Chapter - III

Cost of Production Analysis : Conceptual Foundations and Empirical Study

3.1. Introduction.
Cost Concepts:

The cost of production of grape and pomegranates has been worked out by using the following cost concepts.

Total cost is the aggregate money value of all inputs used in the production process, which covers all paid-out costs and imputed values of the factor units owned by the operator. The cost concepts officially used are as below.

Cost $A_1$ = All actual expenses in cash and kind incurred in production.

Cost $A_2$ = Cost $A_1$ + rent paid for leased-in land

Cost $B_1$ = Cost $A_1$ + interest on value of owned land and rent paid for leased-in land.

Cost $B_2$ = Cost $B_1$ + rental value of owned land and rent paid for leased-in land.

Cost $C_1$ = Cost $B_1$ + imputed value of family labour.

Cost $C_2$ = Cost $B_2$ + imputed value of family labour.

Average cost is associated with estimation of cost on the average of all the farmers in a region producing a specific agricultural commodity. Along with these two concepts, “marginal cost” and “bulk-line cost concepts are also used in farm management studies. No doubt, every cost concept has its own limitations in representation of the picture of the region. However, average cost has been widely used by most of the farm
management studies. This cost concept has been employed for the present study too.

As regards cost coverage, all the items in the official estimation from cost \( A_1 \) to \( C_2 \) are taken as elaborated in the following section. One important point of departure from official method is that allowance has been made for the risk factor and management for arriving at the aggregate cost.

3.2. Cost of Production: Valuation of items:

3.2.1. Preparatory cost

It covers expenses on human and animal labour and on other required farm assets for land levelling, bunding, land improvement and summer tilling. The firstly two items of expenses come under establishment cost and the third item falls under recurring cost.

3.2.2. Cost of human labour

Grape and pomegranate culture has remained largely a labour intensive activity except a limited use trader, diesel engine, electric pumpset and mechanical sprayer. Hence the share of human labour is quite significant. Human labour can be classified into family and hired labour. The farm operations require considerable amount of labour. Hired labour is obtained as and when required. A handful of farmers hire labour on annual basis. Wage rates of agricultural labour are determined mainly by the nature and extent of work and the availability of work force in the locality. In the present investigation, wages paid to hired labour have been valued at the going market rate.

Generally, small and medium farmers perform pre-picking farming activities with the help of the family members and hired labour is
used mostly at the time of picking and packing of fruits. Big farms use more of hired labour. In the absence of only distinct information about the extent of family labour and hired labour employed, no alternative was left but to compute the labour cost of the family labour on the basis of the ongoing wage rate for the hired labour.

There is the practice of using child labour either from own family or from the neighbouring families for picking of fruits and carrying them from field to the packing place. Generally, in practice child labour is not paid in cash as this labour force neither works continuously for the full day like the adult worker nor for the full workday. Therefore, it is difficult to count its labour cost. Hence, the wage of two child workers in a day is considered equal to the wage of one female labourer for a day.

On certain occasions, particularly at the time of applying fertilizers, picking, grading and packing of fruits, growers need additional labour besides their family labour. At that time, they live the neighboring growers on mutual exchange basis, i.e. labour to labour exchange. Such mutual exchange of human labour is treated tantamount to family labour and is counted accordingly in the estimation of cost of human labour.

3.2.3. Cost of farm yard manures

Many farmers have some milch and working animal from which they get some amount of cowdung manure annually. The growers supplement their balance of requirement of the manure from outside sources. The manure cost itself, its transport charges and loading and unloading charges are included in the cost of purchase of manure. Manure from owned animals is valued at the prevailing market rate in the locality. Cost of fertile
soil and green foliage used for filling the pits, is also counted in this cost item.

3.2.4. Cost of chemical fertilizer, Pesticides and insecticides

The actual expenses made on these inputs are taken into account. The prevailing rate schedule of various items used during 1989 to 1991 (before march) is given in Table-3.1 Transport cost at the rate of Rs.4.00 per bag of 50 Kilograms is charged irrespective of whether the material is transported by own or hired carrier. The expenses made for the application of bordo paste in order to protect the trunks are also included in this cost.

3.2.5. Material Cost

It is a very minor cost item. Expenses made on marketing material (string, lime, stake) and material used for supporting the plant (bamboo, string) as its initial growing stage form part of this cost item. Cost of these material, if obtained from own source, is estimated at the prevailing market rates.

3.2.6. Water charges

Grape and pomegranate crops need enough water (supply) facility, as during the gestation period watering of the plants is required with an interval of two week at least. In bahar period (early hasta bahar) of pomegranate, watering is required from the second week of August to the end of January or second week of February at an interval of 6 to 10 days. Even after picking the fruits, at least one or two rounds of watering are required for strengthening the plant. In the bahar period of grapes, watering
starts from the middle of July to the end of December or, in some cases, up
to the mid of January at an interval of 8 to 15 days.

Majority of the growers rely on well irrigation very few use the
other sources of water like, river, canal, nala etc. The principal tools for
lifting the water is the electric pump-set. For the estimation of water
charges, prevailing electricity rates and diesel rate in the respective years are
considered and maintenance cost of watering equipment is added to the
actual cost. Depreciation and interest on capital investment is covered under
the estimates of farm assets other than land and hence this amount is not
credited to this head.

The gravity technique of watering is in fashion, but the more
economic use of water, the technique of drip irrigation, is also adopted by
some growers. Growers, who have installed this technique since the very
beginning of the plantation only are considered and those who have installed
the same after completion of the gestation period are excluded from the
sample list in order to avoid the methodological paradox.

3.2.7. Cost of seedling

The first chapter deals with detailed information about the
plantation of grape and pomegranate. Some growers get plantlets of grape
and pomegranate from their pre-planted orchards. Cost incurred on globular
grafting, covering it with moss, polythene paper with the help of string,
cutting the fully developed plantlets from the mother tree and replanting it in
a polythene bag, watering it are included in the cost of seedling of grapes.
Similarly expenses on collection of the seeds of local verity pomegranate,
sowing them in polythene bag, preparation of bed for these boxes. Watering
them till the plantlets are ready for grafting, grafting of bags (including its cost), polythene string, are included in the cost of seeding of pomegranate.

Some times some growers fall short of own plantlets, while some others do not have their own pre-planted orchards from which they can obtain plantlets. Even if they have a pre-planted orchard, some growers are unable to develop the plantlets from mother tree due to technical problems. Therefore, some growers obtain plantlets from their relatives and friends free of cost and some from the nearby government nursery or private nursery at prevailing market rates. Estimation of expenses on plantlets obtained from friends and relatives have been worked out at the rate of plantlets in the government nursery if they are available there, and if not, expenses are worked out at the rates prevailing in the nearby private nursery. Transport cost and labour cost charges for the purpose are included in this cost item. In the year 1989-1990, average market rate of grape plantlet ranged between Rs.10.00 and Rs.15.00 and that for pomegranate including labour and material of grafting was from Rs.5.00 to Rs.8.00.

3.2.8. Land Taxes

This cost item forms a very small portion of the aggregate cost. It includes land revenue, educational tax and tax of employment guarantee scheme. Actual paid-out amount is included in this cost item.

3.2.9. Interest on working capital

Working capital is raised by the growers from their own sources and supplemented by borrowings from co-operative credit societies, commercial banks, money-lenders, traders, friends and relatives. Cost of borrowed capital is taken at the actual rate of borrowing, whereas the
The imputed cost of own capital is calculated at the rate of 12 percent per annum.

3.2.10. Farm assets other than land

Farm implements and machinery are valued at their purchase price for estimation of depreciation and interest on block capital particulars are as follows.

A. Annual depreciation

Depreciation of each farm asset is estimated by using 'straight line' method. The life of the asset and its junk value at the end of its stipulated life is fixed on the basis of the information gathered from the respondents and rate of depreciation is calculated in the following manner.

Annual amount of depreciation = \( \frac{\text{Cost of asset - junk value of asset}}{\text{Estimated life of asset}} \)

Annual rate of depreciation = \( \frac{\text{Annual amount of depreciation}}{\text{Cost of asset}} \times 100 \%

This annual cost is apportioned on the basis of total area under crops during that year. For keeping farm equipment, fertilizer, pesticides and insecticides and for packing purpose, growers use by and large one-third part of their house. While estimating the depreciation amount of farmhouse, the category of the same is taken into account and accordingly the life of the house is estimated.

Following aspects are specifically noted in this context

i) Actually the asset is often continued to be used beyond its real life through periodical repairs.

ii) Junk value is taken to be 5 per cent of the cost.

Actually arrived, annual rate of depreciation for implements, tools and equipments possessed by the respondents is as below.
Table - 3.1
Annual Rate of Depreciation of Farm Assets.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Annual rate of depreciation (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bullock Carts</td>
<td></td>
</tr>
<tr>
<td>2. Iron Plough</td>
<td></td>
</tr>
<tr>
<td>3. Electric Pump</td>
<td>8</td>
</tr>
<tr>
<td>4. Plastic Pipes</td>
<td></td>
</tr>
<tr>
<td>5. Balance</td>
<td></td>
</tr>
<tr>
<td>6. Harrow</td>
<td></td>
</tr>
<tr>
<td>7. Hoe (Kudal)</td>
<td></td>
</tr>
<tr>
<td>8. plastic tank</td>
<td></td>
</tr>
<tr>
<td>9. Spry pump (Gantur, maruti)</td>
<td>12</td>
</tr>
<tr>
<td>10. Iron tanker</td>
<td></td>
</tr>
<tr>
<td>11. Cement tanker</td>
<td></td>
</tr>
<tr>
<td>12. Bamboo basket</td>
<td></td>
</tr>
<tr>
<td>13. Iron basket</td>
<td></td>
</tr>
<tr>
<td>14. Spray Pump (Vaspee, hand Pump)</td>
<td>25</td>
</tr>
<tr>
<td>15. Scissors</td>
<td></td>
</tr>
<tr>
<td>16. Crate</td>
<td></td>
</tr>
<tr>
<td>17. Khurpi</td>
<td></td>
</tr>
<tr>
<td>18. Farm House</td>
<td></td>
</tr>
<tr>
<td>a. Pakka</td>
<td>5</td>
</tr>
<tr>
<td>b. Midum</td>
<td>15</td>
</tr>
<tr>
<td>c. Kacha</td>
<td>25</td>
</tr>
</tbody>
</table>

B. Interest on Capital Investment

Interest on block capital investment in the farm assets is calculated at 15 per cent and apportioned to all crops on the basis of area.

3.2.11. Rental Value of the land

Since the land under investigation was the inherited property of the respondents, they were unable to quote the exact purchase price of the land. Present market value of land is not the true index of the land value. Hence as more useful and convenient index actual rent of leased in land or expected rental values of land is taken into account. Since there is no case of leased-in-land in the sample study, the former course is not used.
Expected rental values based on the judgment of the respondents and researchers are noted. While calculating the rental value, the quality of the land, its location and water facilities and output of the previous two years before plantation are taken into account.

3.2.12. Cost of supervision and management

“Agriculture is treated as farm business. Farm operator is the entrepreneur interested in earning profit from his farm activity. But most of the cases of farm operators in Indian agriculture do not correspond exactly with the manager of an industrial unit. Hence, a doubt is raised as to whether in agricultural activity the act of supervision and management of the farm owner/operator should form a charge in cost of production. Earlier opinion was against, but in course of time, a positive approach has been developed. In Indian writings on methodology of estimating cost of cultivation, Sherman did not favour its inclusion while later writings favoured its consideration. The Sen committee (1979) appointed for suggesting improvements in the cost of cultivation/production estimates as also the commission for agricultural costs and prices have up held the cause of accounting management cost. Nevertheless, experts continue to opine different views on this point”.

The supervision and management work occupies crucial importance in the cultivation process of grape and pomegranate. The grower has to work frequently along with labour and also make arrangements for the inputs, apply fertilizer in time make arrangements for watering and manage the marketing activity. Some farmers’ get their supervisory and management work done by paid managers locally called Diwanji.
While discussing with the respondents, it was noticed that the supervisory and management work becomes more intensive during the bahar period than the gestation period. There is only minor supervisory works during gestation period irrespective of the size of holding. Hence, in totality, two hours per day for the period of two years are taken as the time spent by the grower for management work and the cost of this time is estimated accordingly for gestation period. For the 8 months bahar period, the duration of supervisory and management work extends. This is fixed as two and a half-hours per day in case of small farmers, three hours for medium farms and three and half hours for large farms. Since supervisory and management work requires some special skill and attention different from the simple agricultural labour, wages of management work are calculated at the rate of one and a half times the prevailing wage rate of ordinary male labour in the respective areas.

3.2.13. Allowance for risk factor:

"Should any allowance be made for risk factor in estimating cost of cultivation of any agricultural commodity has remained even now a debatable point. In the official estimation, this is excluded whereas some private studies have included it. Sen committee on improvement of cost of cultivation/production estimates did not favour any arbitrary change for bearing risk, which is treated as an entrepreneurial function and hence rewarded in the form of profit. It was felt by a number of agricultural economists that though the risk factor associated in the production of different commodities had to be considered in the determination of price policy, yet no useful purpose would be served by adding this component into the cost of production. Still the issue is open for further consideration".
Practically every year, in one part of India or the other, agricultural crops are affected by weather hazards. Natural condition invalidates even the best of human efforts in farming and hence no grower is absolutely certain of his produce. The magnitude of risk and uncertainties to which the farmers’ fortune is exposed is very large. In industrial sector business risks are backed by insurance facility and the premium enters into the cost of production. The same could have happened in agricultural sector of our country. Crop insurance indemnifies loss or damage of growing crops resulting from hail or drought, frost, flood, fire, and disease. The grower pay premia and protection is given to him on the same basis as in other insurance practices. This step has been taken for few crops.

Coming to horticultural crops, whilst many supportive measures have been taken on government level to lift the morale of the farmers in order to augment production to the optimum level and thereby reap its benefits. The vagaries of climate and the natural calamities take away the fruits of their sustained efforts. The losses to the tune of crores of rupees are suffered each year due to the disastrous weather conditions, which prevail occasionally in the fruit growing areas. Recently, the United India Insurance Co. Ltd. has introduced grape and pomegranate (inputs) insurance policy, including fruits like citrus, ber, lemon, guava, sapota banana, papai, mango etc. In case of fruit crops, it is not possible to give the insurance policy on output basis for the reasons that the output varies to a great extent and determination of standard output and measurement at the time of claim present difficulties. Therefore, the cost of cultivation incurred every years after the plant starts bearing fruits is enumerated as “input cost” for the purpose of this policy.
This policy covers the risk only from the season when the fruiting starts. No coverage is available for gestation period of the plant. The rate of the premium is 5 per cent of the input cost per year for grape and pomegranate. This policy is valid for one season and the policy period is taken from the date of payment of premium until the crop in that season is harvested. Hence 5 per cent of the recurring cost of grape and pomegranates are counted as premium for the risk factor. Pomegranate is still outside the purview of the scheme of horticultural crop insurance. But by taking into account the similarities between grape and pomegranates in respect of required dogmatic conditions, growing regions, harvesting period etc., the same percentage of insurance premium is applied for accounting the premium for risk factor in case of pomegranate.

3.2.14. Marketing cost

In Bijapur district, grape and pomegranate are marketed in three ways: a) through co-operative society, b) By one's own efforts and c) through contract system. In the former two systems, the grower has to bear the expenses made on activities from picking of fruits to the collection of final bills and in the last system, these expenses are met by the traders/middlemen. Therefore, while estimating the marketing cost, these marketing systems are borne in mind with reference to each respondent.

3.2.15. Cost of Packing Materials:

As grapes and pomegranates are perishable in nature, they have to be packed very carefully to reach the sellers/distant markets safely. Grape and pomegranates are packed in corrugated boxes. Grapes are packed in special corrugated boxes. These packing materials are purchased from the
market and hence are valued as cost paid by the growers. Thus they are straightaway paid-out costs. Rate schedule of various packing materials used for the two fruits in 1998-99 and 1999-2000 is given in Table 3.2.

Some of the growers used second hand corrugated boxes obtained from fertilizers and medical shops while some of them reuse the boxes obtained from the trader. In fact, this kind of recycling of the corrugated boxes is a desirable practice to save the ultimate cost both to the producer and the consumer and hence can be well encouraged. Whatever, be the source of the packing boxes (new or recycled), their cost is valued at the cost of market rates of first hand boxes.

3.2.16. Crate and shade cost

Crates are used for carrying fruits from plants to the place of packing and sometimes to the nearer markets. Normally, they have five years life. Therefore, one-fifth of the purchase prices is included in the marketing cost. The fruits after picking are dispatched to the markets within 6 to 8 hours and, as such, they do not need specific storage facility. Before packing, fruits are kept for some time in the farmhouse, or in the cowpen, or in temporary shade, or occasionally underneath a big tree in order to cool them naturally. Expenses made on such provisions are included in the depreciation amount, under the item of “farm assets other than land”.

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Table - 3.2

Rate schedule of packing material in Bijapur district

<table>
<thead>
<tr>
<th>Packing Material</th>
<th>Unit</th>
<th>Market Prices (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Corrugated box</td>
<td>One Unit (Size in inches)</td>
<td></td>
</tr>
<tr>
<td>12x8x8</td>
<td></td>
<td>6.90</td>
</tr>
<tr>
<td>10x10x4</td>
<td></td>
<td>6.35</td>
</tr>
<tr>
<td>12x8x4</td>
<td></td>
<td>5.25</td>
</tr>
<tr>
<td>13x9x7</td>
<td></td>
<td>8.45</td>
</tr>
<tr>
<td>14x10x4</td>
<td></td>
<td>6.75</td>
</tr>
<tr>
<td>13x9x5</td>
<td></td>
<td>5.70</td>
</tr>
<tr>
<td>11x7x4</td>
<td></td>
<td>4.65</td>
</tr>
<tr>
<td>15x11x4</td>
<td></td>
<td>8.00</td>
</tr>
<tr>
<td>14x4x8</td>
<td></td>
<td>6.00</td>
</tr>
<tr>
<td>10x10x10</td>
<td></td>
<td>6.85</td>
</tr>
<tr>
<td>16x9x11</td>
<td></td>
<td>10.75</td>
</tr>
<tr>
<td>2. Gum tape</td>
<td>one bundle</td>
<td>38.60</td>
</tr>
<tr>
<td>3. Rope</td>
<td>Kilogram</td>
<td>50.00</td>
</tr>
<tr>
<td>4. Cut paper</td>
<td>Kilogram</td>
<td>6.50</td>
</tr>
<tr>
<td>5. label</td>
<td>100</td>
<td>10.00</td>
</tr>
<tr>
<td>6. Colour Paper</td>
<td>Ream</td>
<td>215</td>
</tr>
<tr>
<td>7. Waste Paper</td>
<td>Kilogram</td>
<td>6.30</td>
</tr>
<tr>
<td>8. Bag of nylon</td>
<td>One unit</td>
<td>--</td>
</tr>
<tr>
<td>9. Crates &amp; shade</td>
<td>One unit</td>
<td>219</td>
</tr>
</tbody>
</table>

Source: Prepared from the data collected from the respondents.

3.2.17. Cost of transport

The nature of transport of produce is two-fold in case of marketing through co-operative marketing societies, one from farm to collection center of the co-operative society and second, from collection center to respective marketing Centres. The society provides light commercial vehicle charging of Rs.0.75 to Rs.1.00 (including unloading) per box, irrespective of the size of the box. To transport to marketing centres they charge at Rs.10.00 to Rs.15.00 on the basis of the distance of the market and current transport charges of truck and railway. The cost is estimated at the same rate if the growers own the vehicle.
In case of marketing on their own those who follow the group system (that is, marketing collectively by making a group of five to ten growers), the cost is estimated on pro-rata basis depending number of boxes of each member. If they have their own means of transport, the cost of transport is estimated at the rate charged by the co-operative marketing society located in the area.

3.2.18. Commission and miscellaneous cost

Co-operative marketing society charges a commission of one rupee per box and the commission agent of the sellers/distant markets charges 8 to 12 per cent of the total sale proceeds. Location specific charges are shown in table 3.3, growers who market their produce on their own bear themselves the expenses on communication.

Table - 3.3


<table>
<thead>
<tr>
<th>Name of Market</th>
<th>Rate of commission in percentage (Rs.)</th>
<th>Name of Market</th>
<th>Rate of commission in Percentages (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Delhi</td>
<td>6</td>
<td>9 Ahmednagar</td>
<td>8</td>
</tr>
<tr>
<td>2. Calcutta</td>
<td>10</td>
<td>10. Kolhapur</td>
<td>8</td>
</tr>
<tr>
<td>4. Pune</td>
<td>8</td>
<td>12. Miraj</td>
<td>8</td>
</tr>
<tr>
<td>5. Madras</td>
<td>10</td>
<td>13. Lucknow</td>
<td>7</td>
</tr>
<tr>
<td>6. Bangalore</td>
<td>8</td>
<td>14. Tatanagar</td>
<td>8</td>
</tr>
<tr>
<td>7. Nagapur</td>
<td>6</td>
<td>15. Coimbatore</td>
<td>8</td>
</tr>
<tr>
<td>8. Indore</td>
<td>8</td>
<td>16. Hyderabad</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: Prepared from the data collected from the Commission agents.

3.2.19. Deduction from marketable surplus

More than 99 per cent of grape and pomegranate produce is available as marketable surplus. The grower neither consumer the superior
quality fruits by himself nor offers it to friends and neighbours. It is a common tendency to use damaged fruits (lower quality) for the same. Since this portion is negligible and practically too difficult to estimate, it is not deducted from the total marketable surplus.

3.2.20. Cost of bill collection

The growers selling their produce through marketing co-operative are asked to collect their bills usually after one month from the receipt of their produce for delivery to the upcountry markets. Meanwhile the sale proceeds are collected by the marketing societies from the commission agents of the up-country markets. Normally the growers, therefore, are not required to make unnecessary trips to the society for bill collection. A trip at the stipulated time suffices. Hence cost of bill collection is taken to be equal to one time to and for Jamey of a single person from his house to the marketing co-operative. On the other hand, growers selling their produce on their own are not required to meet this cost as they get sale proceeds directly from their upcountry commission agents, sometimes immediately after sale of their produce or by bank demand draft within 2 to 3 weeks.

3.3. Production Process of Grape and Pomegranate in Bijapur District:

A. Grape.

3.3.1. Preparation of land and layout

The selected land for grape cultivation is thoroughly and deeply ploughed with furrow timing plough followed by 3 to 4 cultivations and harrowing. The layout is done according to square or hexagonal system.
3.3.2. Digging of Pits and their filling

Pits of required depth and diameter are dug in summer and kept exposed to the sunlight for about a month. The pits are to be dug at the required distance recommended by the experts as in Table-3.1. Then 400 grams is mixed with soil to protect it from the attack of termites and such soil is filled in the pits along with farmyard manure and chemical fertilizers. The distance between the plants varies with the nature and deepness of the soil. Consequently, the density of plant population is more in low quality land than the rich one. However, in practice many growers did not follow this recommendation rigidly and resorted to dense plantation even when the soil is rich to extract more returns. Planting density is the most important yield-contributing factor, which can be manipulated to attain the maximum production per unit area. The optimum spacing is important for maximum utilization of land and good income over a long period. Plant density had no adverse effect on fruit weight. It was observed that as the plant density increases, yield per unit of area also increases without affecting fruit quality.

Table - 3.4

<table>
<thead>
<tr>
<th>Quality of land</th>
<th>Distance between Pits (Meters)</th>
<th>Size of Pits (inches)</th>
<th>Compost (Grams)</th>
<th>Fertilizers per pit (Kg) chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>10'×5'</td>
<td>11'×22'</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>8'×4'</td>
<td>11'×11'</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Low</td>
<td>6'×4'</td>
<td>12'×12'</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Prepared from the data collected from the respondents.

3.3.3. Propagation

There are two main methods of propagating grapevines:

1. One is sexual which involves multiplication by seed. The sexual method is employed chiefly for evolving new varieties through hybridization.
2. The second type is asexual or vegetative where the vines are multiplied by means of vegetative parts such as a. branches b. buds c. canes etc.

Among the different sexual methods the most common method of propagation in grape is by hardwood cutting. The vines are also propagated by other means such as a) Budding b) Grafting, c) Layering and d) Tissue culture.

Seed

Freshly harvested seeds of grapes have poor germination and they are stratified for higher percentage and uniform germination. Exposure to lower temperature between 0 and 10\(^0\) c for 5 months was found effective in breaking the dormancy. When the seeds were kept in a peat, sand (1:1) mixtune plus 0.3 per cent captan in polythene bag at 0-2\(^0\) c showed 79.6 per cent germination at 27\(^0\) c.

A. Vegetative Propagation.

Cuttings

A cutting is piece of parent (stem, root or leaf) that will develop into a new plant when placed under conditions favourable for rooting. Cuttings are always made from mature canes of healthy moderately vigorous and virus free vines. The cuttings are prepared at the time of pruning in January in north India and preferably from October pruning in south India. Depending upon the length of inter nodes in a variety, mature wood is cut into a piece about 23-46cm long and it should have at least four buds. However, two node cuttings and single bud cuttings taken before and after bud burst have also been reported to be successful. The cuttings are allowed to grow in the nursery for one season and can be lifted late in January any
time after leaf fall under conditions of Bijapur district. Under tropical Bijapur conditions the rooted cuttings will be ready for planting in the field about 4 months after planting in the nursery.

**B. Budding and grafting**

Budding (chip budding) and grafting (whip, cleft, side, notch, wedge, barb, green high level and bench) under certain specific conditions as follows also propagate grapevines:

i. To establish vines on a rootstock resistant to soil-borne pests, diseases, nematodes or certain soil conditions (Saline or alkali soils).

ii. To correct the mixed varieties or to replace varieties in an established vineyard without uprooting.

iii. To increase the supply of rare variety rapidly.

Root stock and recently, some progress has been made for rapid multiplication of grapevine using tissue culture techniques. In future, tissue culture may replace the traditional methods of vegetative propagation in fruit crops and grape will not be an exception to it and later on some successes.

**3.3.4. Training and Pruning:**

Training may be defined as the judicious removal of any plant part to give a proper shape. It also includes providing support bending, tying and pinching to encourage side shoots etc. In other words, it is the orientation of the above-ground vine parts. The main objectives of training include,

1. Giving the desired shape that facilitates different operations like cultivation, plant protection, pruning and harvesting.
2. Economical maintenance of the vine yard and
3. Producing fruit of desired quality and yield.
In the natural habitat, a grapevine is a robust climber but it can be trained in any fashion. There are numerous systems of training grapevines. The most prevalent are: a) Head system b) Knifing system c) Trellis overhead system and d) Bower system of training. The Bijapur district growers are choice of bower system training shall depend on many varieties. An ideal training system is one which 1) Facilitates different operations like pruning, culturing, plant protection and harvesting 2) Spreads the fruits in the entire area provided for the purpose, 3) Provides good leaf exposure 4) Avoids bigger wounds to the permanent part of the vine and 5) Maintains the vitality of the vine over a long period.

Pruning is the most important operation for the maintenance of fruitfulness and quality along with vigour of the vine. It should not be confused with training, which mainly concerns with giving the form and the direction of the trunk and arms, and the position of shoots. The training determines the form, while pruning affects the functioning of the vine. It is done to concentrate the activity of the vine to the parts left after pruning. Pruning is the most crucial operation and should be done with precision and care.

3.3.5. Planting

The most common system of planting vineyards in the plains is the square system. However in less vigorous varieties and for mechanized cultivation, the spacing between the rows is increased and between the vines decreased, thus adopting rectangular system of planting.

The budded plants are planted after the soil is settled. After planting, soil around the bud graft is pressed firmly to avoid air pockets and irrigation is given immediately. The new plants require regular irrigation so
that the roots become well-established for easy growth of the plants. Owing to very deep tap root system and prophetic nature, grape plant is hardy and once it gets established, needs care and irrigation. After the plants are well established, in about six months they can withstand even under conditions of severe drought. The plants may be watered at intervals of 2 to 4 weeks depending upon the soil, climate and weather conditions. Fertilizers are applied as per the recommendations of the Mahatma Phule Agricultural University and subject experts. Pesticides and insecticides are sprayed as and when required during its vegetative growth, i.e. up to 18 to 24 months after plantation, which is the gestation period of the crop.

3.3.6. Packaging, Storage, Bahar and Marketing

In India, many types of containers are used for packing grapes. In Karnataka, cylindrical bamboo baskets were in use for quite a long time. Now, progressive growers of Bijapur are in Karnataka use corrugated paper boxes with butter paper, paper cuttings and alkathene bags. They pack the grapes after proper grading and they fetch a good price in different cosmopolitan cities of India as well as abroad. Bamboo baskets are generally used for packing in Bijapur district with dried grass or paper cuttings as packing materials. The use of wooden boxes is limited. Grapes being a perishable commodity, faulty handling, packing or bad storage conditions aggregate the spoilage. Pre-harvest application of fungicides or growth regulators has been found to increase the shelf life of the fruit and reduce spoilage. The pre-harvest spray of 10 per cent calcium nitrate reduced the weight loss and delay when the grapes were stored for 3 days at room temperature. Grapes can economically be stored up to 40-45 days in clod storage.
The grape growers of Bijapur district in Karnataka (personal communication) limited farmers are able to store grapes safely for 2 months with the use of "grape guard" in cold storage. Grape guard is paper impregnated with potassium metabisulphite which is kept at the top of each box. This paper releases 502 for fumigation under high humidity conditions. It has tow only action, i.e. just after packing, 502 is quickly released and then during cold storage, there is slow release of 502. This was developed by Dr. Nelson of USA and is being imported from there. Experts have recommended that the first commercial Bahar should be obtained only after 2 to 3 years since plantation. But some growers preserve new flowering, which occurs after 15 to 18 months, for the purpose of fruiting, for the sake of some earnings.

Bahar period spans the period from the stage of flowering to the stage when fruits are ready for picking and marketing. This period is of 5 to 6 months duration. Normally, preparatory the activities for the bahar for the grapes commence in June-July. Fruits are ready for picking in November-December. The fruits are not picked only once. They are picked in successive lots as and when they are ready for picking and marketing. This period of picking consists for two months. Fruits are assembled in a nearby shed where they are graded and classified. The produce is sorted into two main grades according to the size of grapes. In some cases, it is sorted in 3 to 4, 5 grades. The fruits packaging in 60x40x12 cm cardboard open tray must be used for 8.2kg and 50x30x12 cm cardboard clip top box must be used for 5.0 kg. are together packed in a corrugated box for marketing. Boxes are used only when the produce is to be marketed in distant markets.
B. Pomegranate.

3.3.7. Preparation of land and layout

The selected land for pomegranate cultivation is thoroughly and deeply ploughed with furrow turning plough followed by 3 to 4 cultivations and harrowing. The layout is done according to square or hexagonal system.

3.3.8. Digging of Pits and their filling

Pits of required depth and diameter are dug in summer and kept exposed to the sun for about a month. The distance between two pits is as per the recommendation by the experts as shown in Table-3.5. Importantly 200 grams BHC is mixed with soil to protect it from the attack of termites and the pit is filled with mixture of organic manure, green wastage chemical fertilizers and fertile soil. Table 3.5 shows that the distance between two plants. The size of pits varies according to the nature and deepness of the soil. The density of plant population is more in low quality land than in the rich one. However in practice many growers do not follow this recommendation rigidly and resort to dense plantation to extract more returns. Planting density is the most important yield-contributing factor which can be manipulated to attain the maximum production per unit area. The optimum spacing is important for maximum utilization of land and for good income over a long period. Plant density had no adverse effect on fruit weight. It was observed that as the plant density increases, yield per unit of area also increases without affecting fruit quality. The pits are dug in summer and planting is done during monsoon.
Table - 3.5

Recommended distance between pits and size of pits for pomegranate

<table>
<thead>
<tr>
<th>Quality of land</th>
<th>Distance between Pits (Meters)</th>
<th>Size of Pits (inches)</th>
<th>Compost (Grams)</th>
<th>Fertilizers per pit (Kg) chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>5.9×5.9</td>
<td>45×45</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Medium</td>
<td>5×5</td>
<td>60×60</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Low</td>
<td>4×4</td>
<td>75×75</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Prepared from the data collected from the respondents.

3.3.9. Propagation

The pomegranate can be propagated by the following three methods. First-by seedling, Second-by plant lets-(a) by globular grafting (Gooti Kalarm) (b) by cut graft, Third-by off shoot. Most of the growers of the region in question prefer the method of plantation by globular grafting, which has some advantages. Firstly, these plants become ready for plantation earlier then the other types of plantlets. Secondly, these plantlets maintain uniformity among the vegetative growth of trees, production and quality of fruits. Thirdly, these plantlets bear fruits earlier. The globular grafting is tied at the branch of mother tree. When the root system is developed, the plantlet is ready for transplantation in a polythene bag or tube. This plant is allowed to grow in a polythene bag for 40 to 60 days, when it becomes suitable for transplantation in the pit.

3.3.10. Transplantation in the pit

The transplantation is done during monsoon. The transplanted plants require regular watering to develop good roots system and growth. After the plants are well established in about six months, they can very well withstand conditions of drought, and watering may be done at intervals of 2 to 4 weeks depending upon the soil, climate, weather conditions. Fertilizers
are applied as per the doses recommended by the Mahatma Phule Agricultural University. Pesticides and insecticides are sprayed as and when required during the vegetative growth of the plant during the gestation period of 18 to 24 months after plantation.

3.3.11. Training and Pruning

Initially, pomegranate plants are allowed to grow as bush with a number of main shoots arising at ground level. Growers find it convenient to allow 4 to 5 such shoots to develop and hence later on the plants are suitably trained and pruned.

3.3.12. Bahar and bahar treatment:

Experts recommend that, the first commercial bahar should be taken only after 2 to 3 years after plantation. Some growers preserve new flowering, which occurs after 15 to 18 months, for the purpose of fruiting and thereby get some extra earnings, but some of the growers pluck these flowerings. If pomegranate is commercially cultivated, the plant does not go into dormancy, provided watering is done regularly. The plant under such conditions may continue bearing flower throughout the year. There are, in fact three main seasons (bahars) of flowering known as “Ambe bahar” “Muriga bahar”, and “Hasta bahar”. Commercially, only one bahar in a year is taken from the tree and mainly the market factors, availability of water and nature of soil determine the season of fruiting to be adopted. The recommended bahar and their duration are specified in Table 3.6. Generally the duration of bahar period is of 6 to 7 months. Under unusual circumstances it is longer.
Table - 3.6

Bahars of Pomegranate and their duration

<table>
<thead>
<tr>
<th>Name of the Bahar</th>
<th>Commencement</th>
<th>Fruits ready for Picking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ambe bahar</td>
<td>First week of January</td>
<td>First week of July</td>
</tr>
<tr>
<td>2. Mrig bahar</td>
<td>Second week of June</td>
<td>Second week of December</td>
</tr>
<tr>
<td>3. Hasta bahar</td>
<td>First week of October</td>
<td>First week of April</td>
</tr>
<tr>
<td>1. Aad bahar     (Unscheduled bahar)</td>
<td>Any time</td>
<td>After 135 to 150 day's From the starting period of bahar.</td>
</tr>
</tbody>
</table>

Source: Prepared from the data collected from the farmers

In order to regulate flowering, watering is withheld for about two months in advance of the normal flowering season to let the tree go in dormancy. After two months, manure or fertilizer is applied along with irrigation. Three to four days later follows heavier irrigation at regular intervals. The tree readily responds to this treatment by producing new growth and blossoms and bears a good crop.

But in actual practice, apart from this recommended timetable, first watering is done either sooner or later in order to prepone or postpone the bahar period. In Solapur district, most of the growers opt for hasta bahar as it is climatically more suitable for the crop. The recommended hasta bahar starts from the beginning of October. However, it is observed from the data of the sample growers in this study that they started their bahar during mid-August to early September, which is locally called as “Early Hasta Bahar”. Normally growers of this region do not wait till early October. Because, in Bijapur district, summer season is very hot and average rainfall is very low and erratic. This gives enough leisure (dormancy) to the plants. New leaves grow at the beginning of monsoon in the middle of June, which makes it easy for growers to start bahar from the
second week of August. This is the reason why growers adopt early hasta bahar. Even for the marketability of the fruits, early hasta bahar is suitable for this region. The fruits are ready for marketing during December-end to March-end. This period is quite favourable for marketing of the produce.

3.3.13. Picking, Packing and Marketing of Pomegranate

All fruits are not picked in one lot; they are picked in instalments. The season is spread over, about two months. After picking, the fruits are assembled in the nearby shade for classification and gradation. Grading is based on colour, size and weight of a fruit and then the assorted varieties are branded differently as Disco, Kohinoor, Delux, Yamcea, etc. After grading, these fruits are packed in the corrugated boxes, with cut paper waste and a colored paper and sent to different markets in India.

3.3.14. Marketable Surplus

Nearly 99 per cent of grape and pomegranate produce is normally available as marketable surplus. The labour force, working in these orchards is paid in cash. A very small portion of the total produce (generally the damaged and low quality, fruits) are used for won consumption and for offering free to friends and relatives. Therefore, almost the entire output is available as marketable surplus.

3.4. Classification of cost of production

The following classification of cost of production is adopted for the analysis of data gleaned for the present study by a little reorganization of the official classification of costs into costs $A_1$ to $C_2$ and then further inclusion of some additional items.
3.4.1. Cost of cultivation:

This connotation comprises factor costs from preparation of land for plantation to the stage of fruits ready for picking. This cost is divided into 1. Establishment cost and 2. Recurring cost. Cost of cultivation is by adding annual establishment cost and annual recurring cost.

Annual cost of Cultivation = Annual Establishment cost + Annual Recurring cost.

3.4.2. Establishment cost:

This cost head includes factor costs from preparation of land for plantation up to the beginning of the first bahar. Generally, the Grape and Pomegranates plants can survive for more than 50 years. But the commercially viable life of these plants is less than this duration. In Solapur district, this life of Grape and Pomegranate plants is assumed to be 15 and 20 years respectively. Since adoption of cultivation of these two fruits is very recent in this district, there is no definite general estimation of the commercially viable life of these plants. Very few cases are observed after ten years of the life span, out of 4 or 5 main trunks, one or two trunks at
pomegranate plant are cut off every year, to obtain new shoots which give comparatively good returns for a further four to five years. But in view of the low quality of land under most of the grape and pomegranate orchards, high density of plants per acre and non-availability of assured and sufficient water, the plants in the district regions have limits to their yields. Hence, their commercially viable life cannot be too long. Much discussion with respondents and other experienced farmers of the region has also confirmed this point. Therefore, for the present investigation, the commercially viable life span of grape and pomegranate plant in Bijapur district is fixed at 15 and 20 years respectively.

As mentioned earlier, for estimation of cost of cultivation, annual establishment cost is taken into account. Here total establishment cost is apportioned to the annual account on the basis of the commercially viable life of the respective orchards.

\[
\text{Annual Establishment Cost} = \frac{\text{Total establishment cost}}{\text{Commercially viable life of the Orchards}}
\]

Establishment cost is divided into three constituents, viz. capital cost, working cost and management cost in order to estimate every cost item properly and find out its significance in the total. Detailed cost items of these three cost components are as follows.

A. Capital Cost

1. Depreciation of farm assets.
2. Interest on Block capital in farm assets (excluding land)
3. Rental value of the owned land.
B. **Working Cost (Variable cost)**

I. Preparation cost
   a. Tilling
   b. Land levelling

II. Labour cost:
   a. Layout
   b. Digging and filling back pits
   c. Plantation
   d. Giving support to the plants
   e. Inter-culture
   f. Giving shape to the plants
   g. Grass-cutting
   h. Application of fertilizers
   i. Spraying
   j. Watering

III. Cost of farm yard manure

IV. Fertilizers

V. Cost of string line support, sticks etc.

VI. Water charges

VII. Cost of seedling

VIII. Cost of pesticides and insecticides

IX. Land taxes

X. Interest on working capital (owned and borrowed).

### III. Management cost

1. Cost of Management cost
3.4.3 Recurring cost:

It comprises factor costs for performing routine farm activities over the year. This is also known as "Bahar cost" like establishment cost, this cost is also divided into three constituents, viz. Capital cost, working cost and management cost, for the same reason. Detailed cost items of these three cost components are as follows.

A. Capital cost:
   1. Depreciation of farm assets
   2. Interest on block capital investment in farm assets (excluding land)
      2.1. Rental value of the owned land
   3.

B. Working (Variable) cost
   I. Preparation cost
      a. Summer filling
   II. Labour cost:
      a. Pruning and training
      b. Weeding, striving of soil and inter-cultural work,
      c. Application of fertilizers
      d. Spraying
      e. Watering
   III. Cost of farm yard manure
   IV. Fertilizer cost
   V. Water charges
   VI. Cost of pesticides and insecticides
   VII. Land tax
   VIII. Interest on working capital (owned and borrowed)
I. Management Cost:
   1. Cost of management cost
   2. Allowance for risk factor.

3.4.4. Marketing Cost:

   This head includes factor costs for picking, grading, packing and transporting of fruits market charges and expenses for collection of sale proceeds. Detailed cost items are as under.

I. Labour Cost—labour used for:
   (a) Picking of fruits
   (b) Grading of fruits,
   (c) Transporting of fruits.

II. Cost of packing material

III. Crate and shade cost

IV. Transport cost

V. Commission and miscellaneous cost

VI. Cost of collection of bills.

3.5. Conclusion:

   Due to inclusion of cost of management and risk, the scope of the cost of production adopted for the present study crosses the limit of officially accepted concept of cost \( C_2 \). Cost of production is divided into cost of cultivation and cost of marketing. Again cost of cultivation is divided into establishment cost and recurring cost. Further, each of these two cost heads have been divided into three sub heads viz. capital cost, working cost and management cost, in order to highlight every cost item interalia with respect to question period and Bahar period. The following chapters reveal the actual results.
Notes and References


Note: Expenses made on adoption of this technique come under the establishment cost of which should be made only during the gestation period.


Note: In the corporate sector of India, this is the normal rate of salvage value. Therefore, the same is used in the case of farm assets under reference.

Note: In the present text, it is termed as ‘recurring cost’.

Note: Ibid, P.14. Therefore, in the present study, the cost of allowance for risk factor is not added to the total establishment cost.


**Note:** Since Grape and Pomegranate orchards are perennial in nature, farmers take inter crops during the gestation period in order to pay back the initial cost as much as possible. Therefore, some researchers have taken net establishment cost, i.e., total establishment cost minus income from inter crop, for calculation of annual establishment cost. But in Bijapur district, inter cropping is not a common phenomenon. Those who had followed this practice have been excluded from the investigation because of practical difficulties in culling data regarding its production cost and net return. Therefore, in the present study, actual total establishment cost is taken into account to work out the annual establishment cost.

