crore. The major importers of Indian grapes are UK, Netherlands, Germany, USA, UAE, Saudi Arabia, Qatar, Oman, Bahrain, Sri Lanka, Bangladesh, Mauritius, Singapore and Hongkong. Out of the total exports, 90% is to the Middle East, 8% to the European Union and the rest to South East Asian countries. Though the harvesting season of grape in India starts from January and extends to October, the export season of grapes spans from January to April. During this period, South Africa and Israel are the main competitors. The export of fresh grapes from India during the last three years is given in Table 3.

Table 3. Export of Fresh Grapes from India

Sr. No.	Year	Quantity (t)	Value (Rs. in crore)
1	2004-05	39338	128.44
2	2005-06	54049	214.60
3	2006-07	85897	301.92

Source : DGCIS report Grape cultivation for export is mainly done as per EUREPGAP standards where the pesticide residues should be within permissible limit prescribed by European Union. Organic cultivation of grape is picking up in the grape growing areas. Being a new initiative, data on area and production of organic grapes are not available. As it is in a nascent stage, no

information is available with the Research Institutes and Grower's Association such as National Research Centre (NRC) for Grape and Maharashtra Grape Growers' Association.

4.Organic Farming :

Organic farming is a crop production method respecting the rules of the nature. It maximises the use of onfarm resources and minimises the use of off-farm resources. It is a farming system that seeks to avoid the use of chemical fertilisers and pesticides. In organic farming, entire system i.e. plant, animal, soil, water and micro-organisms are to be protected. The guidelines for organic farming is enclosed in **Annexure I**.

5.Organic Production of Grapes :
5.1Climate

The climatic factors such as temperature, occurrence of frost, rainfall and relative humidity play a vital role for commercial cultivation of grape. Generally grape requires a hot and dry climate. Regions with high rainfall and humidity is not conducive for grape cultivation. Hence the coastal districts of the state are not suitable for grape production. Grape is successfully grown in regions of Maharashtra with a temperature range of 150C to 400C and rainfall of 50 to 60 cm. The weather should be clear for about 3-4 months during the cropping period. Cloudy weather, high humidity low temperature and rain during flowering and berry development are detrimental as they promote spread of diseases.

5.2 Soil

Although grape can adapt to a variety of soils, it grows and performs best in deep medium-textured soils (loams and sandy loams) with good drainage and low salt content. Salinity is the major hindrance in the development of grapes. It grows well in soils with a pH range of 6.5 to 7.5.

5.3 Propagation

Development of salt resistant rootstocks like Dogridge and Salt Creek has given an impetus for area expansion under grape in saline areas. Most of the new vineyards are established on Dogridge rootstocks in the state of Maharashtra. The rootstocks are supplied by NRC Grapes, Maharashtra Grape Growers' Association etc. Some of the progressive farmers produce rootstocks for their own use and sale. The mother plants are available with NRC Grapes and farmers' field. The rootstocks are raised by planting hard wood cuttings on flat beds at desired spacing, depending upon the variety and method of training.

5.4 Varieties

The main varieties grown under organic cultivation in the state are Thompson Seedless, Sharad Seedless and Tas-A-Ganesh.

5.5 Spacing

Spacing varies with variety and soil fertility. Generally under organic cultivation, spacing of 2.5 m x 1.5 m, 2.75 m x 1.50 m and 3.0 m x 1.5 m are followed. For this model scheme, a spacing of 2.75 m x 1.50 m with a plant population of 2425 plants/ha is considered.

5.6 Land preparation

The land is prepared by ploughing it twice and harrowing it thrice.

5.7 Planting

Pits of 90 cm x 90 cm x 90 cm are dug and filled with soil and well decomposed FYM/Compost @ 55 t/ha. The pits are then irrigated in order to allow the soil to settle. Rectangular system of planting is adopted for growing grape.

5.8 Training

Training is an important operation in grapes. It helps to maintain the stature and spread of the vine and facilitates operations like pruning, intercultivation, spraying and harvesting. There are many systems of training. The common systems in India are Bower, Kniffin, Telephone, Trellis and Head system. Under the climatic conditions of Maharashtra, Bower and Trellis system has been found to be the best for commercial varieties like Thompson seedless, Sharad Seedless and Tas-A-Ganesh. In Bower system, a bower of 2.1 m height is erected using stone pillars as support and galvanized iron wire of 8 and 10 guage thickness for mesh. One vigorous growing shoot is selected by nipping off other shoots and this single shoot is allowed to grow up straight with the support of bamboo or plastic wire stake.

All the axillary shoots are pruned and the main growing shoot pinched off at 15 cm, below the pandal level. Two shoots arising below the cut area are allowed to grow in opposite direction on the wires overhead. These two shoots develop into main arms. On the main arms, side shoots are allowed to grow at regular intervals of 40 to 45 cm. These side shoots are called secondaries and tertiaries or canes from which fruiting spurs develop. The arms and secondaries form the permanent frame work of the vine.

The main arm should be trained towards East and West direction so as to reduce damage due to sunburn during summer months especially after February-March pruning. The entire space allocated for each vine is covered in a gradual manner by intermittent pinching of the primary arms and secondaries, not allowing them to grow more than 60 cm at a time. As they grow, the shoots are tied with jute twine and all tendrils are removed.

5.9 Pruning

Removal of any vegetative part in a vine is called pruning. It is a critical operation in grape cultivation. Therefore much care and precision needs to be exercised in pruning a vine. The main

objective of pruning grapevine is to increase productivity, facilitate interculture operations and maintain desired vine framework and vitality of the vine for consistent productivity. In organic grape cultivation, the vines are forced to undergo rest for about a month immediately after harvest.

This helps in storing the food material in the mature parts of the vine. The canes are cut back in April by keeping 1-2 buds which develop into canes in 4-5 months. The removal of dried canes is called ‘back pruning’ or ‘growth pruning’. In the month of September-October these canes are pruned for fruiting. This pruning is called ‘forward pruning’ or ‘winter pruning’. Vines, which have attained the age of one year can be subjected to this pruning.

5.10 Manuring

Manuring is done by applying FYM at the rate of 55 t/ha. Biofertilizers like Azatobacter, Phosphate Solubilizing Bacteria(PSB), Effective Microorganism (EM), Neem cake and vermiwash are being used to supplement the nutrient requirement of crop. Trichoderma, Azatobacter and PSB are applied at the rate of 25 g/plant. Neem cake is applied at the rate of 1.25 t/ha. Jeevamrut is prepared by adding 10 kg cow dung, 5 l cow urine, 2 kg black jaggery, 2 kg ground pulses powder, handful of bund soil in 200 l of water. The solution is kept for 2 to 7 days in shade for fermentation. During the fermentation, the solution is stirred daily. To improve the quality of grapes, a solution of sugar, humic acid and coconut water is sprayed at bud development stage.

5.11 Irrigation

A fully grown vine requires about 1000 l of water in winter and 2000 l in summer season immediately after pruning and application of fertilizer. Vines are given 2 to 3 summer irrigation at 3-4 days interval. During winter, an interval of 8-10 days is maintained between two irrigation. The vines are to be irrigated when the top 5 cm soil is dry in winter and 3.5 cm top soil is dry in summer. During berry development stage irrigations are given at weekly intervals and the same is withheld 10 days before harvesting to improve quality.

5.12 Weeding

In the vineyards, weeding is generally done mechanically. Frequent weeding is required to allow feeder roots to absorb the nutrients and moisture without any competition. Bullock drawn or tractor drawn implements can be used for inter-cultivation and weed control. Weeding is done 3-4 times in a year.

5.13 Shoot Pinching

Shoot pinching is a part of pruning mainly done to promote fruit bearing and regulate the current season’s growth. This is done when the main shoot attains 7-8 leaf stage. During pinching, the tip of the mature shoot is pinched by retaining only five nodes. As a result, the terminal bud

along with 1-2 laterals resumes growth. These laterals are called sub-canes. Buds up to the third node from the base on the sub-cane are observed to be bearing fruits.

5.14 Pests and Diseases

The major pests affecting the grape crop are flea beetles, thrips, mealy bugs and leaf hoppers. The major diseases are downy mildew, powdery mildew and anthracnose. The schedule of plant protection measures are given below:

Pest/disease	**Plant protection measures - Spraying of**
Downy mildew/ Powdery mildew	Trichoderma, 1% Bordeaux mixture + Dasparni arka + Gomutra<
Mealy bug	Cowdung urine
Thrips	Dasparni arka
Anthracnose	Solution of acacia leaves

The dasparni arka is prepared by adding 25 kg leaves of Neem and 2 kg leaves each of custard apple, Nirgudi, Kaner, Cotton, Papaya, Castor, Karanj, Gudwel, Drumstick in 200 l of water. In the solution, 5 to 10 l of gomutra and 2 kg of green chillies are added. The solution is kept for 15-20 days for fermentation. The stock solution is prepared by filteration through muslin cloth. The spraying is done by adding 5 l of stock solution in 200 l of water.

5.15 Harvesting

Grape is harvested almost all the year round. If not all the varieties, one or the other variety is always available at any given time of the year. However, in Thompson Seedless and its clones, major part of the produce is harvested during March-April from the hot tropical region contributing to more than 70% of the total harvest.

5.16 Yield

An average yield of 15 -20 t/ha is obtained during the second and the third year onwards which increases upto 25 t/ha from the fourth year onwards. The economic life of grape is fifteen years and harvesting of fruits can be done upto an age of 15 years.

6. Linkages :

Marketing of grapes is done through APMC market located in taluka/district level or through direct purchase by vendors. There is great demand for grapes in the Indian market. However, marketing of organic grapes with distinct demarcation from non-organic grapes is not there so far. National Research Centre for Grapes, Pune has been involved in problem oriented research activities with respect to Grapes.

7. Financial Aspects :

7.1 Sale price

Although the farmers realise a sale price ranging between Rs. 10000/t to Rs. 15000/t of organic grape based on export or domestic markets, a conservative estimate of Rs. 12000/t is considered for this model.

7.2 Unit Cost

The unit cost estimated in this model scheme is Rs. 432400/- per ha, capitalised upto the second year. The break-up of unit cost is given in **Annexure II**.

7.3 Margin Money

The percentage of margin / down payment to cost of development prescribed is 5, 10 and 15 % for small, medium and large farmers respectively. The rest of the cost of development will be provided as bank loan. Margin considered in the present model is 10 %.

7.4 Bank Loan

Bank loan of 85 - 95 % shall be available from the financing institution. Bank loan considered in the model is 90%.

7.5 Rate of Interest

The rate of interest to be charged to the ultimate borrower would be guided by RBI guidelines issued from time to time. However, the ultimate lending rate has been considered as 12 % for working out the bankability of the model scheme.

7.6 Security

Banks are guided by RBI guidelines issued from time to time in this regard.

7.7 Financial Analysis Results of financial analysis are indicated below :

- NPW at 15% DF : Rs.345540
- BCR at 15% DF : 1.55 : 1
- IRR : 42.30%

The details of financial analysis is presented in **Annexures III-V**

7.8 Repayment

The bank loan with interest is repayable within seven years with one year grace period as shown in **Annexure-VI**. The interest deferred during the first year can be collected during the second year.

8. Conclusion :

In view of the above, it can be concluded that organic cultivation of grapes is a technically feasible, financially viable and bankable activity.