ECONOMICS OF PRODUCTION AND MARKETING OF MANGO IN DHARWAD DISTRICT, KARNATAKA

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CERTIFICATE

This is to certify that the thesis entitled **"ECONOMICS OF PRODUCTION AND MARKETING OF MANGO IN DHARWAD DISTRICT, KARNATAKA"**, submitted by **Mr. K. C. GUMMAGOLMATH**, for the degree of **MASTER OF SCIENCE** in **AGRICULTURAL ECONOMICS**, to the University of Agricultural Sciences, Dharwad, is a record of research work done by him during the period of his study in this University, under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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Affectionately Dedicated

To

My Beloved Parents

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I. INTRODUCTION

I. INTRODUCTION

Cultivation of fruit is a very important factor contributing to the prosperity of a nation. It helps in maintenance of ecological balance and also provides employment to the sizable population in the country.

Often per capita fruit consumption is taken as an index of Standard of living of a country. The Indian Council of Medical Research (ICMR) has recommended consumption of 120gms of fruits per capita and as many variety as season permits. But the per capita consumption of fruits in India is only 40 gms. There is a potential for exporting raw and processed fruits. In view of the ever increasing facilities and improved technology of handling, processing, storing and transportation of fruits, the potential is likely to grow at a faster rate. Looking into these factors it is not only necessary to step up production, but also, to see that fruits are made available during off season.

A combination of cereals and millets and fruits form a balanced diet, since the former provide carbohydrates and later provide vitamins, minerals and protein which are necessary to maintain proper health and acquire resistance to diseases.

Mango has been cultivated in India since antiquity and records show that Huien-T'sang has testified its cultivation during the time of his visit to India. India Occupies a prominent place in the cultivation of mango. It occupies 60.25 per cent of total area under mango in the world. In India, among fruit crops it ranks first both in area and production. During 1992-93 the production of mango was 8.5 million tonnes (30.11 percent) produced in an area of 1.1 million hectares (31.25 percent). The principal states cultivating mango are Uttar pradesh, Bihar, Andhra Pradesh, Maharashtra, west Bengal and Karnataka.

In recent years mango is gaining more and more importance in the national as well as international markets. There is a great demand for fresh fruits as well as processed products prepared out of mango. The main importing countries of Indian mango are USA, USSR, Middle East and European countries.

The hardy nature and adaptability of mango to a wide range of climate and soil conditions is a relative advantage. Mango can be grown well in all types of soil, ranging from alluvial to latertic soil, except black cotton soil which are considered to be poor. The deep and well drained loamy soil is considered best for mango. It prefers slightly acidic soil. Mango can be grown from sea level up to an altitutude of about 1400 meters provided there is no humidity and rain or frost during the flowering period. It does well at a temperature

ranging from 24-27^{0} . Higher temperature during maturity of fruit improves size and quality of fruits. It can do well in areas having rain fall ranging from 25cms to as high as 250cms.

Some of the popular varieties of mango grown in India in different regions are Dashehari, Langra, Chausa and bombay green in Northern region. Himasagar, Langra, Fazil, Zardalu, Krishna bhog and Gulabkhas in Eastern region. Alphonso, pairi, Kesar, Rajapuri Malkura and Jamadar in Western region. Alphonso (Badami), Bangalora, Neelum, Swarna-rekha, pairi and mulgoa in Southern region.

Alphonso is one of the finest varieties of Indian mangoes and is rated to be the best at home and abroad. But this variety is alternate bearing in nature. It is very specific in its requirement and does best in coastal area. The fruits are very attractive, large sized and oval in shape. The taste is superb with an excellent sugar/acid blend. It is favourite fruit of the processing industry since it retains its characteristics flavour even after processing.

The present study was undertaken in Dharwad district of Karnataka, which is one of the principal mango growing state. In Karnataka Mango is cultivated in an area of 76,955 hectares. Kolar, Bangalore, Dakshina kannada, Bidar, Dharwad and Hassan are the important districts growing mango. (Table1.1)

Table 1.1 District wise Area under Mango in Karnataka

Sl. No.	District	Area (in ha)	Percentage total
1.	Bangalore urban	838	1.08
2.	Bangalore rural	8932	11.60
3.	Chitradurga	2510	3.26
4.	Kolar	24293	31.56
5.	Shimoga	2680	3.48
6.	Tumkur	6154	8.00
7.	Belgaum	2480	3.22
8.	Bijapur	1146	1.49
9.	Dharwad	3226	4.20
10.	Uttar Kannada	2476	3.21
11.	Bellary	1233	1.60
12.	Bidar	3511	4.56
13.	Gulbarga	1364	1.77
14.	Raichur	2090	2.71
15.	Chickmagalur	2630	3.41
16.	Dakshina kannada	3852	5.00
17.	Hassan	2854	3.70
18.	Kodagu	592	0.77
19.	Mandya	1710	2.22
20.	Mysore	2379	3.10
		76955	100.00

There is not enough farm business data on cost of production of mango in Dharwad region. The information on establishment cost, operating cost and input requirements of mango orchard would be of immense help to mango growers of Dharwad region. It enables the farmers in making decisions in farm planning and enterprise selection. The results will be of immense use to the financial institutions in fixing the scale of finance and schedule of repayment.

The present study covers the economics of production and marketing of mango and identifies the problems faced by the mango cultivators in its cultivation and marketing. It envisages to suggest possible corrective measures to bring about the desired improvement in production and marketing of mango.

The study was under taken with the following specific objectives

1. To study the general characteristics of mango orchards in the study area.
2. To analyse the costs and returns structure and to work out financial feasibility of mango cultivation.
3. To study the resource use efficiency in mango cultivation.
4. To identify different marketing channels and to estimate

cost, margins and price spreads in marketing of mango.

5. To assess the problems of producer regarding production and marketing of mango and suggest possible corrective measures.

Presentation of the study

The study has been presented in six chapters. In the initial introductory chapter-I, the nature and importance of the present study and also the specific objectives of the study have been clearly indicated.

Chapter-II comprehensively presents a review of the relevant research work done on the related topics.

Chapter-III outlines the features of the study area, sampling designs followed, collection of relevant data and analytical tools used in the study.

Chapter -IV is devoted to present the main findings of the study through tables, graphs etc.

In Chapter-V Discussions of the results of the study are presented.

Chapter-VI provides summary of the whole study and also suggests the policy implications from the findings of the study.

II. REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

A review of the research work done in the fields of this study is presented in this chapter. The number of studies made on mango *per se* are very few. Since the economic analysis of most of the perennial crops are similar reviews relevant to the present study are also presented from various comparable crops under the following broad heads.

1. Costs and returns structure in perennial crops.
2. Financial feasibilities of perennial crops.
3. Production function analysis.
4. Marketing channels and marketing costs.

2.1 Costs and Returns structure in perennial crops

Venkataram (1964) made a detailed study on economics of grape production in Bangalore south taluk of Bangalore district. He considered all the costs incurred during first year as establishment cost and the costs required to operate the grape orchard as maintenance costs. The apportioned establishment cost along with 10 percent interest on the value of land was taken as fixed capital and included in the total cost.

Patil *et al.* (1989) studied the cost of grape cultivation in Sangli district, and production and marketing of

mango in Ratnagiri district, through survey undertaken during 1966-67. The study revealed that the total cost and gross income moved together and the average output-input ratio was 2.4 in grape cultivation. The total cost of establishment of mango was found to be Rs 1863 for five years, out of which more than 50 percent was incurred during first year of establishment itself. The gross return increased upto 40 years age of garden.

Venkateshwaralu and Surya Narayana (1971) dealt with some methodological problems involved in the costing of Anab-E. Shahi grapes in Hyderabad. They classified the costs in grape cultivation in two headings (1) cost incurred during establishing period (2) cost incurred during bearing period. The cost incurred in the former was divided into fixed, working capital and operating assets and later into preharvest and post harvest charges. Simple interest on fixed assets at three percent, depreciation by straight line method, Simple interest at 6.25 percent on half the operating assets for half of the year and on the balance for full year were computed and total amount was distributed over 14 harvests. Regular recurring expenditure for successive years during pre-harvest and post harvest period was calculated and interest at 6.25 percent on half of this expenditure for half year was added to the pre bearing expenditure to arrive at annual balance sheet.

Sharma and Pandey (1972) studied the costs and net profits from Guava orchard in Uttar pradesh. The cost of raising Guava orchard was estimated at Rs 3,964.82 per hectare in the first year. The maintenance costs amounted to Rs 589.49 per hectare per year. The net return from the inter crops during the three year period worked out to Rs.6,287.50 per hectare. It was observed that the Guava orchard generated a net return of Rs 6,500.00 per hectare.

Abraham (1974) in an experiment conducted at CPCRI Sub-station, Palod at Kerala, observed that by growing inter crops in areca gardens, the additional net return per hectare obtained could be Rs 225.00, Rs 591.00 Rs 1,700.00 Rs 1,524.00. Rs 61.00 and Rs 847.00 from pepper, tapioca, elephant foot yam, diascoria, sweet potato and pine apple respectively.

Achoth (1978) in his study on the economics of tea production in Niligiri district, classified the sample into large, medium and small estates. Further, each group was classified into two subgroups namely, estates in low grown area and estates in high grown area. The study revealed that the returns per rupee invested was highest in the small group of the low grown area at Rs 1.71 followed by the high grown small group (Rs1.46) high grown medium group (Rs1,38), high grown large group (Rs1.26) and low grown medium group (Rs1.08).

Jung (1981) collected data on prime costs and returns of grape production in czechoslovakia for 1972 to 1979 and analysed their structure and trends. The results showed that 33.6 percent of direct costs were for labour, 66.3 percent were material costs including overheads, depreciation and initial costs and the rate of profit was 57.9 percent.

Subrahamanyam and Mohandoss (1982) estimated the costs and returns from Coorg Mandarin oranges in Karnataka. They found that the Mandarin orange tree requires seven years to establish and starts bearing from eighth year. The average cost of maintenance from the eighth year onwords was found to vary from Rs 65.00 to Rs 590.00 with an average of Rs 370.00, per acre. The per acre returns ranged between Rs 219.00 and Rs 3,000.00. The average gross returns per acre was found to be Rs 992.00

Sunderesan and Thanasekaran (1984) studied the costs and returns from cultivation of muscat grapes in Madurai district of Tamilnadu. The study revealed that on an average Rs 49,467.00 per hectare were required for establishing vines upto bearing stage of which operation and maintenance costs amounted to Rs 26,658.00. The cost of production of grape was Rs 1.58 per kg for the first four years, Rs 1.80 from the fifth to eight year and Rs 2.29 per kg after eighth year.

Singh *et al.*(1986) studied the costs and returns of inter crops in arecanut plantations in Kerala. The study was conducted in respect of five major inter crops viz., Banana, betelvine, ginger, pineapple and turmeric. The results showed that, interms of net income, betel vine was the most profitable inter crop followed by pine apple, ginger, banana and turmeric.

Subrahmanyam (1987) studied the cost and returns of mango orchards in Karnataka. It was observed that on an average the establishment of mango orchard required Rs 3000 per ha. The maintenance cost of mango orchards was only Rs 200.00 per ha. The gross returns from a hectare of mango orchard was Rs 1200 in Karnataka. As indicated by the study the pay back period was 11 years, Internal rate of return was 30 percent and B.C ratio was 2.00 indicating that the investment was profitable.

Patil *et al.*(1989) in their study on the economics of coconut production in Maharashtra categorised the total cost into amortization cost and annual maintenance cost. The study revealed that per hectare annual cost of coconut cultivation had inverse relationship with the size of orchards.

The per hectare gross returns were the highest (Rs 33,613.00) for medium orchards followed by the small (Rs 31,489.00) and large (Rs 27,031.00) Size orchards. also the net returns were the highest (Rs 23,060.00) for the medium followed by small (Rs 20,332.00) and large (Rs 16,742.00) size orchards.

Malave (1990) studied the cost of cultivation of mango. The over all per hectare cost of cultivation was Rs 13,631.70 and Rs 5802.14 was marketing cost. out of total cost of production 17.64 percent (Rs 3429.10/ha) was incurred on human labour, 7.85 percent was on manures and fertilizers, and 5.19 percent on plant protection. The cost benefit ratio in bearing mango orchard was 1.58.

Raikar (1990) studied production and marketing of cashew in Karnataka. The study revealed that the per hectare annual maintenance cost of cashew plantation was higher on small size(Rs 1,674.17) plantations compared to large size plantation (Rs 1,303.65). The per hectare gross returns over maintenance cost was highest (Rs 3,787.61) on small farms compared to large size plantations (Rs 2,919.84). The gross returns were Rs 3,234.32 for the over all size group of plantation. The net return over total cost was found to be Rs 1,487.42, Rs 800.77 and Rs 1,049.61 on small, large and over all size groups of plantations respectively.

Singh and Sikka (1991) They studied the cost of production and marketing of apple. A sample of 40 growers in Kinnaur tribal development block in Himachal pradesh was selected for the study. The sample was divided into two groups on the basis of age of apple trees. The study showed that net returns were highest from trees in the age group of 16-20 years. Net returns per hectare ranged between Rs 9,330 and

Rs.45,818. The incremental income of apple orchard was Rs 13,710 per ha. The employment generated by apple orchards was 331 mandays per ha. The producers share of consumer price was 33 percent in Delhi market.

2.2 Financial feasibilities of plantation crops

Prest and Turvey (1965) reported cost-benefit analysis as a practical way of judging the desirability of long term projects. Hence the cost-benefit analysis implied the complete enumeration and evaluation of costs and benefits from the projects.

Upton (1966) applied discounted cashflow technique to compare the returns from investment on tree crops with returns from annual crops in Western Nigeria. He discounted the expected future returns from new varieties of cocoa, oil palm and rubber over 32, 35 and 35 years respectively to arrive at net present worth. This was compared with returns per acre from annual crops like cotton, rice, maize, sorghum and Tobacco. The analysis indicated that with the exception of rubber, all other crops showed a lower returns than the annual crops and therefore it was concluded that use of land for tree crops was less profitable when compared with the use of land for annual crops.

George and Joseph (1973) applied the benefit-cost analysis to evaluate the investment on tree crops like coconut rubber and oil palm The costs and returns were discounted at nine percent interest being the rate at which credit could be available for long term loans The analysis indicated that emong three crops oil palm appeered to provide more favourable returns to the cepital

Gupte and George (1974) estimated the profitability of santra (orange) cultivation in Nagpur district of Maharashtra by using the conventional measuras of project appraisal for the date from 60 orange growers The study using a discount rate of 12 per cent indicated that orange orchards had a pay back period of seven years a net present value of Rs 6,438.00 per acre an internal rate of return of 39 per cent and a benefit cost ratio of 2.5

Joseph (1978) conducted a comparative study of profitabilities in rubber cultivation with a life span of 62 years with that of tapioca an annual crop The study revealed that stability of income absence of risks and immunity from land reforms were the factors affecting the choice of crops by the medium and large farmers. It further showed that at a discount rate of 11 per cent, rubber plantations showed higher profits than tapioca But for the small farmer rubber plantations were uneconomical when the discount rate of 11 per cent used for analysis was increased to 60 percent But

they would materialise only if additional lands were made available to the small farmers

Kalyankar (1979) evaluated the dairy enterprise by using discounted cash flow techniques with 14 percent discount rate The pay back period benefit cost ratio and internal rate of return respectively were 3 to 5 years 2:1 and 32 percent indicating that proposed project was financially and economically feasible

Menon (1979) studied the feasibility of investment in grape gardens in Bangalore north taluk The estimated model life of the vine yards were 30 years and 25 years for Bangalore blue and anab-e-shahi respectively The study in which the net present worth was found to be Rs 38,228.28 per hectare the benefit cost ratio was 1.42 and internal rate of return was 40 per cent in the case of Bangalore blue variety For Anab-e-shahi the respective values were Rs. 92,480.96 per hectare 1 76 and 49.06 per cent

Patil and Kumar (1986) They studied the economic viability of investments in Alphenso mango plantations in Ratnagiri district of Maharashtra Considering 72 orchards from six villages The study revealed that the capital investment in Alphanso Mango plantations was an economically viable proposition The B.C ratio was 1.38 NPV was (21.78) the internal rate of return was higher than interast rate of Bank (18%) and pay back period was 10 years

Patil *et al.*(1989) studied the economic viability of coconut production. The over all benefit cost ratio stood at 2.27. While the net present value and IRR were Rs 8,186 and 43.2 respectively.

Koujalagi (1990) evaluated financial feasibility of pomegranate orchard in Bijapur district of Karnataka. The study showed that the per acre net present value for the entire life period of the project was found to be Rs.8,283.81. The discounted benefit cost ratio (at 12 percent discount) was 1.53. The pay back period was 6.56 years and internal rate of return was 15.55 per cent.

Azad and Sikka (1991) in their study on production and marketing of temperate fruits applied project evaluation measures to study the economic viability of fruits such as apples, peaches, plums and apricots. The net present value was Rs 26257.00 for apples, Rs 89222.00 for peaches, Rs 117837.00 for plums and Rs.160541.00 for apricots. The internal rates of return were 22, 33 and 47 percent respectively. The benefit cost ratios were 1.36, 3.87, 4.62 and 5.10.

Hugar *et al.*(1991) examined the economic potentiality and viability of Guava cultivation under scientific management. The study revealed that the net present worth was Rs 7,38,042 per hectare. The benefit cost ratio, internal rate of return and pay back period were found to be 3.88, 57.82 percent and six years respectively.

2.3 Production Function Analysis

Dhaliwal (1969) studied the various factors affecting the productivity of sweet oranges in south western Punjab by employing Cobb-Douglas production function, using cost of fertilization, cost of spraying, cost of labour as independent variables. The computed regression coefficients were less than unity indicating diminishing returns to each production factor. Further analysis indicated that about 93.30 per cent of variation in gross returns was explained by the variables included in the function.

Venkataram (1969) fitted Cobb-Douglas production function to estimate the productivity of five inputs used in grape cultivation in Bangalore south taluk. The analysis indicated 82.5 percent of variation in output was explained by independent variables like land, capital, labour, manures and fertilizers and plant protection chemicals.

Patil (1975) in his study on economics of pomegranate cultivation in Rahuri region of Ahemadnagar district, Maharashtra employed Cobb-Douglas type of production function to examine the resource productivities in pomegranate cultivation. He considered the yield in quintals as dependent variable, while land (guntas), Human labour (mandays), expenditure on manures and fertilizers (Rupees) as independent variables. The analysis revealed that 84.00 percent of variation in the output was explained by independent variables.

Lalit Achot (1978) in his study on economics of tea production in Niligiri district of Tamil nadu employed Cobb-Douglas type of production function separately for large and small estate groups where in he considered the yield in kilograms as dependent variable and area under tea, expenditure on plucking and tipping, expenditure on fertilizers, expenditure on plant protection and herbicides, expenditure on labour and over heads as independent variables. The production function analysis revealed that the coefficients of only two variables in large estates namely area under tea (0.68053) and expenditure on plucking and tipping (0.35192) were found to be significant at 5 per cent level and variables like land and expenditure on plucking and tipping were significant in case of small estate groups.

Rana *et al.* (1978) used Cobb-Douglas type of production function with four variables for three groups of apple growers namely progressive, non progressive and pooled sample of Kumarsein block of Simla district. The independent variables were labour, quantity of fertilizers and organic manure, value of pesticides used per acre and age of the apple orchards. The analysis revealed that 99,96,98 per cent variation in output was accounted for by independent variables respectively on progressive, non progressive and pooled sample farms.

Murthy and Ramanna (1979) employed modified Cobb-Douglas type of production function to the data obtained from 48 mulberry growing farmers to study the resource productivity and allocation efficiency of important factors in mulberry cultivation. The results indicated that six variables like land, farm yard manure, fertilizers, number of irrigations, human labour and other variables costs explained 95 per cent of variation in the yields of mulberry crop. They also reported that ratios of their marginal value product to their factor costs were more than one indicating that they are economically used in mulberry cultivation.

Chinnappa (1981) fitted Cobb-Douglas type of production function to estimate the productivities of five inputs used in guava cultivation in Bangalore district. The analysis indicated that 43.00 percent of variation in output was explained by the independent variables like land, human labour, manures, fertilizers, and plant protection chemicals.

Acil and Rebber (1985) carried out the economic analysis of grape production in Nevesehir province. Cobb-Douglas type of production functions were used to determine the level of resource use efficiency. Labour was used at nearly optimum level. Estimated level and input coefficients showed that land suitable for grape production could be brought under cultivation. Fertilizer input had a negative production efficiency and was not used according to

modern techniques and at proper time to be effective. The chemical cost factor had the biggest marginal efficiency and needed to be increased to the economic optimum.

Thomas and Gupta (1987) studied the economics of Banana cultivation in Kottayam district of Kerala. The study revealed that the main items of expenditure in working out the cost of cultivation of banana per hectare were the expenditure on Manures and fertilizers followed by labour cost. The Cob-Douglas production function was used and the results showed increasing return to scale.

Kulkarni (1989) employed Cobb-Douglas type of production function to the farm level data, for evaluating the resource productivities and allocation efficiency of resources used by the grape cultivators in Bijapur district, Karnataka. The variables included were output in kilograms per acre, as dependent variable and number of vines per acre (number), value of manures and fertilizers (Rupees) and value of human labour employed (Rupees) as independent variables. The functional analysis revealed that 36.00 percent of variation in output was accounted for the independent variables.

Koujalagi and Kunnal (1992) examined the resource use efficiency in cultivation. Cobb-Douglas type of production function was used. The variables considered were, land, number of plants per acre, labour, plant protection chemicals,

irrigation and manures and fertilizers The functional analysis revealed that 70 percent of the variation in gross returns was explained by the six independent variables included in the model The regression coefficients of land labour and manures and fertilizers indicated that contribution of these inputs to gross income was significant but the regressiion coefficients of number of plants per acre and plant protection chemicals were negative and nonsignificant The marginal value productivities of inputs indicated that labour, irrigation and plant protection chemicals were used efficiently while manures and fertilizers were used optimally

2.4 Marketing channel and Marketing cost

Sidhu and Kahlon (1987) identified three marketing channels for apple in Kullu valley, namely a) contract system b) sales in market through agents c) directly to consumers and their shares in the market were 62.2 per cent contract basis 34.14 percent to commission agents in the market and only 3.65 per cent through direct sales to consumers The main reason for leasing the orchard on contract were small and scattered holdings lack of transportation facilities and absence of local market in Kullu proper.

Singh and Kahlon (1968) in a study on marketing of grapes in Punjab observed that commission agents and retailers were important channels for selling grapes About

41 and 40 per cent of produce was marketed through commission agents and retailers respectively. Further analysis showed that grading and packing formed 72.6 per cent of total marketing costs in the primary markets, transportation cost accounted for 10.96 per cent and 34 per cent in these markets respectively.

George and Singla (1969) studied marketing of sweet oranges in Punjab and found that 77.39 per cent of farmers disposed of their produce to the pre-harvest contractors, 20.38 per cent to the distant terminal markets and rest to the local wholesalers and retailers and directly to consumer.

Singh and Kahlon (1969) reported that the sale of grapes in Punjab through retailer was highest (41.05 per cent) followed by sales through commission agents (40.60 per cent), whole salers (11.26 per cent) and pre-harvest contractors (4.53 per cent).

Kochhar and Thakur (1971) reported that most common mode of marketing apples in Himachal Pradesh was through commission agents which accounted for about 85.63 of the marketable surplus. The next important method of sale was through pre-harvest contractors which accounted for only 14.67 per cent of total marketable surplus.

Dhar *et al* (1976) stated that pre-harvest contract system was most common method of sale of apples, among small and medium orchardists and sales through commission agent was more popular among large orchards. The marketing costs when sold through commission agent at the markets of Jammu, Amritsar and Delhi came to Rs.11.88, Rs.14.58 and Rs.17.37 respectively. The major items of marketing costs were packing, transportation and commission charges. Further analysis showed that commission agents accounted for more than 41 per cent of total marketing margins followed by transportation and handling charges.

Krishnamurthy *et al* (1978) studied the economics of production and marketing of coorg mandarin oranges in Karnataka and found that the pre-harvest contractors made a net profit of Rs 25.06 per thousand fruits and incurred expenses of Rs.24.24. Commission charges which were Rs 10.71 per thousand fruits formed 44.18 per cent of the total marketing cost Harvesting and transportation costs were the other important items of marketing cost. The grower received Rs 57.89 per thousand fruits.

Patil *et al*. (1983) studied the marketing margins and price spread in the marketing of Alphanso mangoes in Ratnagiri district. Out of the four identified channels, the direct sale to consumer was the most profitable, while selling through pre-harvest contractors was the least profitable.

Rajagopal (1987) in his study on marketing of apple, guava and mango fruits reported that the producer's share in the final price was highest in apple crop, followed by mango and guava. The cost of marketing was higher in guava followed by mango and apple. It revealed that apple cultivation was economically viable even to small growers. He recommended that direct sales and sales through cooperatives should be promoted to provide more share to the producers in the final price of fruit crop.

Patil (1989) in his study on marketing of Alphanso mangoes in Maharashtra identified four channels viz., Producer-Consumer (direct sale); Producer-Cooperative Consumer (cooperative sale); Producer-Commission agents-Whole Salers-Retailers-Consumer (middle men sales) and Producer-Pre-harvest Contractor-Commission Agents-Whole Salers-Retailers-Consumer (pre-harvest contract sale). The study revealed that when the contract was made at the time of flowering stage, the price received by the growers was the lowest (Rs.28.50 /crate) though the crate size was big. The average price of Alphanso mangoes received by the growers was only Rs.29.40 per crate. Finally he concluded that the direct sale to consumer was the most profitable and the one through pre-harvest contractor was the least profitable.

Kulkarni (1989) in his study on economics of production and marketing of grapes in Bijapur district, Karnataka, identified two marketing channels, they were :

a) Producer-Commission Agents cum Whole Saler-Retailers-Consumers and

b) Producer-Preharvest Contractors-Retailers-Consumers.

The study revealed that selling through commission agent in the market was profitable compared to sale to pre-harvest contractors.

Raikar (1990) in his study on investment in production and marketing of cashewnut in Karnataka, identified six channels of trade namely

1. Grower-Preharvest Contractor-Itinerent Traders-Processer,
2. Grower-Itinerent Traders-Processer,
3. Grower-Village Dealer-Processer,
4. Grower-Trader (wholesaler)-Processer,
5. Grower-Commission Agent-Trader (wholesaler)-Processer,

The channel 3 was more advantageous than the other channels for disposal of produce interms of both the quantity and the number of farmers who sold their produce through that channel.

III. METHODOLOGY

III. METHODOLOGY

This chapter outlines briefly the characteristics of the area selected for the study, the methods adopted in the selection of samples, the nature and sources of data, and the various statistical tools and techniques employed in analysing the data and evaluating the results.

The methodology is presented under the following major heads.

3.1. Description of the study area.

3.2. Description of sample Taluka

3.3. Sampling procedure.

3.4. Nature and source of data

3.5. Analysis of data

3.6. Definition of terms and concepts used

3.1 Description of study area

Dharwad district, falling geographically in the northern region of Karnataka state lies between latitudes 15° 17'N and 15° 50'N and longitude 74° 48'E and 76°E. It is surrounded by the districts of Belgaum and Bijapur on the North,

Shimoga and Chitradurga on south, Raichur and Bellary on the East and Uttar kannada on the West.

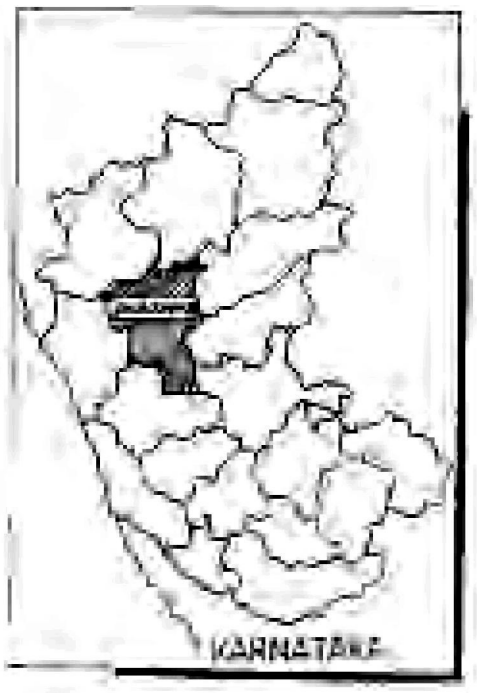
Dharwad district ranks fifth in mango cultivation with an area of 13,78,200 hectares which comes to 7.15 percent of the area of the state. It comes in the transitional belt between malnad and maidan, the two sub divisions of Karnataka plateau and enjoys a conducive climate for healthy crop production. The maximum temperature in the summer (April-May) is about 42°C and the minimum in the winter is 10°C(December-January).

It has varying soil types, while black loams are seen in the eastern part of the district, red soils are found in hilly and mountanous regions of the district all over except in the northern region. The transition tract has laterites. Around the district head quarters of Dharwad, Mango and Guava fruits as well as Potato and various vegetables are produced.

3.3 Sampling procedure

3.3.1 Selection of study area

Dharwad is one of the leading districts in mango cultivation. It ranked fifth with respect to area under mango (Table 1.1) in Karnataka. Alphonso is one of the popular vareities in Dharwad district due to its suitablity to


KARNATAKA


BIJAPUR DISTRICT
BELGAUM DISTRICT
GULBARGA DISTRICT
RAICHUR DISTRICT
BIDAR DISTRICT

agroclimatic conditon. The familiarity of research worker to the study area is one of the factors to choose Dharwad district for the study.

3.3.2 Selection of the sample Taluka

Mango is cultivated through out Dharwad district. How ever, the large scale cultivation of mango is concentrated in Dharwad Taluka, contributing 44.82 per cent of the total area under mango in the district (Table 3.1) Hence, Dharwad taluka was selected. In Dharwad taluka the most popular variety grown is Alphonso (Badami). Other varieties and Hybrids are also grown to some extent.

3.3.3 Selection of sample villages

From the selected sample taluka a list of villages cultivating mango were obtained in consultation with the Assistant Horticulture officer, Dharwad taluka. Mango is being cultivated in about 30 villages in Dharwad taluka. Six villages with high concentration of area under mango were selected in consultation with Assistant Horticultural Officer, Dharwad.

Table 3 1 Taluka wise area under mango in Dharwad district (1992-93)

Sl No	Taluka	Area (in ha)	Percentage total
1	Byadagi	43.30	1.02
2	Dharwad	1893.50	44.82
3	Gadag	160.80	3.80
4	Hangal	226.00	5.35
5	Haveri	255.00	6.03
6	Hirekerur	241.00	5.70
7	Hubli	289.00	6.84
8	Kalaghatagi	475.00	11 24
9	Kundagol	45.00	1.06
10	Mundaragi	37.20	0.88
11	Naragund	70.50	1.67
12	Navalgund	15.05	0.35
13	Ranebennur	166.50	3.91
14	Ron	61.00	1 44
15	Savanur	35.00	0.83
16	Shigguoan	148 15	3.50
17	Shirahatti	82 10	1 47
	Total	4224 10	100.00

3.3.3.1 Selection of sample mango cultivators

From each village 15 farmers were selected randomly, thus forming a total sample size of 90.

The farmers were post classifed in to small, medium and large based on total mango holdings of the farmers, using formula $\bar{X} \pm 0.425r$. Over all there were 30 small, 42 medium and 18 large orchards.

3.3.3.2 Selection of pre-harvest contractors, commission agents and retailers

In all 10 pre harvest contractors, 5 commission agents and 15 retailers were selected at random for the study.

3.4 Nature and Source of Data

The necessary data for 1992-93 were obtained from selected sample cultivators and various market intermediaries through personal interviews with the help of pre-tested schedule.

The data include general information about the mango cultivators, their socio economic characters, cost and returns of inter crops, cost of establishment, cost of cultivation,

yields and returns and method of marketing. Information about method of storage, transportation, cost of marketing etc were also collected from the intermediaries involved in the marketing of mango.

The secondary data regarding area under mango cropping pattern were obtained from the (i) the Directorate of Horticulture Bangalore (ii) the Assistant Horticulture officer Dharwad (iii) District statistical officer Dharwad.

3.5 Analysis of the data

For the purpose of achieving the Specific objectives of the study the data were subjected to the following analyses.

1. Tabular analysis.
2. Functional analysis
3. Financial analysis.

3.5.1 Tabular analysis

Tabular analysis was used for analysing the general economic characteristics of sample farms, per hectare establishment cost, per hectare cost of cultivation and per hectare resource utilization.

3.5.2 Functional Analysis

Production Function Analyai

A Cobb-Douglas type of production funotion was fitted to evaluste the resource use efficiency in the produotion of Mango

The form of the production function fittad was as follows

$$Y - a\ X_1^{b1}\ X_2^{b2}\ X_3^{b3}\ X_4^{b4}\ X_5^{b5}]$$

Y : Yield of Mango(thousand fruits)

a Intercept

X_1 Land (hectares)

X_2 Labour (Mandays)

X_3 Plant protection chemicals (rupees)

X_4 Farm yard Manure (cart loads)

X_5 No of trees (per orchard)

The Cobb-Douglas type production funotion was converted in to log linear form and the parametera were estimated using Ordinary Least Square Technique

$$\ln y \quad \ln a + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5$$

3.5.3 Financial Analysis

The techniques used for the financial analysis were :

1. Net present value (NPV)
2. Benefit-cost Ratio (BCR)
3. Internal Rate of return (IRR) and
4. Pay back period (PBP).

3.5.3.1 Net present value

The present value represents the discounted value of the net cash inflows to the project. In the present study, a discount factor of 14 percent was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by

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

Where,

Yn = refers to the net cash inflows in the year n

r = refers to the discount factor

I = Initial investment.

3.5.3.2 Benefit Cost Ratio

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

$$\text{B.C. ratio} = \frac{\text{Discounted net returns}}{\text{Discounted cost}}$$

3.5.3.3 Internal Rate of Return

The rate at which the net present value of 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

$$\text{IRR} = \text{Lower discount rate} + \text{Difference between the two discount rates} \left[\frac{\text{present worth of cash flows at lower discount rate.}}{\text{Absolute difference between present worth cash flows stream at the two discount rates}} \right]$$

3.5.3.4 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 that is, the time required for the project to pay for it self. In the present study, Pay Back Period is calculated by successively deducting the initial investment from the net returns untill the initial investment is fully recovered.

Marketing Channel

Marketing channel is the route through which the product moves from producer to the consumer. In this study it was possible to trace the channel from producer to consumer by interviewing various intermediaries.

3.6 Definitions of Terms and concepts used

3.6.1 Planting material

The planting material used (Grafted) was valued at the current market rate. Each seedlings costs Rs 30 (Average).

3.6.2 Manures, plant protection chemicals and staking material

These were valued at the purchase price of the producer. The value of the owned things were valued at the prevailing market price in that area. Manure was valued at Rs 70 per cart load.

3.6.3 Human labour

Human labour was estimated in terms of eight hours. The woman labour was estimated in terms of eight hours. The woman labour days were converted into man days on the criterion that one woman day equal to 0.66 man days on the basis of wage rate equivalence. Similar methodology was adopted by Kulkarni (1990).

The prevailing wage rates were Rs 25 per man day and Rs 15 per woman day.

3.6.4 Bullock labour

It was measured in pair days. Here one pair means eight hours of work by a pair of bullocks and a person needed to operate the bullock pair. It was valued at the rate of hire (Rs 100 per pair) charges prevailing in the study area.

3.6.5 Irrigation charges

The charges for irrigation were calculated at the actual price paid and was included in the rental value of the leased land.

3.6.6 Land rent

For the establishement period rental value of land for rainfed condition was Rs. 12,000, Rs.14,000 for land with well and Rs. 16,000 for land with irrigation. It was estimated on the basis of rent paid to similar land in villages. It was Rs 2,400 per hectare for rainfed, 3,000 for land with well and Rs 3,600 per hectare for irrigated land.

3.6.7 Price Spread

The difference between the price paid by consumers and the price recieved by the producer is generally referred to as the 'marketing margin' or price spread.

3.6.8 Market intermediaries

(i) commission agents

Commission agents locally known as Baagvans play an important role in the marketing process. He is the first agency to receive the produce when it arrives at the market. He charges commission at the rate of 8 per cent from producer and at the rate of 4 per cent from purchaser.

(ii) Pre harvest contractor cum whole salers

Pre harvest contractors are professional buyers. When the crop is ready for harvesting or even at the stage of flowering he enters into contract with the producer. These intermediaries bear the cost of plant protection, packing and transportation.

(iii) Retailers

Retailers sell the mango directly to the consumer in the market. They purchase the produce either from pre harvest contractor or commission agent and sell it to consumers.

IV. RESULTS

IV. RESULTS

In this chapter the results obtained with respect to various objectives set for the study, are being presented under the following heads.

4.1 General characteristics of the sample mango orchards.

4.2 Cost of establishment of mango orchards and cost and returns of inter crops.

4.3 Maintenance cost of mango during bearing period, labour utilization pattern and yield pattern in mango orchards.

4.4 Cash flows and financial feasibilities of investment in mango orchards.

4.5 Resource use efficiency in mango orchards.

4.6 Marketing channel and marketing costs.

4.7 Problems confronting the producer in production and marketing.

4.1 General characteristics of sample mango orchards

Table 4.1 gives a broad view of general characteristics of sample orchards. The present study covered 90 mango orchards consisting of 30 small, 42 medium and 18 large orchards. The average size of mango orchards were 0.59, 1.43 and 3.14 hectares in small, medium and large orchards respectively. The popular variety grown in the study area was Alphonso.

Table 4.1 : General characterstics of Mango orchards

Sl. No.	Particulars	Units	Orchards			Total/ overall
			Small	Medium	Large	
1	Total samples collected	Number	30	42	18	90
2	Average holding under Mango	Hectares	0.59	1.43	3.14	1.59
3	Variety grown	-	Alphonso	Alphonso	Alphonso	
4	Average spacing	Feet	33 X 33	35 X 35	37 X 37	35 X 35
5	No. of plants per hectare	Number	112	100	88	100
6	Range of age of bearing orchards	Years	5 - 60	5 - 60	5 - 60	5 - 60
7	Average age of bearing orchards	Years	30	22	33	

The spacing followed by sample orchards were 33'X33' 35'X35' and 37'X37' in small, medium and large orchards respectively. As a result the number of trees per hectare worked out to 112 in small, 100 in medium and 88 in large orchards.

The age of sample mango orchards ranged from 5 to 60 years. The maximum life period of mango orchard was found to be 60 years under field conditions.

4.1.1 Land utilization pattern of selected sample orchards

The land utilization pattern in three different categories of orchards are given in table 4.2. The average size of holding was 3.64 in small, 13.98 hectares in medium and 15.15 in large orchards.

Barring small unclutivated area most of the owned land was put under the cultivation. The proportion of irrigated area was almost same in medium and large orchards (i.e. 25.53 and 26.4 per cent in medium and large orchards respectively) and very little in the small orchards.

Area sown more than once was 33.18 per cent in small, 32.45 per cent in medium and 27.07 per cent of total owned land in large orchards.

Table 4.2 : Land utilization pattern of sample farmers

(in ha)

Sl. No.	Particulars	Small	Medium	Large
1	Total owned land	3.64	13.98	15.15
	a) Dry	3.14	10.41	11.09
	b) Irrigated	0.50	3.57	4.06
2	Uncultivated area	0.14	0.76	1.1
3	Net area cultivated	2.96 (66.80)	13.80 (67.50)	15.57 (72.90)
4	Area sown more than once	1.47 (33.18)	6.63 (32.45)	5.78 (27.07)
5	Gross cropped area	4.43 (100.00)	20.43 (100.00)	21.35 (100.00)
6	Cropping intensity (in percentage)	149.62	148.04	137.12
7	Area under			
	a)Mango	0.59 (16.21)	1.43 (10.23)	3.14 (20.72)
	b)Guava	0.11 (3.02)	0.18 (1.29)	0.25 (1.65)
	c)Biannuals	1.15 (31.6)	5.81 (41.56)	5.07 (33.46)
	d)Annuals	2.58 (70.88)	12.88 (63.4)	16.28 (76.25)

Note : Figures in parantheses indicate percentage to gross cropped area

The net cultivated area was 2.96 hectares in small, 13.80 hectares in medium and 15.57 in large orchards. Proportion of mango was high in large orchards (20.72 per cent) followed by small and medium orchards (16.21 and 10.23 per cent). The cropping intensity was 149.62 per cent in small, 148.04 in medium and 137.12 in large orchards.

4.1.2 Capital asset position of sample farmers

Table 4.3 reveals the capital asset position of sample farmers. In all the categories of farmers land was most significant item contributing to the asset position. It's share was 71.95 per cent (Rs.86500.00) in small, 88.52 per cent (Rs.402800.00) in medium and 86.77 per cent (Rs439650.00) in large farmers. The next main item contributing to the total value of assets was that of Implements and machinery, which shared 12.11 per cent (Rs.14570.00) in small, 4.81 per cent (Rs.21925.7) and 5.27 per cent (Rs.26680.00) of total value of assets of large farmers.

The other items such as wells, farm house, cattle shed and live stock accounted for 15.94 (Rs19,153.00), 6.67 (Rs30,358.74) and 7.96 (Rs.40,356.19) per cent of total values of assets in small, medium and large farmers respectively.

The ratios of total returns to total capital, total cost to total capital and live stock to non live stock capital were claculated. They are as follows.

Table 4.3 Capital/asset position of Sample farmers in study area

Sl No.	Particulars	Farmers								
		Small			Medium			Large		
		value (Rs)		Units	value (Rs)		Units	Value (Rs)		Units
1	Land									
	a) Dry	66500.00	3 14	(ha)	260000.00	10 41	(ha)	277250.00	11.09	(ha)
	b)Irrigated	20000.00	0 50	(ha)	142800.00	3 54	(ha)	162400.00	4.06	(ha)
	Sub total	86500.00 (71.95)	3.64	(ha)	402088 00 (88.52)	13 98	(ha)	439650.00 (86.77)	15 15	(ha)
2	Implements and machineries									
	a) Farm implements	12570.00 (10.45)			15640 (3.43)			16680.00 (3.30)		
	b) Pumpset	2000.00 (1.66)	0 16	(number)	6285.70 (1.38)	0 52	(number)	10000.00 (11.97)	0 83	(number)
3	Wells	11333.30 (9.42)	0 56	(number)	14761.90 (3.24)	0 73	(number)	20000.00 (3.94)	1.00	(number)
4	Farm house and cattle shed	4220.00 (3.52)	0 70	(number)	7596.84 (1.67)	1.26	(number)	10356.19 (2.05)	1.72	(number)
5	Live stock	3800.00 (3.00)	0 90	(pair)	8000.00 (1.76)	2.00	(pair)	10000.00 (1.97)	2 50	(pair)
	Total	120223.30 (100.00)			455084 40 (100 00)			506685.90 (100.00)		

Note . Figures in parentheses indicate percentage to total

Ratio	Small orchards	Medium orchards	Large orchards
1. Tota returns to Capital	0.83	0.45	0.82
2. Total cost to Capital	0.38	0.54	0.45
3. Live stock to Non live stock	0.03	0.02	0.02

The ratio of total returns to capital is high in small orchards and large orchards (0.83 and 0.82) and low in medium orchards (0.45). The ratio of total cost to total capital is high in medium orchards (0.52) followed by large orchards (0.45) and small orchards (0.38). The ratio of live stock captial to Non live stock capital is same for both medium and large orchards and it is high in small orchards (0.03).

4.1.3 Cropping pattern of selected farms

The area under different crops in the selected sample farmers are given in table 4.4. The gross cropped area was 4.43 hectares in small, 20.29 hectares in medium and 21.35 hectares in large farmers.

In all categories, food grains occupied a major proportion of area put under cultivation. They formed 61.15, 58.00 and 57.47 per cent of gross cropped area (i.e. 2.37, 11.76 and 12.27 hectares) in small, medium and large farmers.

Table 4.4 Cropping pattern of sample farmers

(in ha)

Sl. No.	Crops	Farmers		
		Small	Medium	Large
1.	Fruit crops			
	a) Mango	0.59	1.43	3.14
		(13.30)	(7.04)	(14.70)
	b) Guava	0.11	0.18	0.25
		(2.50)	(0.88)	(1.16)
	Subtotal	0.70	1.61	3.39
		(15.80)	(7.93)	(15.86)
2.	Commercial crops			
	a) Chilli	0.45	2.13	1.34
		(10.15)	(10.49)	(6.27)
	b) Cotton	0.25	2.53	1.92
		(5.64)	(12.46)	(9.00)
	c) Groundnut	0.10	1.60	1.53
		(2.39)	(7.88)	(7.16)
	Subtotal	0.80	6.26	4.79
		(18.06)	(30.83)	(22.43)
3.	Vegetables	0.22	0.71	0.92
		(4.96)	(3.48)	(4.30)
4.	Food grains			
	a) Jowar	0.70	2.42	1.99
		(15.80)	(11.92)	(9.32)
	b) Paddy	0.42	1.87	3.23
		(9.48)	(9.21)	(15.14)
	c) Navane	0.12	0.40	0.91
		(2.70)	(1.97)	(4.25)
	d) Wheat	----	0.38	0.58
			(1.87)	(2.71)
	e) Redgram	0.23	0.44	0.89
		(5.19)	(2.16)	(4.16)
	f) Greengram	0.34	2.38	0.93
		(7.67)	(11.72)	(4.35)
	g) Blackgram	0.25	0.53	0.53
		(5.64)	(2.60)	(2.48)
	h) Bengalgram	0.28	1.90	1.36
		(6.37)	(9.36)	(6.36)
	i) Horsegram	0.37	1.50	1.85
		(8.35)	(7.36)	(8.65)
	Subtotal	2.37	11.76	12.27
		(61.15)	(58.00)	(57.47)
	Gross cropped area	4.43	20.30	21.35
		(100.00)	(100.00)	(100.00)

Note : Figures in parentheses indicate percentage to gross cropped area

Share of commercial crops in the total area were 18.18 per cent (0.8 hectares) in small, 30.83 per cent (6.26 hectares) in medium and 22.42 per cent (4.79 hectares) in large farmers.

Mango occupied a larger proportion in small and large farms (13.30 and 14.70 per cent respectively) and relatively smaller proportion in medium farmers with only 7.04 per cent of gross cropped area.

4.2 Cost of establishment of mango orchards

4.2.1 Investment costs for four years

The establishment of mango orchards needs four years. The establishment costs in mango orchards are classified in to investment cost and maintenance cost. The investment cost includes the cost on rental value of leased land, sprayer charges, cost on planting material, cost on digging of pits and cost on staking material. The maintenance cost includes cost on labour for various operations, material costs and cost incurred to raise the inter crops during gestation period.

The result of the analysis of cost of establishment in different size groups are presented in table 4.5. The investment costs were considered for the beginning of the establishment, while the maintenance costs were for the four year period up to the bearing stage.

Tabel 4.5 Cost of establishment of Mango orchards

(Rs. per ha)

Sl. No.	Particulars	Orchards		
		Small	Medium	Large
A.	Investment costs			
1.	Rental value of leased in land (for four years)	12000.00 (21.66)	14000.00 (26.46)	16000.00 (32.36)
2.	Sprayer	882.50 (1.60)	812.40 (1.53)	785.80 (1.59)
3.	Plant material	3360.00 (6.06)	3000.00 (5.67)	2640.00 (5.33)
4.	Cost on digging of pits and filling with FYM	675.00 (1.22)	600.00 (1.13)	525.00 (1.06)
5.	Fencing	1729.50 (3.12)	1729.50 (3.26)	1729.50 (3.50)
6.	Planting	165.21 (0.30)	158.36 (0.30)	152.78 (0.30)
7.	Staking material	549.86 (1.00)	489.92 (0.92)	404.46 (0.81)
		19362.04 (34.95)	20789.18 (39.30)	22331.74 (45.17)
B.	Maintenance cost			
	I Year	8640.00 (15.30)	7581.57 (147.33)	6449.45 (13.04)
	II Year	8824.82 (15.60)	7794.65 (14.73)	6453.66 (13.05)
	III Year	9049.45 (15.95)	8095.80 (15.30)	6964.92 (14.08)
	IV Year	9517.24 (16.33)	8368.82 (16.33)	7237.93 (14.63)
	Subtotal (I + II + III + IV)	36032.11 (65.04)	324110.80 (58.01)	27105.96 (54.82)
	Total cost of establishment	55394.15	52999.02	49443.70
	(A + B)	100.00	100.00	100.00

Figures in the parentheses indicate the percentage to the total cost of establishement

The per hectare total cost of establishment was Rs.53,675.85 in small, Rs.52,999.62 in medium and Rs.49,342.7 in large orchards.

It can be observed from table 4.5 that the share of investment cost in the total establishment cost was Rs.19,362.04 (36.07 per cent)in small, Rs.20,889.18 (39.4 per cent) in medium and Rs.22,338.74. (45.17 per cent) in large orchares.

The rental value of land accounted for Rs.12,000 (22.35 per cent) in small followed by Rs.14,000 (25.45 per cent) in medium and Rs.16,000 (32.43 per cent) in large orchards. The next major item contributing to the investment cost was the expenditure on plant material accounted for 6.25, 5.45 and 5.35 per cent in small, medium and large orchards respectively. The other items of costs were fencing, cost on digging of pits and filling with FYM, staking material and planting all together formed 5.80, 5.39 and 5.67 per oent in small, medium and large orchards respectively.

The maintenance costs which are considered for the gestation period increased from Rs.8,640.6 per hectare (15.30 per cent) to Rs.9,517.24 (16.33 per cent) in the fourth year in small orchards. Thus total maintenance cost up to bearing stage amounted to Rs.56,032.11 in small orchards accounting for 65.04 per cent of total establishment cost.

In medium orchards, the maintenance cost was lower than small orchards and costs increased from Rs.7,581.57 per hectare (13.78 per cent) during first year to Rs.8,638.82 (15.70 per cent) in the fourth year. Total maintenance cost upto bearing stage in medium orchards amounted to Rs.32,110.84 forming 58.38 per cent of total establishment cost.

For the large orchards, the maintenance costs per hectare during first year were still lower than small and medium orchards. They increased from Rs.6,449.45 (13.07 per cent) during first year to Rs.7,237.93 (14.66 percent) during fourth year. Thus total maintenance cost amounted to Rs.49,342.7 (54.93 per cent of establishment cost) per hectare.

4.2.2 Details of maintenance cost during gestation period of mango orchard

The maintenance costs are divided into material costs, labour costs and cost of inter crops. Material cost comprises of cost on farm yard manure and cost on plant protection chemicals. Labour costs consist of cost on labour for mango as well as inter crops, which are common for both the crops. The common operations are ploughing, harrowing, weeding, manuring and spraying of plant protection chemicals. But irrigation was not common for both the crops and hence the labour cost on irrigation are not common for both the crops. The labour cost on irrigation for mango were classified into

two categories, namely, farmers with well, farmers without well and farmers with pumpset.

Details of physical requirements and total maintenance costs during gestation period are presented in table 4.6a and 4.6b.

Small orchards

The total maintenance cost during four years upto bearing stage amounted to Rs. 36,032.39,of which the share of material cost was Rs.3,912.71(10.86 per cent) and that of labour was Rs.25,224 (69.48 per cent) and share of inter crops formed Rs.7,063.97 (19.66 per cent) of total maintenance cost.

The major items of labour costs were irrigation Rs.11,361.45, ploughing Rs4,160.0 weeding Rs.3,226.61, earthing up Rs.1,937.55 and harrowing Rs.2,472.0 forming (31.55, 11.55, 9.40, 4.77 and 6.86 per cent) of total maintenance cost. The other items accounted for Rs.2,087.80 (5.89 per cent of total costs) to the maintenance cost.

The cost on labour for irrigation of orchards with well was Rs.8,594.72 and that of orchards with and without well were Rs.14,130.00 respectively.

Medium orchards

The per hectare total maintenance cost in medium orchards during gestation period amounted to Rs.32,110.84 which

Table 4.6a Labour and material input required for maintanance of mango orchards during gestation period (per hactare)

Sl. No.	Particulalrs	Units	Orchards		
			Small	Medium	Large
I.	Farm yard manure	Cart loads	33.15	37.83	32.11
II.	Labour inputs				
a)	Ploughing	Bullock days	41.60	36.22	31.45
b)	Horrowing	Bullock days	24.72	22.00	12.13
c)	Total mandays required for various operations	Mandays	735.75	610.7	504.25

Table 4.6b : Maintenance cost of mango orchards during gestation period (for four years)

(Rs. per ha)

Sl. No.	Particulars	Orchards Small	Medium	Large
I	Material cost			
	a) FYM	2320.67 (6.44)	2647.89 (8.24)	2247.90 (8.30)
	b) PPC	1592.04 (4.42)	1849.08 (5.75)	1612.97 (5.96)
	Subtotal	3912.71 (10.86)	4496.97 (14.00)	3860.87 (14.24)
II	Labour input costs			
	a) Ploughing	4160.00 (11.55)	3622.00 (11.28)	3145.52 (11.60)
	b) Horrowing	2472.00 (6.86)	2200.02 (6.85)	1212.20 (4.47)
	c) Weeding	3226.61 (8.96)	2835.55 (8.83)	2226.66 (8.21)
	d) Manuring	776.20 (2.15)	986.54 (3.07)	792.25 (2.94)
	e) Spraying of PPc	656.60 (1.82)	868.88 (2.70)	784.92 (2.90)
	f) Irrigation			
	i) Farmers with wells	9087.14	8250.20	8360.00
	ii) Farmers without wells	13634.86	8993.20	——
	iii) Farmers with pumps	——	6759.16	6320.00
	Average	11361.00 (31.55)	8001.96 (24.92)	7340.00 (27.07)
	g) Earthing up	1718.30 (4.71)	1981.30 (6.17)	1642.51 (5.40)
	h) Removal of inflorscence	655.00 (1.82)	592.70 (1.84)	468.00 (1.72)
III	Cost of intercrops	7063.97 (19.60)	6524.59 (20.26)	5813.03 (21.45)
	Total cost	36032.11 (100.00)	32110.84 (100.00)	27105.96 (100.00)

Note : Figures in parentheses indicate per centage to total manitenance cost

is slightly less than small orchards.

The share of material cost was Rs.4,496.97 (13.99 per cent) of total maintenance cost, labour cost formed Rs. 19,396.54 (64.56 per cent) and cost towards inter crops accounted for Rs.6,524.59 (20.26 per cent).

The major items of labour cost were irrigation Rs.8,001.96, ploughing Rs.3,622.00, weeding Rs.2,835.88, harrowing Rs.2,200.0 and earthing up Rs.1,981.3, constituted (24.92, 11.28, 8.83, 6.85 and 6.17 per cent) of total maintenance cost respectively. The rest of the items contributed Rs2,448.22 (7.61 per cent) to the total maintenance cost.

Unlike small orchards, the cost on labour for irrigation have got three classes. orchards with pumpset spent Rs.6,759.16, those without pumpset spent Rs.8,250.2 and orchards without well spent Rs.8,993.20.

Large orchards

The total maintenance cost of large orchards amounted to Rs.27,105.96 which is less than small and medium orchards. The share of material cost was Rs.3860.87(13.96 per cent), Labour cost was 57.17 per cent and that of inter crops formed 21.45 per cent of total maintenance cost.

Among the labour costs the major items were irrigation Rs.7,340.00, ploughing Rs.3,145.2 weeding, Rs.2,226.00 and earthing up Rs.1,462.51 constituting (27.067, 11.60, 8.21 and 5.40 per cent respectively). Rest of the operations constituted Rs.3,255.42 (12.01 per cent)of total maintenance cost.

Among the labour cost for irrigation, there were two categories of orchards. The orchards with pumpset incurred Rs.6320.00 per hectare, where as orchards without pumpset spent Rs.8360.00 towards labour cost for irrigation.

4.2.3 Cost and returns of inter crops

Farmers in the study area took up inter crops in mango orchards. During first year generally chilli, cotton and redgram were grown and in the 2nd year paddy and pulse crops were taken up. In the third and fourth year pulse and jowar were grown.

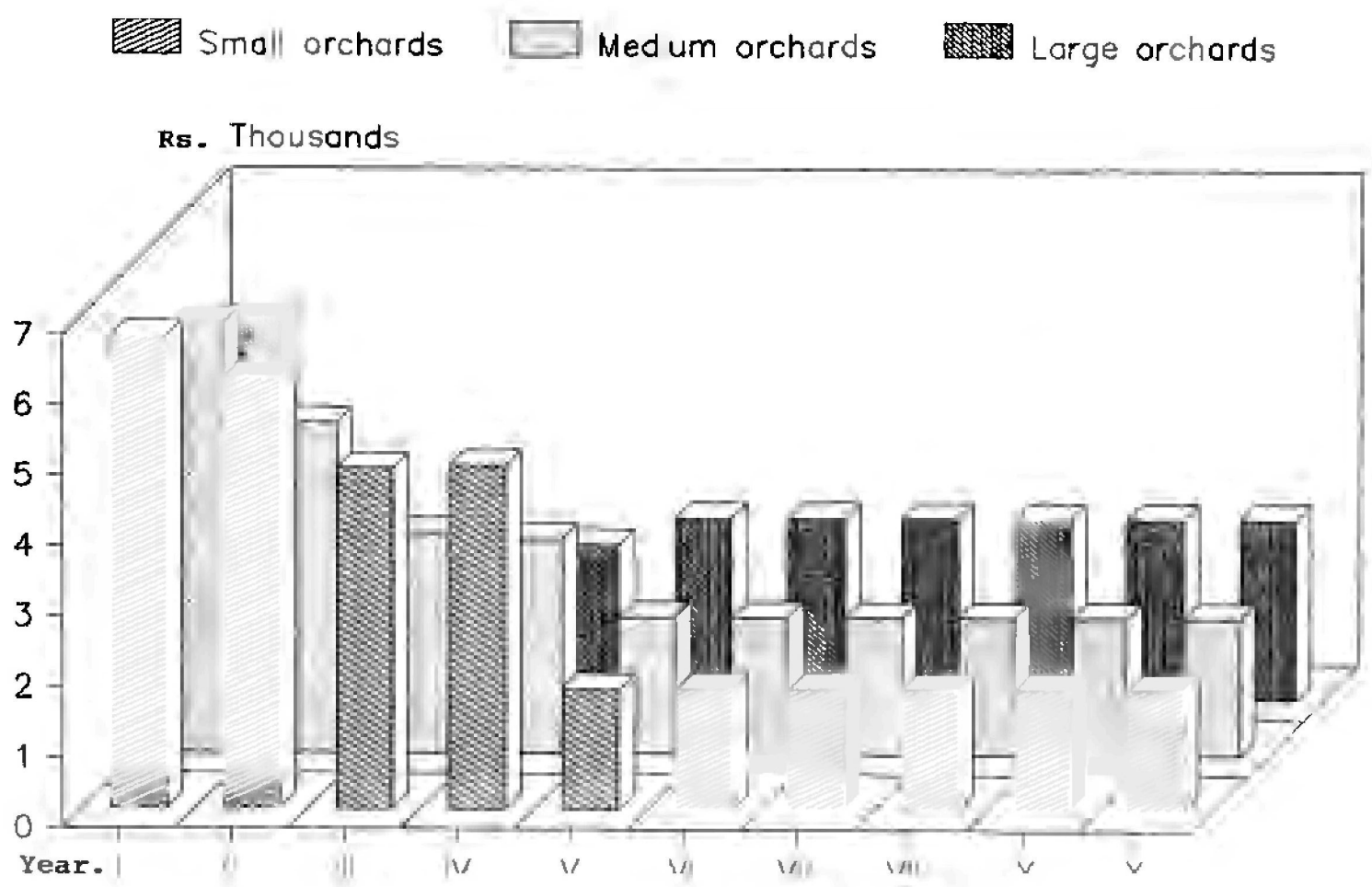
The cost and returns of inter crops are presented in table 4.7. The total cost incurred by small orchards during four years was Rs.7,065.02 per hectare and gross returns were Rs.29,245.39 per hectare for four years. Hence cumulative net returns realised were Rs.22,180.37 per hectare.

Gross returns from inter crops in the medium orchards were Rs.23,484.18. The cost incurred was Rs.6,524.56 and net returns amounted to Rs.16,959.62 per hectare for four years.

Table 4.7 : Costs and returns of Inter crops

(Rs per hectare)

Year	Crops grown	Total costs	Gross returns	Net returns
Establishment period				
Small orchards				
I	Chilli	2095.60	8822.40	6726.80
II	Paddy and Horse gram	1865.08	7989.00	6123.00
III	Green gram and jowar	1682.94	6525.69	4843.25
IV	Black gram and Jowar	1421.40	5908.30	4886.90
Total		7065.02	29245.39	22579.95
Maintenance period				
V-X	Horse gram	1376.90	3084.93	1708.03
Establishment period				
Medium orchards				
I	Cotton	1878.36	7983.70	6105.34
II	Black gram and Jowar	1724.89	6410.39	4685.50
III	Black gram and Jowar	1522.89	4649.69	3126.60
IV	Black gram and Jowar	1396.45	4440.60	3042.15
Total		6524.59	23484.38	16959.59
Maintenance period				
V-X	Horse gram	1352.80	3284.60	1931.80
Establishment period				
Large orchards				
I	Cotton	1642.64	7010.14	5367.50
II	Red gram	1501.86	4628.60	3180.74
III	Horse gram	1439.50	3959.50	2520.70
IV	Jowar	1228.63	3912.34	21683.71
Total		5812.57	19510.58	13752.65
Maintenance period				
V-X	Horse gram	1248.92	3796.90	2547.98


Small orchards
Medium orchards
Large orchards
Rs. Thousands
7
6
5
4
3
2
1
0
Year.

In large orchards total cost incurred for inter crope was Rs 5,812.63 per hectare, gross returns obtained ware Rs 19,510.58 and cumulative net returns were found to be Rs 13,697.95

Total costs gross returns and net returns were found to be high in small orchards followed by medium and large orchards over the year, the cost and returns decreased and it is true with all the size of orchards

4.3.1 Maintenance cost during bearing period in mango orchards of different size groups (5^{th} to 10^{th} year)

The cost incurred in cultivation of mango per hectare in d erent size groups are presented in table 4 8

The maintenance cost was divided in to variable costs cost towards inter crops and fixed cost The variable costs included the cost of farm yard manura cost on plant protection chemicals and the labour costs for various operations in the mango orchards cost of inter crops included cost of seeds sowing and Harvesting Fixed cost included the rental value of leased land and apportioned establishment cost

Among the variable costs, labour costs contributed a major share in all the size groups of orchards They amounted to Rs 6 186 16 per hectare (64.26 par cent) in small

Table 4.8 Maintenance cost during bearing period in mango orchards of different size groups (from 5th to 10th years)

(Rs./ha)

Sl. No.	Particulars	Orchards		
		Small	Medium	Large
A.	Variable costs			
I	Material costs			
	a) FYM	1257.60	1375.44	1620.83
		(13.06)	(15.24)	(19.47)
	b) PPC	806.70	739.47	679.65
		(8.38)	(8.20)	(8.37)
II	Labour input costs			
	a) Ploughing	661.33	492.05	432.12
		(6.87)	(5.45)	(5.32)
	b) Harrowing	320.78	333.30	206.60
		(3.33)	(3.70)	(2.54)
	c) Weeding	783.87	708.36	627.67
		(8.14)	(7.85)	(7.73)
	d) Manuring	389.70	482.29	340.69
		(4.05)	(5.34)	(4.20)
	e) Sparing of PPC	322.60	404.59	389.47
		(3.35)	(4.48)	(4.80)
	f) Irrigation	2289.82	1679.70	1340.64
		(23.80)	(18.61)	(16.52)
	g) Earthing up	882.36	979.60	789.40
		(9.16)	(10.85)	(9.72)
	h) Picking of fruit	175.00	150.00	137.50
		(1.82)	(1.66)	(1.70)
	i) Watch and ward	360.00	327.80	302.64
		(3.74)	(3.63)	(3.73)
	j) Cost of intercrops	1376.90	1352.80	1248.92
		(14.30)	(14.99)	(15.39)
	Total variable costs(A)	9628.66	9025.40	8116.17
		(100.00)	(100.00)	(100.00)
B	Fixed costs			
	i) Land rent	2400.00	3000.00	3600.00
	ii) Apportioned establishment cost	894.95	883.32	822.30
	Total (A + B)	12921.61	12908.72	12538.17

Note : Figures in parentheses indicate percentage to the total variable cost

Rs 5,557.69 (61.57 per cent) in medium and Rs 4,586.74 (56.26 per cant) in large orchards

The results indicated that tha operations like irrigation earthing up and weeding contributed more to variable costs among the labour items. They amounted to Rs 3,956.05 (41.09 per cent), Rs 3,367.66 (37.31 per cent) and Rs 2,757.72 (34.00 per cent) in small,medium and large orchards respectively

In small orchards,the other items of labour costs included ploughing and harrowing from 5^{th} to 10^{th} year Cost on ploughing amounted Rs 661 33 (6.87 per cent) and Harrowing Rs 320.78 (3.33 per cent) Manuring, spraying of chemicals and watch and ward contributed Rs 369.70 (4.05 per cent) Rs 322.60 (3.35 per cent) and Rs 360.00 (3.74 per cent) to the variable costs respectively

The other main items of variable costs were cost towards inter crops and material costs The annual average cost of inter crops amounted Rs 1 376.90 (14.30 per cent) and that of material cost amounted to Rs 2,064.30 (21 4 per cent of total variable costs). Among fixed costs land rent accounted for Rs 2,400.00 per hectare per year and apportioned establishment cost amounted to Rs 894.95

In medium orchards,maintenance cost is little lower than small orchards Material cost was Rs 2,114.91 (23.43 per

cent), of which expenditure on FYM was Rs.1,375.44 (15.24 per cent) and Rs.739.47 for plant protection chemicals (8.2 per cent).

Out of labour costs, operations like irrigation, earthing up and weeding contributed more to labour cost. The cost was Rs.1,679.70 per hectare (18.61 per cent) for irrigation, Rs.979.60 (10.85 per cent) for earthing up and Rs.708.36 (7.85 per cent) for weeding. The other items of labour costs due to inter crops were ploughing and harrowing both together amounted to Rs.825.35 (9.14 per cent). The items like manuring spraying of plant protection chemicals, watch and ward and picking of fruits contributed Rs.482.29 (5.34 per cent), Rs.404.59 (5.34 per cent), Rs.327.80 (3.63 per cent) and Rs.150.00 (1.66 per cent) to total variable costs in that order. The cost towards inter crops formed 14.99 per cent (Rs.1,352.8) of total variable costs.

Table 4.8 also indicates the maintenance cost of large orchards during bearing period. The total variable oost was less than that in small and medium orchards.

The share of labour cost was 56.27 per cent (Rs.44,566.96), share of inter crops was Rs.2,300.51 (28.34 per cent).

Out of the labour costs, the amount spent on irrigation was Rs.1,340.65 (16.52 per cent), earthing up

Rs.789.40 (9.72 per cent), weeding Rs.627.67 (7.73 per cent) and spraying of PPC 389.47 (4.80 per cent) of total variable costs. The expenditure on other operations like manuring watch and ward and picking of fruits amounted to Rs.340.69 (4.20 per cent), Rs.302.64 (3.73 per cent) and Rs.137.5 (1.70 per cent) respectively.

The expenditure on fixed cost was Rs.4,422.30 of which land rent accounted for Rs.3,600.00 and that of apportioned establishment cost was Rs.822.30.

4.3.2 Maintenance cost during bearing period of different size groups of mango growers (from 11th to 20th years)

Cost of maintenance of mango orchards during bearing period (from 10 to 20 years) is presented in table 4. Items of variable costs as well as fixed costs are same as given in maintenance cost during 5^{th} to 10^{th} years. (Table 4.9). It can be seen that the variable costs were high in medium orchards accounting for Rs.6,859.58 followed by large and small orchards where in variable costs amounted Rs.6,625.60 and 5,840.91 respectively.

In small orchards, material costs constituted sizable proportion of variable costs (39 per cent).

Among labour costs, earthing up and weeding formed 15.80 and 15.47 per cent of (Rs.923.36 and 903.65) of total

Table 4.9 Maintenance cost during bearing period (from 11th to 20th year)

(Rs./ha)

Sl. No.	Particulars	Orchards		
		Small	Medium	Large
I	Material cost			
	a) FYM	1323.42	1441.05	1630.80
		(22.65)	(21.01)	(24.60)
	b) PPC	950.98	1028.00	1128.60
		(16.27)	(15.00)	(17.03)
	Subtotal	2274.40	2469.05	2759.40
		(38.94)	(36.01)	(31.63)
II	Labours input costs			
	a) Weeding	903.65	840.45	760.60
		(15.47)	(12.25)	(11.47)
	b) Manuring	546.38	598.30	425.00
		(9.35)	(8.70)	(6.41)
	c) Spraying of PPC	383.12	402.18	325.15
		(6.26)	(5.90)	(5.00)
	d) Earthing up	923.36	979.60	710.00
		(15.80)	(14.28)	(10.70)
	e) Irrgation	----	812.00	910.00
		----	(11.83)	(13.70)
	f) Watch and ward	360.00	360.00	360.00
		(6.16)	(5.24)	(5.43)
	g) Picking of fruits	450.00	400.00	375.00
		(7.70)	(5.83)	(5.66)
	Total variable costs	5840.91	6859.58	6625.60
		(100.00)	(100.00)	(100.00)
	Fixed costs			
	i) Land rent	2400.00	3000.00	3600.00
	i) Apportioned establishment cost	894.95	883.32	822.30
	Grand total	9135.86	107742.10	11047.90

Note : Figures in parentheses indicate percentage to the total variable cost

variable costs. The other operations such as manuring, picking of fruits and watch and ward formed 9.35,7.7,6.55 and 6.16 per cent (Rs.546.38, 450,383.12 and 360) of total variable cost respectively. During this period there was an absence of irrigation in small orchards.

In medium orchards material cost formed 36.01 per cent (Rs.2,469.05) of total variable costs. Labour costs formed the lion's share accounting for 63.95 per cent (Rs.4,386.70) of the labour costs, earthing up accounted for 14 28 per cent (Rs.979.60), weeding 12.25 per cent (Rs.840.45), irrigation 11.83 per cent (Rs812.00) and manuring 8.70 per cent (Rs.596.30) of total variable costs. Other operations such as spraying of Plant Protection Chemicals, picking of fruits and watch and ward formed 5.86, 5.83 and 5.24 per cent (Rs.402.18, 400.00 and 360.00) of total variable costs respectively.

In large orchards also labour cost was the main item of maintenance cost. They formed 58.04 per cent (Rs.3845.49). Material cost shared 41.64 per cent (Rs.2758.6) of total variable costs, labour cost on irrigation formed important item and shared 13.74 per cent, (Rs.910.00) followed by weeding 11.47 per cent, (Rs.760.60) earthing up 10.70 per cent, (Rs.710.00) manuring 6.41 per cent, (Rs.425.00) picking of fruits 5.66 per cent (Rs.375.00), watch and ward 5.43 per cent (Rs.360) and spraying of chemicals 4.90 per cent (Rs.325.15) of variable costs.

4.3.3 Labour utilization pattern in mango orchards during bearing period (From 5th to 10th year)

The operation wise labour utilization pattern in mango cultivation during bearing period is presented in Table 4.10. The table revealed that in small orchards the total labour used per hectare were 208.13 and total bullock days used were 9.81. Of the total labours utilized, irrigation formed 91.6 man days (44.01 per cent) followed by earthing up 35.30 man days (16.96 per cent) and weeding 31.35 man days (15.06 per cent).

The other operations like manuring, spraying of PPC and watch and ward accounted for 15.58, 12.9 and 14.4 mandays (7.49, 6.2 and 6.92 per cent) respectively. The other operation viz., picking of fruits accounted just 3.36 per cent (7.00 mandays) of total labour utilized.

In medium orchards as indicated in table 4.10, the total mandays used were 189.28 and bullock pairs used were 8.25. Here also operations like irrigation, earthing up and weeding received lion's share. Irrigation formed 67.18 man days (35.5 per cent), earthing up 39.18 man days (20.70 per cent) . and weeding formed 28.33 man days (14.96 per cent) of total labour used. The other operations such as manuring, spraying of Plant Protection Chemicals, watch and ward and picking of fruits accounted together for 54.77 mandays (28.94 per cent).

Table 4.10 Labour utilization pattern during bearing period

(per hectare)

Sl. No.	Operations	5 - 10 year			11th - 20th year			Beyond 20 year		
		Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
1.	Ploughing **	6.61	4.92	4.32	----	----	----	----	----	----
2.	Horrowing **	3.20	3.33	2.06	----	----	----	----	----	----
3.	Weeding *	31.35	28.33	25.10	36.10	33.61	30.40	16.50	14.40	12.80
4.	Manuring *	15.58	19.30	13.62	21.85	23.85	19.00	24.60	27.30	22.00
5.	Sparing of PPC *	12.90	16.18	15.57	15.32	19.28	16.60	9.60	8.15	7.80
6.	Earthing up *	35.30	39.18	31.57	36.93	39.18	31.57	----	----	----
7.	Irrigation *	91.60	67.18	53.62	----	32.48	40.40	----	----	----
8.	Watch and ward *	14.40	13.11	12.10	14.40	14.40	14.40	14.40	14.40	14.40
9.	Picking of fruit *	7.00	6.00	5.50	18.00	16.00	15.00	22.50	20.50	19.00
	Total	208.13	189.28	157.08	126.00	178.00	167.37	80.10	84.75	76.00

** Unit :- Bullock day per hectare

* Unit :- Man days per hectare.

The total labour utilized per hectare of large orchards (as presented in Table 4.10) were lower than small and medium orchards. Totally 157.08 man days and 6.38 bullock days per hectare were used. Irrigation, earthing up and weeding accounted major share and their contribution was i.e. 53.62, 31.57 and 25.10 man days (34.13, 20.10 and 15.98 per cent) of total labour utilized. The other operations contributed 46.80 man days (29.75 per cent) of total labour utilized.

4.3.4 *Labour utilization pattern during bearing period (From 11th to 20th year)*

The total labour utilized for mango cultivation (from 11^{th} to 20^{th} year) consisted of labour operations such as weeding, manuring spraying of Plant Protection Chemicals, earthing up, irrigation, watch and ward and picking of fruits.

As presented in Table 4.10 Total labour requirement of mango orchard (from 11^{th} to 20^{th} year) was high in medium orchards than in large and small orchards.

In small orchards the total labour utilized per hectare were lower (142.64 man days) than in medium (159.18) and large (131.43) orchards due to absence of pot watering involving human labour. Contribution of operations such as earthing up and weeding were high and formed 36.93 man days (25.00 per cent) and 36.14 man days (25.33 per cent) of total

labour required respectively. The operations like manuring and picking of fruits contributed 21.85 and 18.00 man days (15.32 and 12.61 per cent) of total labour used. The other operations such as spraying of plant protection chemicals and watch and ward contributed 15.32 and 14.4 man days (10.74 and 10.10 per cent) of total labour utilized per hectare.

In medium orchards total labour utilized per hectare were 159.18 man days. Major share was accounted by irrigation and weeding i.e. they together formed 66.06 man days (41.5 per cent) of total labour utilized. The other major operation like earthingup contributed 39.18 man days (24.61 per cent), remaining share of 53.94 man days (33.89 per cent) was formed by operations like manuring, spraying of plant protection chemicals watch and ward and picking of fruits.

In large orchards total labour utilized was 131.43 man days. The contribution or irrigation was 40.4 man days (30.73 per cent) and other major operation contributing were earthing up 31.57 man days (24.02 per cent), weeding 30.40 man days (23.4 per cent), manuring 14.45 per cent, (19 man days). Next sequential operations such as spraying of plant protection chemicals, watch and ward and picking of fruits together formed 12.38 man days (7.4 per cent).

Labour utilization pattern beyond 20 years

Here there was an absence of operations like earthing up and irrigation. The substantial part of labour were used for manuring and picking of fruits which together required 47.1, 47.8 and 41 man days in small.. medium and large orchards respectively. Spraying of chemicals required 9.60 man days in small, 8.15 man days in medium and 7.80 man days in large orchards. Another important item of operation was weeding which required 16.50, 14.40 and 12.80 man days in small, medium and large orchards respectively.

4.3.5 Yield pattern in mango orchards

Yields of mango during different growth periods of the orchard are presented in Table 4.11. The yield rate in mango varies with the age of the orchard. During the initial period i.e. from 5^{th} to 10^{th} year the average yield per hectare was 26-30 thousand fruits in small, 22.00 thousand fruits in medium and 20.00 thousand fruits in large orchards. The yield maximized from 16^{th} to 20^{th} year and trend continued up to 51^{st} to 55^{th} year where in after this period yield started decreasing. Considering yield per hectare, small orchards got higher yield than medium and large orchards.

However it is interesting to note that, yield per tree was higher in large orchards after 16^{th} year followed by medium and small orchards.

Table 4.11 Yield pattern in mango orchards during different growth periods

('000 fruits)

Year	Small orchards		Medium orchard		Large orchard	
	Yield per hectare	Yield per tree	Yield per hectare	Yield per tree	Yield per hectare	Yield per tree
5 - 10	26.300	0.234	22.000	0.220	20.000	0.227
11 - 15	48.000	0.428	42.000	0.420	39.000	0.443
16 - 20	71.800	0.641	71.420	0.714	67.800	0.770
21 - 25	100.000	0.893	96.000	0.960	90.000	1.022
26 - 30	128.000	1.143	120.000	1.200	118.000	1.340
31 - 35	134.000	1.196	131.500	1.315	127.600	1.450
36 - 40	138.000	1.232	134.600	1.348	133.300	1.515
41 - 45	140.000	1.250	138.200	1.382	136.900	1.555
46 - 50	142.800	1.275	141.900	1.419	140.000	1.590
51 - 55	131.600	1.175	128.400	1.284	127.500	1.471
56 - 60	76.300	0.681	78.300	0.783	79.200	0.900

4.4 Cash Flows and Financial Feasibilities of Investment in Mango Orchards

In this section analysis was made taking into consideration the cash flows during different periods of mango orchards.

4.4.1 Cash flows in mango orchards

The costs incurred and returns obtained in mango orchards are presented in Table 4.12. From the Table it is evident that the costs per hectare in small orchards increased from first year to the fourth year i.e. from Rs.8,640.6 to Rs.9,517.24. From 5^{th} to 10^{th} year the costs were the same i.e. Rs.12,921.61. Where as from 11^{th} to 20^{th} year the costs were lower than the costs of 5^{th} to 10^{th} year. The annual cost from 11^{th} to 20^{th} year was Rs.9,135.86. Again as the age of the orchard increased the costs incurred kept on decreasing. They were Rs.6,754.65 from 21^{st} year to 35^{th} year and Rs.4,807.95 from 36^{th} year untill the end of life span of mango orchard.

The returns on the other hand, decreased from Rs.6,726.80 in the first year to Rs.4,486.90 during fourth year. When the orchards start yielding, the returns were Rs.37,613.60 per hectare during 5^{th} to 10^{th} year and were maximum 46^{th} to 50^{th} year i.e. Rs.1,97,666.67.

Table 4.12 Cash flows of mango in small orchards

(Rs./ha)

Year	Cost	Returns	Net returns	D.F.at 14 %	N P V
0	55394.150				
1	8640.60	6726.80	-1913.80	0.877	-1678.00
2	8824.82	6123.00	-2701.82	0.769	-2077.70
3	9049.45	4843.25	-4205.70	0.674	-2834.64
4	9517.24	4486.90	-5030.34	0.592	-2977.96
5 - 10	12921.61	37631.60	24709.99	2.300	56832.98
11 - 15	9135.86	66400.00	59264.14	0.925	54819.33
16 - 20	9135.86	99323.33	90187.47	0.484	43380.17
21 - 25	6754.65	138333.34	131578.47	0.250	32894.67
26 - 30	6754.65	177066.67	170312.02	0.130	22140.56
31 - 35	6754.65	185366.67	178612.02	0.671	11984.86
36 - 40	4807.95	190900.00	186092.05	0.035	6513.22
41 - 45	4807.95	193666.67	188858.75	0.018	3399.46
46 - 50	4807.95	197540.00	192732.05	0.009	1792.41
51 - 55	4807.95	182046.67	177238.72	0.005	840.11
56 - 60	4807.95	105508.33	100700.38	0.003	254.77

NPV = 169889.69

Consequent to the above mentioned costs and returns the net returns were negative in the first four years. The net returns which were Rs.24,709.99 during fifth year, increased to Rs.1,92,732.05 per hectare during 46th to 50th year. The net returns decreased to Rs.1,05,548.33 per hectare from 50th year.

Table 4.13 indicates the cost and returns in medium orchard. It shows that the cost per hectare in medium orchards increased from Rs.7,581.57 to Rs.8,638.82 per hectare. The cost which were Rs.12,908.72 during 5th year remained the same up to 10th year. From 11th to 20th year, the costs per hectare were Rs.10,786.18. Here also as the age of orchard increased, cost of cultivation decreased. The cost of cultivation per hectare were Rs.7,774.95 during twenty first year to 35th year. They were Rs 5,753.35 per hectare from 36th to 60th year.

The returns on the other hand,decreased from Rs.6,105.34 to Rs.3,042.15 during first four year period, when inter crops were taken. The orchard started yielding a returns of Rs.32,033.3 from 5th year to Rs.1,96,295.00 per hectare during 46th to 50th year. Returns decreased to Rs.1,68,315.00 during 56th to 60th year.

Consequently the net returns per hectare in medium orchards were negative during the first four years. The annual net returns were positive during 5th to 10th year, which were Rs.19,124.68 per hectare annually. The annual net returns

Table 4.13 : Cash flows of mango in medium orchards

(Rs. per ha)

Year	Cost	Returns	Net returns	D.F.at 14 %	N P V
0	52999.82				
1	7581.57	6105.84	-1476.12	0.877	-1294.60
2	7794.65	4685.50	-3109.15	0.769	-2390.33
3	8095.80	3126.60	-4969.20	0.674	-3349.24
4	8638.82	3042.15	-5596.67	0.592	-3313.22
5 - 10	12908.72	32033.30	19124.58	2.300	43986.53
11 - 15	10786.18	58100.00	47313.82	0.925	43765.28
16 - 20	10786.18	98797.66	88011.48	0.481	42333.52
21 - 25	7774.95	132800.00	125025.05	0.250	31256.26
26 - 30	7774.95	166000.00	158225.05	0.130	20569.25
31 - 35	7774.95	181908.33	174133.38	0.067	11684.34
36 - 40	5753.35	186196.67	180443.32	0.035	6315.51
41 - 45	5753.35	191176.67	185423.32	0.018	3337.61
46 - 50	5753.35	196295.00	190541.65	0.009	1772.03
51 - 55	5753.35	177620.00	171866.65	0.005	814.64
56 - 60	5753.35	108315.00	102561.65	0.003	259.48

NPV = 142746.64

Table 4.14 : Cash flows of mango in large orchards

(Rs. per ha)

Year	Cost	Returns	Net returns	D.F.at 14 %	N P V
0	49342.70				
1	6449.45	5367.56	-1081.90	0.877	-948.81
2	6453.66	3180.74	-3272.92	0.769	-2516.87
3	6964.92	2720.70	-4244.22	0.674	-2860.60
4	7237.93	2683.71	-4550.22	0.592	-2696.09
5 - 10	12538.17	29416.66	16878.49	2.300	38820.52
11 - 15	11047.90	53950.00	42902.10	0.925	39684.40
16 - 20	11047.90	93790.00	82742.10	0.431	39798.95
21 - 25	8350.90	124500.00	116149.50	0.250	29037.27
26 - 30	8350.90	163233.33	154882.43	0.130	20134.71
31 - 35	8350.90	1766513.33	169162.43	0.067	11283.69
36 - 40	6335.80	184398.33	178062.53	0.035	6232.18
41 - 45	6335.80	189378.33	183042.53	0.018	3294.76
46 - 50	6335.80	193666.67	187330.87	0.009	1742.17
51 - 55	6335.80	176375.00	170039.81	0.005	805.98
56 - 60	6335.80	109560.00	103224.20	0.003	261.15

NPV = 132730.78

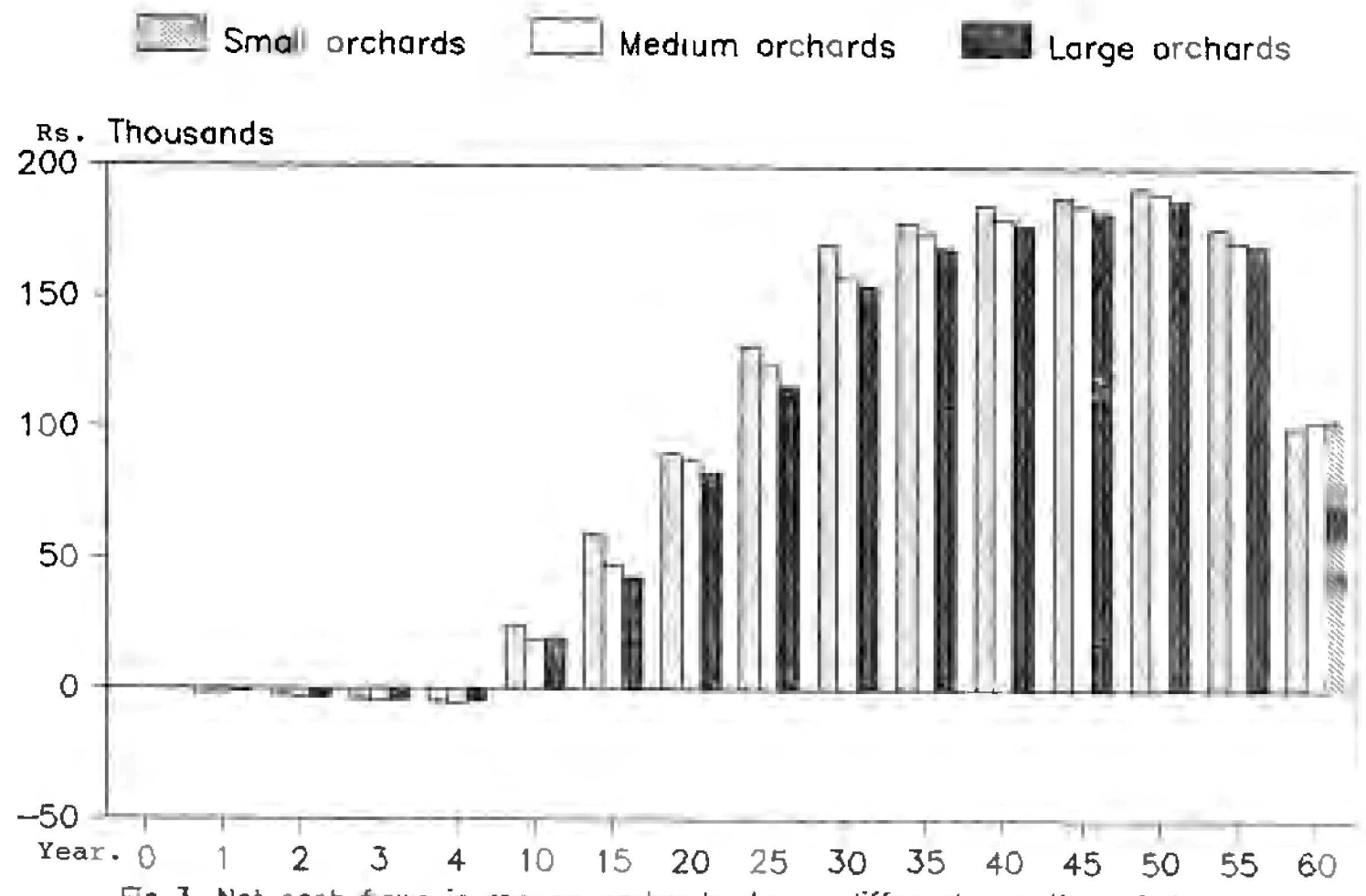


Fig 3 Net cash flows in mango orchards during different growth periods

showed increasing trend up to 46th to 50th year. The net returns during 46th to 50th year were Rs.1,90,541.60 per hectare. It started decreasing from fifty first year. The net returns during 56th to 60th year were Rs.1,02,561.65.

The costs and returns structure of large orchards are presented in Table 4.14. Here the same pattern of costs and returns flow was found as it was in small and medium orchards. The costs per hectare in first year increased from Rs.6,449.45 to Rs.7,237.93 during the fourth year. From 5th to 10th year the costs were Rs.12,538.17 per hectare annually. Here also inverse relationship between age of orchards and cost of cultivation was seen. The costs during 11th to 20th year were Rs.11,047.9 per hectare. From twenty first year to 35th year the costs decreased to Rs.8,350.9 per hectare every year. The costs were same during 36th year to 60th year which were Rs.6,335.8 per hectare.

Returns during first year to fourth year decreased from Rs 5,367.86 to Rs.2683.71. They increased fro m 5th year to 50th year. During 51st to 60th year there was decline in returns.

4.4.2 Evaluation of investment in mango orchards

To evaluate the feasibility of investment in mango orchards, the criteria of Net Present Value, Benefit Cost

Table 4.15 Financial feasibility tests of investment in mango orchards

Sl. No.	Particulars	Orchards		
		Small	Medium	Large
1.	Net Present Value (Rs.) at 14 % discount rate	169889.60	142746.60	132730.70
2.	Benefit - Cost Ratio at 14 % discount rate	4.06	3.69	3.69
3.	Internal Rate of Return (per cent)	26.63	24.69	24.91
4.	Pay Back Period (years)	6.80	7.70	7.56

Ratio, Internal Rate of Returns and Pay Back Period were used. The results are presented in Table 4.15.

The annual cash inflows were discounted at a discount rate of 14 per cent to obtain the present value of net benefits in mango orchards. It is clear from the table that the Net Present Value of net cash inflows per hectare was Rs.1,69,889.68 in small, Rs.1,42,746.46 in medium and 1,32,730.78 in large orchards.

The Pay Back Period (PBP) was 6.8 years in small, 7.70 years in medium and 7.56 years in large orchard. pay back period was the least in small orchards and longer in medium orchards. The Benefit cost ratio was high in small orchards and was the same in medium and large orchards. The BCR was 4.06, 3.69 and 3.69 in small medium and large orchards respectively. The internal rate of returns were high in small orchards (26.63 per cent) followed by large orchards (24.91 per cent) and medium orchards (24.69 per cent).

4.5 Resource use efficiency in mango cultivation

The Cobb-Douglas type of production function was fitted for the data and the results are presented in Table 4.16.

The regression coefficients of manure for small orchards and large orchards (0.66 and 0.88) were found to be

Table 4.16 Estimates of Cobb Douglas production function

Sl. No.	Catergory	Intercept	Land (hectare)	Labour (mandays)	PPC (Rs)	Manure (cartload)	No. of trees (number)	R2
I	Small orchards							
	Geometric mean		0.59	126.3	561.1	14.57	56.66	
	Regression coefficient	0.76	0.231	0.052	-0.0529	0.66***	0.069	0.99
			(0.180)	(0.100)	(0.180)	(0.17)	(0.268)	
II	Medium orchards							
	Geometric mean		1.43	257.26	1489.34	38.19	139.57	
	Regression coefficient	0.143	-0.03	-0.123	0.41	0.305	0.41**	0.72
			(0.691)	(0.225)	(0.803)	(0.233)	(0.172)	
III	Large orchards							
	Geometric mean		3.14	522.28	4160.98	95.26	349.16	
	Regression coefficient	0.08	-0.0735	0.0044	0.983***	0.88***	0.1031	0.98
			(0.167)	(0.221)	(0.198)	(0.106)	(0.200)	

** Significant at 5 %$ level
*** Significant at 1 % level

Note : Figures in parentheses indicate standard error

significant at 1 per cent level and the same for medium orchards (0.305) was non significant. Regression coefficient for plant protection chemicals was non significant in small and medium orchards (-0.0529 and 0.41) but was significant in large orchards (0.983) at 1 per cent level. Number of trees were significant at 5 per cent level in medium orchards (0.41), where as it was non significant in small and large orchards (0.069 and 0.1031). The regression coefficient for land small orchards (0.231) was non significant. Where as regression coefficient for land of medium (-0.030), large (-0.075) orchards was -ve and non significant (-0.030 and -0.075).

4.6 Marketing of mango

In this section marketing chanels were identified and marketing cost, price spread and margins were worked out.

4.6.1 Marketing channel

In this study it was possible to study four marketing channels.

Channel I Producer-->commission agent-->Retailers-->consumer

Channel II Producer-->Preharvest contractor cum whole salers-->
-->Retailers-->Consumer

Channel III Producer-->Processing unit-->Agents at district level
-->Retailers-->Consumer

Channel IV Producer-->commission agent preharvest contractors
cum whole salers-->Distant places.

In the first channel producer himself brought the produce to district market and sold through commission agents. Commission agent acts as a mediator between producer seller and retailers. For the service he rendered he charged 8 per cent commission of total value of produce marketed. Of the 90 producers 34 of them marketed through this channel (i.e., 11 small, 16 medium and 7 large producers).

In the second channel, pre harvest contractors used to enter contract with producer either during flowering or at fruit set stage. The producers in need of money got advance from pre harvest contractor and some times whole amount is paid to producer at the time of contract. The pre harvest contractor then take care of orchards. Each pre harvest contractor has got storage house at district market which are called as 'Adi mane'. As and when produce is harvested he brings it to store at storage house. Thus, these pre harvest contractors performed duties of whole saler also,they intern supplied it to retailer for selling in retail market. Fourty two producers marketed through this channel (13, 21 and 8 small, medium and large producers) were included (Table 4.17).

In III channel, the representative appointed by the processing unit (which is located at Tarihal of Hubli Taluk) negotiates with the producer and reach to an agreement on prices. Here also the payment to the producer is made at the beginning of the contract. The produce as and when harvested is

Table No4. 17 : Preference of marketing channels by different categories of producers

Particulars		I Channel	II Channel	III Channel
Small orchards	No of Farmers	11 (36.66)	13 (43.35)	6 (20.00)
Medium orchards	No.of Farmers	16 (38.09)	21 (50.00)	5 (11.90)
Large orchards	No.of Farmers	7 (38.88)	8 (44.44)	3 (16.66)
Total	No.of Farmers	34 (37.70)	42 (46.66)	14 (15.55)

Figures in Parantheses indicate percentage to total (n=90)

sent to processing unit called Excel Fruits Company Limited. In this processing unit the pulp is prepared and then for the further processing it comes to Nectar Beverages Private Limited located at Dharwad. Through this channel 14 producers marketed their produce (6 small, 5 medium and 3 large producers).

In IV channel, pre harvest contractors also purchase produce from commission agent and send it to distant markets like Kolhapur ,Poona and Davanagere. Such a trade was found when there is a glut in the market. The producers marketed through this channel are included in channel-II.

4.6.2 Price spread in marketing of mango

Mango passes through various intermediaries from producer to consumers. The intermediaries involved rendered variety of services in the process of marketing of mango with a view to earn some profit. The margins of the intermediaries can be taken as an indicator of the efficiency of the marketing system.

4.6.2.1 Channel-I

The marketing cost and margins of the agencies involved in the marketing of mangoes are give in Table 4.18.

Table 4.18. Price spread in marketing of mango in Channel I and II.

Rupees per dozen

	Channel-I		Channel-II	
	Rupees	Percentage	Rupees	Percentage
1. Price recieved by producer	22.42	78.33	16.71	58.40
2. Marketing cost of :				
a) Producer	3.62	12.64	—	—
b) Pre-harvest contractor	—	—	3.39	11.84
3. Profit ofpre-harvest contractor	—	—	4.37	15.26
4. Retailer's purchase price	22.42	78.33	24.47	85.50
5. Cost incurred by retailer	1.85	6.46	1.25	4.36
6. Retailer's sale price (Consumer price)	28.62	100.00	28.62	100.00
7. Profit of retailer	4.35	15.20	2.90	10.13
8. Price spread	6.20	21.66	11.91	41.61
9. Producer's share in consumer rupee	—	78.33	—	58.39

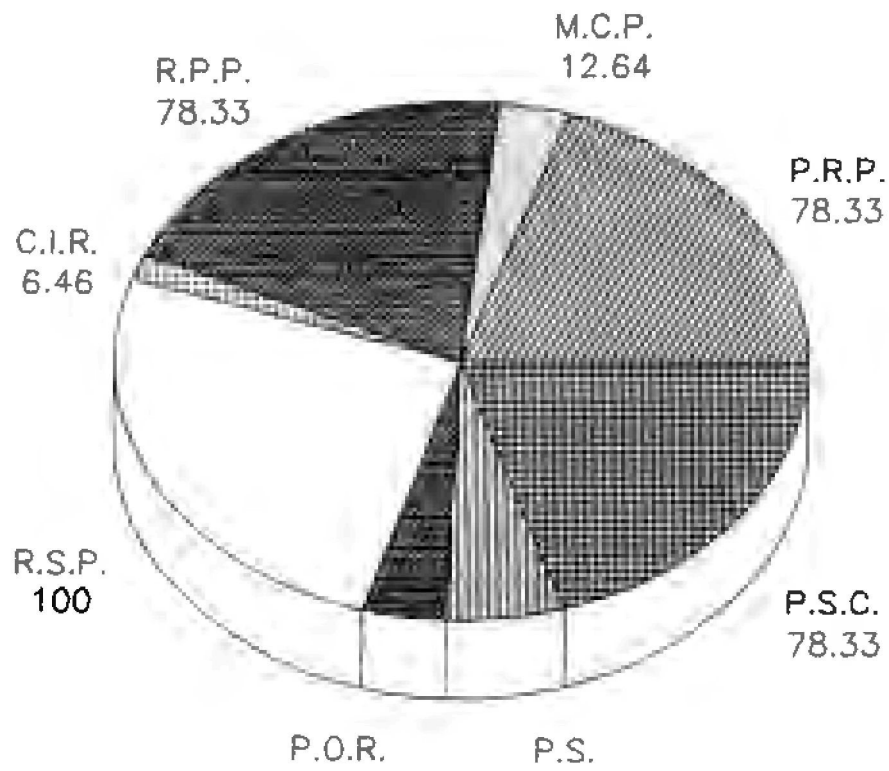


Fig 4. Price spread in marketing of mango in channel-I

PRP- Price recieved by producer

MCP- Marketing cost of producer

RPP- Retailer's purchase price

CIR- Cost incurred by retailer

RSP- Retailer's sale price

POR- Profit of retailer

PS- Price spread.

PSC- Producer's share in consumer rupee.

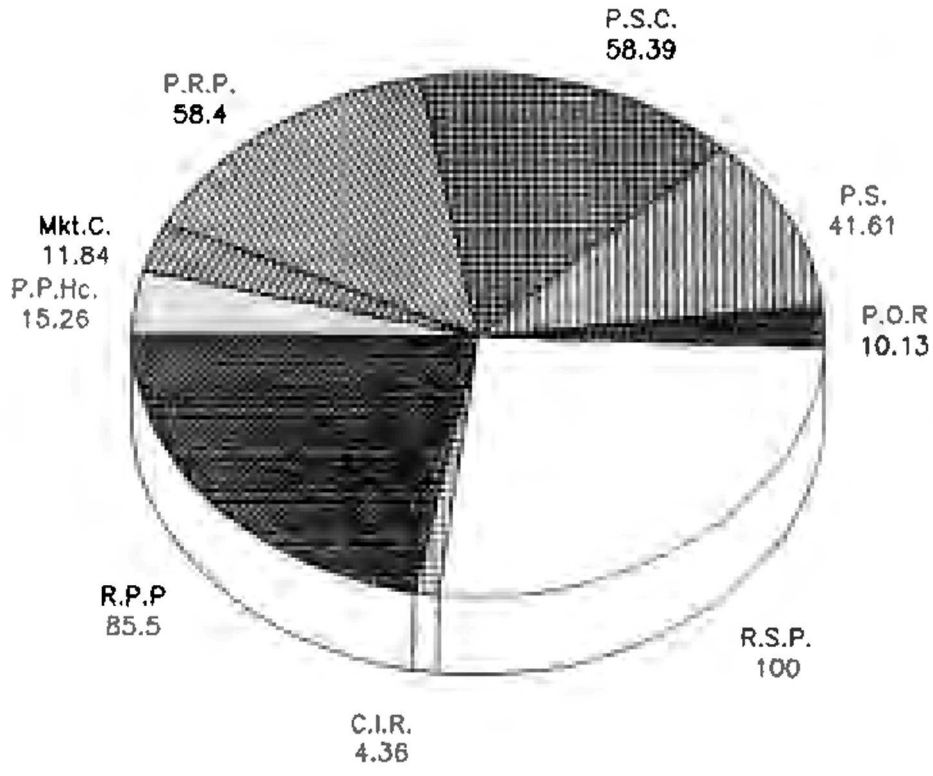


Fig.5 : Price spread in marketing of mango in channel-II

PRP- Producer s purchase price

MKT-C- Marketing cost of pre-harvest contractor

PPHC- Profit of pre-harvest contractor

RPP- Retailer s purchase price

CIR- Cost incurred by retailer

RSP- Retailer s sale price

POR- Profit of retailer

PS- Price spread

PSC- Producer's share in consumer rupee.

The producer's share in consumer rupee in channel-I was 78.32 per cent. The total marketing costs incurred by the various intermediaries and producers accounted for 19.1 per cent of consumer's price. The total marketing cost incurred by intermediaries amounted to Rs.5.46 per dozen. The price spread in first channel was Rs 6.2 per dozen (21.66 per cent) Share of commission agent was only 8 per cent from producer and 4 per cent from retailer which is included in marketing cost of producer seller and marketing cost of retailer. Share of retailer amounted Rs.4.35 (15.20 per cent) per dozen. Though commission agents charge 8 per cent from producer and 4 per cent from retailer it is not explicity mentioned in Table.

4.6.2.2 Channel-II

Channel-II consisted of producer, preharvest contractor cum whole saler and retailer. The price spread in channel-II is given in Table 4.18. It shows that producer's share in consumers rupee is less when compared to channel-I. It formed 58.40 per cent (Rs. 16.71) of consumer's price. The net profit of a retailer was 10.13 per cent (Rs.2.90 per dozen) and profit of pre harvest contractor was Rs.4.37 (15.27 per cent). per dozen. In channel III and IV it was not possible to estimate marketing cost, price spread and marketing margin due to non-availability of necessary data.

4.7 Problems of producer in production and marketing of mango

The problems faced in production and markeing of mango were collected from the farmers with a view to know the constraints involved.

4.7.1 Problems of production

An opinion survey was conducted to know the problems in the production of mango. As indicated in Table 4.19, problem of alternate bearing was expressed by 100 per cent orchardists in all categories, a few of them expressed problem of irregular bearing. Problem of non availability of labour was expressed by most of the medium orchards (66.67 per cent) followed by small orchards (40.00 per cent) and large orchards (33.37 per cent). Over all 51.1 per cent of orchards expressed problem of non availability of labour.

Lack of technical guidance was expressed by 86.70 and 88.10 per cent of small and medium orchards. Where as 44.44 per cent of large orchards expressed problem of lack of technical guidance. Most of the medium and large orchards expressed about malformation of inflorescence (83.3 and 88.89 per cent) and about 46.66 per cent of small orchards expressed problem of mal formation of inflorescence.

Table 4.19 Problem of producer regarding production of mango

Sl No	Particulars	Orchards			
		Small	Medium	Large	Total
1	Alternate bearing of fruits	30 (100.00)	42 (100.00)	18 (100.00)	90 (100.00)
2	Irregular bearings	Nil	Nil	Nil	4 (4.44)
3	Non avalibility of labour	12 (40.00)	28 (66.67)	6 (33.37)	46 (51 10)
4	Lack of technical guidance	26 (86.70)	37 (88.10)	8 (44.44)	71 (78.80)
5	Mal-formation of inflorescence	14 (46.66)	35 (83.30)	16 (88.89)	65 (72.22)

Note Figures in parentheses indicate percentage to total

4.7.2 Problems faced in marketing of mango

Table 4.20 indicates opinion of producer regarding problems faced in marketing of mango. Problem of price fluctuation was expressed by 44.44 per cent of small 36.80 per cent of medium and 50.00 per cent of large orchards out of 34 producer who marketed their produce through commission agent. 37.30 per cent of orchards expressed non availability of packing material.

All farmers in all categories who marketed through commission agents expressed high commission charge and underhand dealing between whole salers and commission agents as their marketing problem.

Table 4.20 Opinion of farmers regarding problems in marketing of mango

Sl. No.	Particulars	Small (n = 34)	Medium (n = 34)	Large (n = 34)
1.	Price fluctuation	40 (44.44)	7 (36.80)	3 (50.00)
2.	Non availibility if packing material	3 (33.33)	6 (31.57)	2 (33.30)
3.	High commission	11 (100.00)	16 (100.00)	7 (100.00)
4.	Exhistance of under hand dealing between whole saler and commission agent	11 (100.00)	16 (100.00)	7 (100.00)

Note : Figures in parentheses indicate percentage to total

V. DISCUSSION

V. DISCUSSION

The results of the study are discussed in this chapter under the following broad heads

5.1 General characteristics of sample mango orchards

5.2 Cost of establishment of mango orchards and costs and returns of inter crops.

5.3 Maintenance cost of mango orchards during bearing period, labour utilization pattern and yield pattern of mango

5.4 Cash flows and financial feasibilities of investment in mango orchards

5.5 Resource use efficiency in mango orchards

5.6 Marketing channel, marketing costs, margin and price spread

5.7 Problems confronting the producer about production and marketing.

5.1 General characteristics of mango orchards

5.1.1 In table 4.1 the general characteristics of mango orchards are presented. Farmers with different size of holding had accepted mango cultivation. The absolute size of mango orchards increased with the size of holding. Conspicuously all the farmers had grown the recommended Alphonso variety. There was a tendency for increase in plant

density in smaller holdings. The average size of holding under mango were 0.59, 1.43 and 3.14 in small, medium and large orchards.

During the survey, it was observed that the farmers were totally convinced about the profitability of growing the recommended Alphonso, primarily because of its commanding ready market. However, there was a general opinion for increasing the plant density as the size of the holding of the respondent decreased. Small farmers opined that more number of plants can be accommodated per unit area, if intensive care can be taken in the cultivation of mango orchards. During the discussion with respondents, the small farmers expressed their preference for fruit crop because of its high value and ready market. It was noticed that large farmers preferred mango because of its perennial nature. This had helped them in the management of labour and other resources. In case of small farmers mango crop was preferred because of its income. They were able to manage the orchard more carefully because of availability of family labour. These observations are also reflected by the density of mango trees. The small farmers preferred to have higher density since, they were able to take intensive care. This aspect need to be considered while developing extension strategy and also in suggesting technology for promoting mango enterprise. Though the practice appears to be against the recommended

plant density there is a need to consider the experience of the farmers and to revise the recommendation to different categories of farmers if found appropriate

5 1.2 Land utilization pattern

The land utilization pattern of sample farmers has shown that the cropping intensity increased with the increase in the size of the holdings As per the crop diversity all the categories of farmers had grown perennial crops-mango and guava, annual and biannual. Between mango and guava there was some difference in the allocation of area While large farmers had allocated larger proportion of area under mango The small farmers had allocated larger proportion of area for guava In both the crops the area allocation was less in medium sizad farmars

5.1.3 Capital assets position of sample farmers

In table 4.3 the asset position of different categories of farmers is provided There was much difference with respect to the asset position among small medium and large farmers It is due to value of asset has increased with the increase in the size of holding The valua of farm implements and machineries also increased with the increase in the size of holding, es farmers with larger holding requirad more number of farm implements and machineries

However, the proportion of farm implements and machineries was high in small farmers due to possession of less proportion of holding under irrigation This phenomenon is also true with all other assets In medium and large farmers, the proportion of irrigated land was high, as a result in larger holding proportion of other assets was obviously low

As indicated in results (4 1.3) the ratio of total returns to total capital was low in medium farmers since the proportion of holding under mango in medium farmers was low (10.23 per cent in medium farmers as against 16.21 and 20.7 per cent in small and large farmers). The ratio of total cost to total capital was high in medium farmers since they spent more on establishment and maintenance during bearing period Live stock to non live stock ratio was high in small farmers Because of small holding the proportion was higher

5.2 Cost of establishment of mango orchards

The mango orchards call for investments on land fencing, planting material and planting staking material and sprayer charges Which together have been grouped as investment cost Investment on all these has to be made during the year of establishment of the orchard During 4 years the farmers have to maintain the orchards by spending money on manures plant protection chemicals spraying,

irrigation, weeding and earthing up. All these items have been grouped as maintenance cost. However, in mango orchards farmers raised inter crops like chilli, cotton, paddy, pulses and jowar for 4 years which also gave returns. These returns from inter crops reduced the maintenance cost of the farmers to a great extent.

During the establishment period of 4 years, farmers have incurred costs to maintain the orchards. The maintenance cost during 4 years of establishment has increased over the period in all categories of orchards. The annual maintenance cost during the gestation period was around 15 per cent in all the categories. The investment cost ranged between Rs.19000 and 22000. The scale of finance for establishment of mango orchard is fixed at Rs.16,500 looking to the investment potentials of farmers, the scale of finance appear to be sufficient.

In table 4.5 details of maintenance costs are presented. This included the cost incurred during the first year of establishment and imputed rental value of land for four years. The investment cost accounted for about 35 per cent of total establishment cost in the case of small orchards, 40 per cent in medium orchards, and 45 per cent in large orchards. The differences among the classes were mainly due to the differences in rental value of land. However, as against the increasing rental value of land, the

costs for other items-sprayer, plant material and digging and filling of pits, planting and staking materials reduced with the increase in the size of orchards, indicating the economies of scale in most of the cost except land. As already indicated the plant density also had contributed for decrease in cost in larger orchards.

Labour cost of small orchards for irrigation was higher (Rs.11361.00) than medium (Rs.8001.96)and large (Rs.7340.00) orchards. It was due to the reason that, farmers in the small orchards carried pot irrigation during four year period of establishment. (in 22 outof 42 irrigation was provided using pumpset, as a result the labour requirement was less. It can be seen from the Table 4.6 that cost on labour for irrigation of medium orchards have got three classes. Where in farmers with pumpset spent Rs. 6759.16 which is less than orchards without pumpset (but who possess well) whose cost was Rs.8280.20 per hectare for four years. Orchards without well spent Rs.8993.2 per hectare for four years which is higher than orchards with wells. It was due to requirement of more labour for pot irrigation. It is also true with large orchards where orchards with well and pumpset spent Rs. 6320.00 and orchards with only well spent Rs.8360.00 for four years.

Labour cost on operations such as manuring and spraying were high in medium orchards due to use of high

amount of farm yard manure and costly plant protection chemicals by medium orchards.

5.2.2 Cost and returns of inter crops

Costs of inter crops were higher in small orchards than medium and large orchards. It was due to intensive care taken by small orchards for intercrops and it was a means of livelyhood for small orchard owners. Whereas relatively less care for inter crops was taken by medium and large orchards. It was true with even returns also. As shown in the table, the net returns obtained by small orchards were higher (Rs.22,180.70) than medium and large orchards (Rs. 16959.62 and Rs.13697.95). The net returns were very low in large orchards due to the reason that, they cultivated only rabi crops after third year of planting. In kharif they did not take any intercrops due to their attention towards other crops.

The net returns from intercrops have declined over the establishment period by about 20 per cent in small, 50 per cent in medium, and 50 per cent in large orchards. As indicated earlier small orchardists bestowed their attention on inter crops, since their dependence on these crops was high until the income started generating from the mango plants. This high rate of return was achieved by small orchards despite higher density of plants compared

to large orchards This shows the potential of intercrops in supporting farmers intending to develop mango orchards while the financial institutions cen support to the tune of Rs 16,500.00 the intarcrops can support to tha tune of Rs 22,500.00 in case of small orchards. There is need for identification and managament of remunarative intercrops in diffarant settings to provida rational recommendation

The returns from inter crops raduced burden of establishment cost of mango orchards to the extent of 40.05 per cant in small 32.00 per cent in medium and 27.70 per cent in large orchards

5.3 Maintanance cost in mango orcharda during bearing period

Maintanance cost was calculated for two periods since the intensity of irrigation changes with different size groups of farmars resulting in changes in cost

5.3 1 Maintenance Cost during bearing period in mango orcharda from 5^{th} to 10^{th} year

Details of maintenance cost during bearing period are given in Table 4.8 The Table revealed that among the variabla costs the labour cost contributad more in all size groupe of orchards because of labour intensive operations Tha amount spent on labour were more in small (Rs 6 185.430) orchards followad by medium (Rs 5,557.70) and lsrge (Rs 4.566 74) orchards

It was observed that large orchards had the advantage of economies of scale except irrigation.

The amount spent on material cost was more in large (Rs. 2,300.51) than medium (Rs. 2,114.91) and small (Rs. 2,064.3) orchards per hectare. It was observed that large orchards used more of farm yard manure due to the availability of the same on the farm itself.

Mango growers in the study area had grown inter crops up to 10 years. The average annual cost of inter crops was Rs.1376.90 in small, Rs. 1352.8 in medium, and Rs.1248.92 in large orchards. The lesser cost in large orchards was due to operation of economies of scale and relatively less care by large orchards towards inter crops. From 5th year onwards all the categories of orchards grown only one pulse crop in rabi season with a view to increase nutrient status of soils and also the pulse like horse gram was needed for feed purpose.

None of the orchard owners used chemical fertilizers. During survey, farmers expressed opinion that, application of fertilizer was costly and also they had an apprehension that the chemical fertilizers induced more vegetative growth resulting in more variation in the size of the fruits. Since this was not a desirable character, they abstained from application of chemical fertilizers.

5.3.2 Maintenance cost of mango orchards during bearing period from 11th to 20th

Maintenance cost of mango orchards during bearing period from 11th to 20th year was less in all categories compared to maintenance cost during bearing period from 5th to 10th year (Table 4.8 and 4.9). The per hectare total variable costs were Rs. 5840.91 in small, Rs.6859.58 in medium and Rs.6625.60 in large orchards. The maintenance costs were low in small orchards due to absence of irrigation from 11th year onwards, because all the small orchards carried pot irrigation up to 10 years only. After that irrigation was not necessary since, the plants were able to spread their root zones in deeper layer and also rainfall in the study region receded is at the time of flowering which was a desirable feature, Since the vegetative growth will be unduly prolonged if water is available to the plants either in the form of rain or irrigation. In medium orchards total maintenance costs were high due to intensive operations such as earthing up and weeding. Despite applying more amount of farm yard manures and plant protection chemicals, the large orchards incurred less cost due to operation of economies of scale in various agronomic practices. However, cost of irrigation in large orchards at the time of fruit development stage was more due to frequent irrigation. The cost of irrigation during 11th to 20th

year in medium and large orchards was less compared to cost of irrigation during 5th to 10th year, since the frequency of irrigation during this period was less due to development of root zones deep in to the soil.

5.3.3 Labour utilization pattern during bearing period from 5th to 10th year

The results presented in the table 4.10 indicated average annual labour utilization. Among the various operations irrigation utilized highest proportion of labour in all the categories of orchards. Since mango required irrigation up to 10 years to stabilize yields in all the categories, the irrigation became major operation and consumed highest proportion of total human labour utilized. The proportion of labour for irrigation was high in small (91.6 man days) than medium (67.18 man days) and large (53.62 man days) orchards. As already mentioned all the small orchards carried pot irrigation during summer months (March to June) which required more labour than those orchards which used pumpsets.

Weeding and earthing up were next major operation in the production of mango which consumed substantial part of total labour utilized. Compared to medium and small orchards, large orchard owners used less labour for weeding and earthing up. It was due to the operation of economies

of scale in large orchards. Earthing up operation was more frequent in medium orchards.

Table 4.10 also indicated Bullock pair utilized for inter culture and for inter crops. The proportion of bullock labour for ploughing was obviously more in all categories of farmers. However, the total bullock labour used was more in medium orchards than in small and large orchards. As medium orchards carried intensive cultivation they required more bullock labour.

In other operations such as manuring and spraying of chemicals also the number of man days utilized were high in medium orchards due to two reasons. 1. There was an operation of economies of scale in large orchards and 2. frequency of these operations was more in medium orchards.

5.3.4 Labour utilization pattern during 11^{th} to 20^{th} year

The total labour utilized for various operations during 11th to 20^{th} year are given in table 4.10.

Compared to period 5^{th} to 10^{th} year, the total labour utilized for various operations was less in all categories. There was absence of irrigation operation in small orchards. In medium and large orchards though they

irrigated the crop, the frequency of irrigation was reduced. As a result requirement of labour. However, the operations like weeding and earthing up required more number of labours during this period than the labour required during 5^{th} to 10^{th} year. It was due to the absence of intercultivation in all the categories of orchards which could have reduced the labour requirement for weeding.

5.3.5 Labour utilization pattern beyond 20 years

This period required less labour employment due to absence of some of the operations like earthing up and irrigation in all the categories of farmers. The requirement of labour for weeding also reduced due to spread of vegetative growth of plants which discouraged development of weeds to some extent. Another reason was the negligence of farmers to remove the weeds frequently.

During 5^{th} to 10^{th} year small orchards utilized maximum labour while the medium orchards utilized maximum labour during 11^{th} to 20^{th} year. The major operation explaining this difference was the variation in the type of irrigation followed by these category of farmers.

5.3.6 Yield pattern in mango orchards

As indicated in table 4.12 the yield pattern in all categories of orchards varied with the size of the

holdings. Considering output per unit area, small orchards got higher yield followed by medium and large orchards. However, when yield per tree was compared, small orchards got higher yield up to 15th year only. After 16th year yield per tree was higher in large orchards followed by medium orchards. This trend continued throughout the bearing period of orchards. It was also found during the survey that some of the orchard owners followed a very narrow spacing. (23' X 23'). After 20 years of planting they removed alternate plants leaving the spacing 46' X 46'. They opined that this sort of practice gave better returns because, the density of trees is more in small orchards when compared to medium and large orchards. The competation for light, water and nutrients was observed in smaller orchards after 16th year. This was due to increased canopy of grown up trees. This was reflected in the reduced yield per tree, in the later years.

5.4 Cash flows and financial feasibilities in mango orchards

In this section cost and returns of different categories of orchards during different periods of growth are discussed.

5.4.1 Cash flows in mango orchards

The annual cost per hectare in small orchards were higher than those in the medium and large orchards in

the first four years mainly because the small orchardists incurred high cost on irrigation and inter crops. The cost on irrigation and intercrops was high. As mentioned earlier they took to pot irrigation which required more labour and intensive cultivation for inter corps. The least cost per hectare during gestation period was found in large orchards due to economies of scale and relatively less cost on irrigation compared to medium and small orchards.

It can be seen from the Tables 4.12 to 4.14 that the per hectare cost remained the same from 5^{th} to 10^{th} year during bearing period of orchards, since, they were applying the same quantity of inputs and also the labour employment remained same for different operations during this period. This phenomenon was true with all the orchards. However, the annual costs per hectare were higher in small orchards followed by medium and large orchards.

Tables 4.12 to 4.14 also revealed the returns structure of all the categories of orchards. The returns varied according to age yield pattern of trees. They increased up to 15^{th} year and maximized during 16^{th} to 50^{th} year. Returns decreased from 51st year in all the groups, since the yield declined during this period. Increase in returns during 16^{th} to 50^{th} year is also explained by decrease in per hectare annual cost in two phases i.e. from 21st year the costs decreased and remained same up to 35^{th} year. This was mainly

due to reduced necessity of operations such as irrigation and earthing up in all the categories of orchards.

The net returns were high in small orchards. Since yield levels were high and another reason for increased net returns was that the cost of cultivation in small orchards were lower than medium and large orchards from 21st year onwards. This finding was contradiction with Patil *et al.* (1989), where in they found that as the increase in the size of coconut orchards increased, the cost of cultivation decreased.

When the annual net returns were discounted at 14 per cent the net present value in small orchards was more than medium and large orchards. This was due to the lower cost of cultivation in small orchards and also higher yield.

5.4.2 Evaluation of investment in mango orchards

For evaluating the investments, the tests of financial feasibilities - Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR) and Pay Back Period (PBP) were estimated. The analysis was carried out for all the categories of orchards seperately.

5.4.2.1 Net Present Value

From the Table 4.15 we can see that the Net Present Values were Rs. 1,69,889.69 for small orchards, Rs. 1,42,746.64 in medium and Rs.1,32,730.78 in large orchards. The Net Present Value in small orchards was high. As discussed earlier it was due to higher yield in small orchards than medium and large orchards and also lower cost of cultivation in small orchards after it attained age of 20 years.

5.4.2.2 Benefit Cost Ratio

The benefit cost ratios were 4.06, 3.69 and 3.69 for small, medium and large orchards respectively. As the net returns were high in small orchards the BCR was more than medium and large orchards. The benefit cost ratio was more than unity in all the categories of orchards indicating financial feasibility of investments in mango orchards.

5.4.2.3 Internal Rate of Return

The Internal Rate of Returns were 26.63, 24.69 and 24.91 per cent in small, medium and large orchards respectively. The Internal Rate of Returns were higher than the discount rate of 14 per cent considered in the analysis. This measure also ranked the small orchards on top followed by large and medium orchards.

5.4.2.4 Pay Back Period

The Pay Back Period was minimum in small orchards (6.80 years) followed by medium orchards (7.56 years) and large orchards (7.7 years). This indicated that large orchards required more time to recover the initial investment. Considering this period as a criterion in the study area, the financial institutions advancing loan to establish mango orchards have to keep recovery period around 10 years. All the above measures have indicated that mango orchards are financially feasible proposition for all categories of farmers in the Dharwad district. Interestingly the small farmers had better position. The Pay Back Period, Benefit Cost Ratio and Internal Rate of Returns were 11 years, 2.0 and 30 per cent respectively for mango cultivation in Karnataka during 1987 (Subrahmanyam, 1987).

5.5 Resource use efficiency in Mango orchards

The results presented in table 4.17 shows that manure had a maximum influence on gross returns of small and large orchards. The regression coefficient for manure of small and large orchards were significant at 1 per cent level (0.66 and 0.88). The regression coefficient for manure of medium orchards was non significant (0.305). The regression coefficient for plant protection chemicals for large orchards was also significant at 1 per cent level

indicating its influence on gross returns. Where as the regression coefficient for plant protection chemicals of small and medium orchards were non significant. The regression coefficient for number of trees of medium orchards was significant at 1 per cent level. The regression coefficient of land and labour for all the categories of orchards were non significant. In most of the production function analysis land indicated significant regression coefficient. But in this study unusually land turned out to be non significant. It indicated that mere extension of area under mango without due regard to other factors and their management may not give desirable results.

About 99.00, 72.00 and 98.00 per cent of the variation in yield in small, medium and large orchards were due to the variation in the variables included in the function. The R^2 (Coefficient of multiple determination) value was less in medium orchards (0.72) as some of important factors could not capture variation in the yield.

5.6 Marketing of mango

It was found during the time of investigation that, farmers marketed their produce through various intermediaries. The farmers in the study area sold their produce either through commission agent or to processing units. Farmers selling through commission agent brought their

produce to district market (Dharwad market) and farmers who marketed their produce through other above mentioned agencies entered in to contract with them prior to harvesting of the crop. Farmers use to get advance from these agencies and there by bound to market their produce to them.

5.6.1 Marketing channel

In this study there were 4 channels of marketing.

The first channel was Producer ---> commission agent ---> Retailer --->Consumer. As and when, the produce was harvested the farmers brought their produce to district market. As all the villages were located on main roads, the farmers found no difficulty in transporting of their produce. Commission agents used to negotiate the price on behalf of producer and he did not possess title of the goods. For the service he rendered he charged 8 per cent commission from the producer and 4.0 per cent from purchaser. This practice was collecting 8 per cent commission from producers was prevailing, since, the commodity was not notified. The method of sale was through negotiations. Of the 90 farmers, 34 of them sold through channel-I.

The second channel was Producer ---> Pre-harvest Contractor (Whole Saler) --> retailer ---> consumer.

The pre-harvest contractors used to enter in to contract with the farmers at the flowering and fruitset stages. They took care of orchards until the fruit is harvested from the day of contract. Farmers got advance from pre-harvest contractors and were obliged to sell their produce to them. However, farmers had good opinion about pre-harvest contractors due to their timely financial assistance. The pre-harvest contractors had got their storage houses at Dharwad and Navlur, where they stored the harvested fruits and sold it to the retailers. Retailers purchased produce on credit and repaid the amount after selling it at Dharwad market on the same day. The packing material (Bamboo basket) was provided by pre-harvest contractos.

Out of 90 farmers 42 farmers sold their produce through pre-harvest contractors. Even though the price they got was low. They preferred pre-harvest contractors due to risk aversion i.e. shifting risk to pre-harvest contractor. In case of severe losses due to climatic variations, in some instance farmers showed concession to pre-harvest contractors. But in the case of high profit to them, the farmers did not get any premium over the agreed amount.

The third channel comprised of producer and representatives of processing unit. Here the representative agent negotiated the price with the farmers. They acted

just like pre-harvest contractors. But the only difference was that they supplied the fruits after harvesting to the processing unit. The processing unit is located at Tarihal of Hubli taluk. In this unit only the pulp is extracted and sent to the Nectar beverages private limited Dharwad for further processing. The pulp so supplied was converted into soft drink at this unit. Then it was bottled and marketed through agents at district level and retailers in various towns in the states of Karnataka and Goa.

The channel-IV comprised of producer pre-harvest contractors-cum-wholesaler and commission agents. Here the pre-harvest contractor, apart from purchasing from producer, also purchased produce from open market and sent it to the distant markets like Davanagere, Kolhapur, Puna and Bombay.

5.6.2 Price spread in marketing of mango

Table 4.18 indicated the price spread in marketing of mango for channel-I and channel-II. It is clear from the table that the share of producer in consumer's rupee was higher (78.32 per cent) in channel-I as compared to channel-II. (58-40 per cent). It was due to presence of additional market intermediaries in channel-II. Apart from commission agents and retailers, there was pre-harvest contractors. Also the price received by producer from pre-harvest contractors was low (Rs.16.71 per dozen) as against Rs.22.42 per dozen when marketed through commission agents. Even though pre-harvest

contractor gives low price for the producer, he was popular because of fluctuations in the open market price, which enabled the producers to avert the risk. It was not possible to estimate the price spread in the other channels (III and IV) because details of processing costs were not available and pre-harvest contractor took the produce to distant markets.

5.7 Problems confronting producer about production and marketing of mango

5.7.1 Problems of production of mango

As mentioned in table 4.19 in previous chapter, the main problems the farmers were facing was that of alternate bearing. This phenomenon was most common in 'Alphonso' variety. Alternate year was only vegetative growth there by the flower bud differentiation did not take place. In a few case the normal bearing was only once in three years. This phenomenon was only with respect to few farmers. Some of the research workers have suggested to use the growth regulator as a remedial measure. But under field conditions except one or two farmers no body had used the growth regulator to over come the problem of irregular bearing or alternate bearing. It was due to lack of technical guidance as expressed by the farmers. Deblossming and pruning are also some of the measures to over come alternate bearing. The other problems expressed by farmers

were malformation of inflorescence and non availability of labour. Malformation occured at the time of flowering, where in the flowers turned in to black colour and also floral panicle became short, as a result the fruit set did not take place.

5.7.2 Problems faced in marketing of mango

One of the most important drawbacks in marketing of mango was that it was not a notified commodity. Therefore the commission agents and whole salers exploited the farmers. commission agents charged high commission (8 per cent of total value of produce) and also farmers expressed that there was conspiracy among commission agents and whole salers.

Farmers also expressed problem of price fluctuation i.e. in the year of good yield the price fell steeply. But during the year of bad yield there was sharp increase in the price.

VI. SUMMARY AND POLICY IMPLICATIONS

VI. SUMMARY AND POLICY IMPLICATIONS

Cultivation of fruits is a very important factor contributing to the prosperity of nation. It helps in maintenance of ecological balance and also provides employment to the sizable population in the country. Often fruit consumption is taken as an index of prosperity of a nation.

In India fruits are grown over an area of 3.23 million hectares with a production of 28.2 million tonnes (1991-92)*. Mango occupies first place with an area of 1.1 million hectares and production of 8.5 million tonnes Alphonso is one of the important varieties which is preferred at home and abroad due to its excellent quality, taste and suitability of it for processing.

In Karnataka mango occupies an area of 76,955.00 hectares (1990-91). The leading district are Kolar, Tumkur, Bangalore, Bidar and Dharwad.

Very few studies have been made on the economics of mango cultivation and its marketing. The information on the economics of mango helps in decision making on mango enterprise.

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* A report on the occassion of Silver Jubilee of Horticultural Society of India Held on March 24, 1993.

The present study was taken up in Dharwad district of Karnataka with the following specific objectives.

1. To study general characteristics of mango orchards in the study area

2. To analyse cost and returns structure and to work out financial feasibility of mango cultivation.

3. To study the resource use efficiency in mango cultivation.

4. To identify marketing channels and to work out marketing cost, margin and price spread in marketing of mango.

5. To assess the problems of producer and to suggest possible corrective measures.

Sampling

Mango is cultivated through out Dharwad district. However, mango cultivation is concentrated in Dharwad taluka (44.82 per cent). Hence Dharwad taluka was selected for the study. After consultation with Assistant Horticultural Officer, six villages selected where the mango cultivation was more concentrated. From each village 15 farmers were selected randomly. Thus the total size of the sample selected for the study was 90. The sample farmers were post classified in to three size groups based on their size of

holding under mango, viz., small, medium and large orchards.

Analytical techniques

Three major analytical tools were used viz., Tabular, financial and functional analysis. The technique of tabular analysis was employed to estimate the cost of establishment, cost of cultivation, pattern of labour use and so forth.

Financial analysis was employed to measure the financial feasibility of investment in mango orchards. The tests used were Net Present Value (NPV), Benefit Cost Ratio (BCR). Internal Rate of Return (IRR) and Pay Back Period (PBP).

Functional analysis was employed to know the resource use efficiency in mango cultivation and Cobb- Douglas type of production function was fitted.

Findings

The cost of establishment was higher in the small orchards (Rs.55394.157) followed by medium (Rs.52999.8) and large (Rs.49403.7) orchards. Irrigation costs accounted for 31.55, 24.92 and 27.07 per cent in small, medium and large orchards respectively. Material cost accounted for 10.86 per cent in small, 14 per cent in medium and 15.26 per

cent in large orchards. Rest of the cost was accounted for maintenance cost. The total variable cost per hectare was found to be Rs.36,032.11 in small, Rs.32,110.84 in medium and Rs.27,105.96 in large orchards.

Farmers in the study area took up inter crops in mango orchards. chilli, cotton blackgram and jowar were taken up for four years. The total cost incurred in growing intercrops by small orchards for four years was Rs.7,065.02 per hectare and gross returns were Rs.29,245.39 per hectare. Hence cumulative net returns realised were Rs.22,180.37 per hectare. In medium orchards cost incurred for four year was Rs.6,524.56 and net returns realised were 16,959.62 per hectare. In large orchards total cost incurred for intercrops was Rs.5,812.63 per hectare. Gross returns obtained were Rs.19,510.58 and net returns were Rs.13,697.95.

The total cost of cultivation was found to be Rs.9,626.60, 9,025.40 and 8,916.17 in small, medium and large orchards respectively during 5th to 10th year after planting. Whereas the total cost of cultivation at the age of 11th to 20th year was found to be Rs.5,840.91 in small, Rs.6,859.58 in medium and Rs.6,625.60 in large orchards.

A discount factor of 14 per cent was employed to discount the net cash flows. It was found that the Net

Present Value of investment were Rs.1,69,889.68 in small, Rs.1,42,746.46 in medium and Rs.1,32,730.78 in large orchards.

The Pay Back Period was found to be 6.8 years in small, 7.70 years in medium and 7.56 years in large orchards. The Benefit Cost Ratio of small (4.06) was higher than medium (3.69) and large (3.69) orchards. The internal rate of returns were more than discount factor (14 per cent) adopted to discount cash flows. Internal Rate of Returns were high in small (26.63 per cent) followed by medium (24.91 per cent) and large (24.69 per cent) orchards.

The production function analysis employed for small, medium and large orchards revealed that 98.00, 72.00 and 99.00 per cent of variation in yield was explained by five variables included in the function. The regression coefficient of manure for small and large orchards was found to be significant at 1 per cent level. The regression coefficient of plant protection chemicals for large orchards and regression coefficient of number of trees per hectare in medium orchards were significant at 1 per cent and 5 per cent level respectively. It was observed that the quality of management of orchards was having more potential in increasing yields of the existing orchards.

Marketing channels

In this study it was possible to trace four marketing channels.

Channel I. Producer-Commission agent- Retailers-Consumers

Channel II. Producer - Preharvest Contractor (Whole saler) Retailer-Consumer

Channel III. Producer-Processing unit-Consumer

Channel IV. Producer-Commission agent-Preharvest contractor cum whole saler-Distant places.

It was possible to calculate price spread and marketing margin in case of first two channels only. Channel-I was found to be more efficient than Channel-II since, producer's share in consumer rupee was more in Chanel-I (78.33 per cent) and was low in channel-II (58.40 per cent).

Opinion survey was conducted to know the problems of production and marketing. Most of the farmers expressed problems of alternate bearing and some even irregular bearing. Farmers those who marketed through commission agent, mostly faced problem of high commission and under hand dealing of commission agents with whole saler.

POLICY IMPLICATIONS

1 It was found during the survey that most of the farmers followed high density planting, which did not affect final output per unit area Hence there is a need to verify farmers experience and to revise the recommendations if found appropriate

2 As indicated by the financial measurements the investment in mango was found to be financially feasible The farmers who wish to establish mango orchards may avail financial asstistance from Bank at the prevailing rate of interest

3 During the survey most of the farmers expressed lack of technical guidance As there are no sufficient field level workers in the set up of the state department of Horticulture So there is a need to employ field level workers

4 The study indicated that most of the small farmers and few of medium and large farmers have grown mango under rainfed conditions To establish orchards they carried pot irrigation and they were better off in getting out put per unit area Hence there is a need to provide pitcher irrigation facilities in the study area By these measures farmers need not make heavy investments on pumpsets

5. The regression coefficient of land was found to be non significant unlike many other studies. It indicated that mere extension of the area under mango, without due regard to other facrtors and their management may not give desirable results.

6. It was also found during study that, mango is not a notified commodity despite being major contributor for production of fruits in the district. This had led to unjustified collection of commission from producer. Therefore, there is need to notify commodity or atleast to create better environment for marketing of mango through setting up of co-operatives or other measures.

VII. REFERENCES

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ECONOMICS OF PRODUCTION AND MARKETING OF MANGO IN DHARWAD DISTRICT, KARNATAKA.

K.C. GUMMAGOLMATH 1994 Dr. K.N.R. SASTRY

ABSTRACT

The study was conducted in Dharwad district of Karnataka, with an over all objective of studying economics of production and marketing of mango. Data were collected from 90 mango orchards from six villages of Dharwad taluk. Tabular, financial and functional analysis were employed to analyse the data. Financial feasibility was examined by estimating, NPV, BCR, IRR and PBP.

The results revealed that the per-hectare cost of establishment for the four-year gestation period was Rs 55,394.15 in small, 52,999.02 in medium and 49,443.70 in large orchards The inter crops made good the establishment cost by 40 per cent in small, 32 per cent tin medium and 28 per cent in large orchards. The per-hectare cost of cultivation was estimated for two periods. During 5th to 10th year it was high in small orchards (Rs. 12,921.61) followed by medium (RS. 12,908.72) and large orchards (Rs. 12,513.17) . During 11th to 20th year it was high in large orchards (Rs. 11,047.90) followed by medium (Rs 10,774.21) and small orchards (Rs. 9,135.86).

The study further revealed that at 14 per cent discount rate, the small orchards has maximum NPV, (Rs. 1,69,889.60), BCR (4.06), IRR (26.63 %) and minimum PBP (6.8 years) as compared to large (1,42,746.60, 3.69, 24.91 and 7.56) and medium (1,32,730.60, 3.69, 24.69 and 7.70) orchards.

The results of functional analysis-yield of mango as dependent variable and land, labour, PPC, manure and number of trees as varlables included in the functlon explained about 99, 72 and 98 per cent of variation in mango yield of small, medium and large orchards, respectively. It was observed that PPC and manures contributed significantly to mango yield in large orchards. Whereas, manure in small orchards and number of trees in medium orchards contributed significantly to the mango yield

Producer s share in consumer rupee was 65.70 per cent in Channel-I (Producer-commission agent-retailer-consumer) and it was 58.40 per cent in Channel-II (Producer-PHC cum Wholesaler-Retailer-consumer)

The study indicated the possibility of promoting dry land mango orchards, specially among small farmers. There is need for examining the possibility of recommending higher density of plants.

(Major Advisor)