PRODUCTION AND MARKETING OF SAPOTA IN NORTHERN KARNATAKA – AN ECONOMICS ANALYSIS

Thesis submitted to the
University of Agricultural Sciences, Dharwad
in partial fulfillment of the requirement for the
Degree of

MASTER OF SCIENCE (AGRICULTURE)

In

AGRICULTURAL ECONOMICS

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I. INTRODUCTION

Agriculture continues to be the mainstay of our economy as it occupies the central place in rural life. The contribution of agriculture towards national income was about 22.1 per cent in 2003-04 besides 64 per cent of population still depending on it.

Horticultural industry is fast emerging and the most remunerative sector for changing the age-old subsistence farming especially in the rainfed, dry lands, hills, arid and coastal agro-ecosystems. The horticultural crops are characterized by high productivity, higher returns, higher potential for employment generation and exports, comparatively lower requirement of water and easy adaptability to adverse soil and waste land situations.

Pomology (cultivation of fruits) is one of the important branch of horticulture and fruits are the man's oldest food. Fruits are the prime source of vitamins and minerals without which human body cannot maintain proper health and resistance to the diseases. Indian Council of Medical Research (ICMR) has recommended the consumption of at least 92 grams of fruits per day and as much variety as the season permits (Anonymous, 2001a). On the contrary, the per capita consumption of fruits in India is only 46 grams per day. This indicates the wide gap between the use and requirement of fruits.

The major fruit crops grown in India are mango, banana, citrus, grapes, guava, papaya, sapota, pomegranate, jack, ber, aonla etc.

Fruit crops in Indian economy

India is endowed with different agro-climatic condition that offers immense scope for cultivation of various kinds of fruit crops. This provides an excellent platform for the country to emerge as a leading producer of fruit crops. The fruit crops have established their credibility thrown by improving the economic condition of farmers and entrepreneurs, enhancing exports as well as providing nutritional security to people. This has assumed special significance in the context of liberalized global economy and establishment of World Trade Organization (WTO).

In India, the total area under fruit crop was 1.12 million ha, in 1951-52 and increased to 3.79 million ha in 2001. The production of fruits has also increased from 11.7 million tonnes in 1950 to 45.50 million tonnes in 2001. India ranks second in fruit production with a global share of 10 per cent.

It is a leading producer of sapota, with an estimated area of 48224 ha and an annual production of 629312 metric tonnes (Anon, 1999).

Karnataka is one of the progressive states of India with great potential for development of fruit crops. The State is blessed with ten agro-climatic regions suitable for growing variety of fruits all around the year. The total area under fruit crops has increased from 1.41 lakh ha in 1978-79 to 2.60 lakh ha in 2001, registering the growth rate of 184 per cent. The production of fruit crops has also gone up from 23.41 lakh tonnes during 1978-79 to 41.65 lakh tonnes in 2001 showing the growth rate of 178 per cent. The major districts growing fruit crops in Karnataka are Kolar, Belgaum, Bidar, Bangalore, Bijapur, Gulbarga, Dharwad, Mysore, Tumkur, Bagalkot and Chitradurga.

Status of sapota as commercial proposition:

Fruits are a part of Indian heritage and culture. Sapota (*Manilkara achras* (Mill.) Fosberg) is one of the important tropical fruits belonging to the family sapotaceae. It is called by many names viz., chikku, sapodilla plum, zapota, and nose-berry. It is said to be the native of southern parts of Mexico and it spread to other countries such as Philippines, Malaysia, United States, Sri Lanka, India and Caribbean Islands. At present, it is cultivated in all the tropical countries of the world.

In India sapota cultivation was taken up for the first time in Maharastra in 1898 in Gholwad village. Thereafter, the cultivation of this fruit crop spread mainly in tropical parts of India. Now sapota occupies a significant position among fruit crops in India.

Sapota is mainly valued for its sweet and delicious, it has high sugar content (20%) in addition to vitamins A, B1, B2 & C. It is also rich in minerals such as phosphorous, calcium, potash, iron, magnesium and sodium. Sapota is also grown for its edible milky latex known as "gutta-percha", from which chewing gum is manufactured. Many processed products such as jam, jelly, candy, marmalade, toffee, fruit bar, flakes and wines are prepared from fruits. Of late, sapota cultivation has attracted many farmers of this region on account of its better adoption to diversified soil and climatic conditions. Though, there is more scope for cultivation of sapota; the expansion of area is limited due to the non-availability of genuine planting material.

Post harvest loss of fruits is one of the most pressing problems in the tropical countries like India. It is estimated that the total loss of fruits in India for want of adequate post harvest care, transportation and storage facilities was around 20 to 30 percent of the fruit production (Madan and Ullasa, 1993). In addition to the physical losses in quantity severe losses also occur in the essential nutrients, vitamins & minerals. It has been observed that when there is bumper production of sapota the fruit goes waste for non-availability of suitable preservation facilities. Processing of fruits can prevent the losses, there by add value addition.

Further, during glut periods, surplus as well as scarred fruits, which consist of high sugar and better edible pulp, need to be utilized for processing into value added products based on the available technology such as ready to serve sapota juice, wine, dehydrated products, powder etc. as many of these products are new to consumers. Sincere efforts are needed to introduce them in the market and to evaluate the consumer acceptance and economic viability of such products.

In India, sapota is mainly grown in Karnataka, Gujarath, Maharashtra, Tamil Nadu, West Bengal and Andhra Pradesh. India ranks first in the world in sapota production. During 1998-99, 2,649.77 tonnes of sapota valued at Rs.292.12 Lakhs were exported from India to non-growing countries (Chadha, 2001). The important cultivars of sapotas grown in different parts of India are Kalipatti, Cricket ball, Baramasi, Dwarpudi, Oval, DHS-1, DHS-2, CO-1 CO-2, Pala, PKM-I and PKM-3.

In Karnataka, sapota crop occupied an area of 21274 ha during 2002-03 and being cultivated in 27 districts. High productivity has been achieved in Karnataka (17.50t/ha). In Northern Karnataka, Belgaum and Dharwad districts account for 2668 ha of area. However, in recent years sapota growers are facing several production and marketing problems. The problems in production include non-availability of genuine plant material, high incidence of disease especially leaf spot, etc., have hindered the cultivation of sapota. And enough farm business data on cost of production and marketing of sapota are not available. The information on establishment cost, operating cost inputs requirement of sapota orchard and overall economics of production and marketing of sapota would be of immense help to sapota growers of Northern Karnataka. It enables the farmers in making the decision in farm planning and enterprise selection as well as the results will be of practical use to the financial institutions in fixing the scale of finance and schedule of repayment.

The present study covers the economics of sapota production and identify the problems faced by the sapota cultivators in its cultivation and marketing. It envisages to suggest possible corrective measures to bring about the desired improvement in production and marketing of sapota. Hence, the study was undertaken with the following specific objectives:

1. To document growth in area, production and productivity of sapota in Karnataka.

2. To examine the financial feasibility of investment in sapota production.

3. To estimate costs and returns of sapota production.

4. To identify marketing channels and to estimate price spread in sapota marketing.

5. To identify constraints in production and marketing to suggest corrective measures to improve the production and marketing of sapota.

Hypotheses

1. There is increase in area, production and productivity of Sapota in Karnataka.

2. Investment in Sapota cultivation is financially feasible.

3. There are many channels in sapota marketing

4. Sapota producers in the study area are facing numerous problems.

Presentation of the study

The study has been presented in six chapters as indicated below:

Chapter-I deals with the nature and importance of the present study and also the specific objectives of the study have been clearly indicated

Chapter II describes comprehensively a review of the relevant research work done in the past related to the present study

Chapter III outlines the features of the study area, sampling design followed by 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.

Chapter V discussions of the results of the study are presented.

Chapter VI provides summary of the whole study and also suggest the policy implications based on findings of the study. At the end important references have been listed related to the present study.

Limitations of the study

1. Constraints at the time of the research forced to select whole district as sample area of North Karnataka. Hence findings are largely applicable to those areas where similar condition prevails.

2. The interview method of data collection, respondents required to recall from their memories about the cultural operations

3. The average price realized during the study year was calculated and used in converting production figures from quantitative to value terms, although the price realized differ from farmer to farmer every year.

II. REVIEW OF LITERATURE

A review of the research work done in the field of the objectives of this study is presented in this chapter. The number of studies made on sapota are very few. But the economic analysis of most of the perennial crops are similar therefore in this chapter reviews relevant to the present study are presented from various comparable crops under following broad heads.

2.1 Growth rates in area, production and productivity

2.2 Financial feasibilities of perennial fruits crops

2.3 Cost and returns in the cultivation of fruit crops

2.4 Marketing channels, marketing costs and price spread

2.5 Problems in production and marketing of fruit crops

2.1 GROWTH RATES IN AREA, PRODUCTION AND PRODUCTIVITY OF FRUIT CROPS

Patil *et al.* (1987) studied trends and growth rates in area, production and productivity and the factors responsible for change in acreage under banana crop in Jalgoan districts from 1950-51 to 1979-80. The area under banana increased tremendously from 6600 hectares to 33400 hectares and the production of banana has increased 689 per cent in the same period. Net irrigated area and one year lagged price of banana have jointly explained nearly 97 per cent of the variation in the acreage under banana.

Raju *et al*. (1987) estimated that compound growth rates of area (1967-83) and production (1970-83) for fruit crops by fitting the semi log function in Andhra Pradesh. The year to year fluctuations in area and production of fruit crops were studied with the help of index numbers and their per centage changes from the previous years. The production of grapes had showed a phenomenal increase in (329%) 1973-74, the index stood at 511 in 1982-83. From 1974-75 TO 1977-78 there was a continuous fall in production by 27.00, 24.00, 39.00,3.88 and 8.64 per cent, respectively. Early 1980s witnessed an increasing trend in grape production. Though the area under grapes which was concentrated only in two districts (Ranga Reddy and Ananthpur) increased in absolute term, its growth rate was negative and non-significant (-2.44). The compound growth rate of grape production was 12.09 per cent and statistically significant.

Venkateshwarlu *et al.* (1988) studied growth rate and productivity of banana in Andhra Pradesh using exponential trend equation of the following type

$$Y = AB^t$$

Where

Y = Index number of area / production / productivity.

A = Intercept

B = (I + r) where “r” was the annual growth rate expressed as per cent / year.

In the study period (1967-68 to 1982-83) the area in the state had shown constant level in the first two years VIZ, 1967-68 and 1968-69. Though there was an increase in also during 1969-70, started declining more or less gradually from 1970-71 and continued up to 1975-76. It started increasing during 1977-78 and reached peak during 1980-83.

Indiradevi *et al.* (1990) computed the trends in area, production and yield of banana in Kerala state. Quadratic function was fitted to explain the trend in a period of 17 years (1970-87). The study revealed that banana production in the state showed an increasing trend (94.57%) because of the intensive cultivation practices and favourable price factors for banana. The study also indicated that the main determinant of production of banana in Kerala state during seventies was area (extensive cultivation), while it was yield (intensive cultivation) in the eighties realizing the fact that banana cultivation had become productivity oriented in the recent years.

Handiganur (1995) studied the growth rates of area, production and productivity of grapes in Bijapur district from 1978-79 to 1992-93. Growth rate analysis had showed an increase of 7.12 per cent of area in Bijapur district and an increase of 0.6 per cent in area, 2.80 per cent in production and2.0 per cent in productivity of grapes was observed in Karnataka state. The increase in production and productivity was due to the use of improved cultural practices, increased use of manures, fertilizers and plant protection chemicals.

More (1999) studied the growth rate in area, production and productivity of banana in Nanded district, Parbhani district and Maharashtra state as a whole (4.50%) due to suitability of climate to cultivate banana in addition to more awareness of farmers towards horticultural crops in Nanded district. In Nanded district production growth rate had shown higher growth rate (21.04%). The higher growth in production was contributed mainly by significant increase in area coupled with productivity. The growth rates of productivity was high (1.43%) in Maharashtra state as a whole as compared to Nanded (1.40%) and Parbhani (0.90%) district. It was due to the use of improved cultural practices, higher use of manures and fertilizers, more use of other inputs and also increased yield levels in other districts of the state.

Gangal (2002) studied the growth rate in area, production and productivity of banana in North Karnataka and Karnataka state as a whole. The growth rates in area (6.69%) in Karnataka state between 1980 and 2000 was substantially higher than all the other major banana growing states and all India average.

2.2 FINANCIAL FEASIBILITIES OF FRUIT CROPS

Upton (1966) applied discounted cash flow 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 return 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.

Gupta and George (1974) estimated the profitability of Santra (orange) cultivation in Nagpur district of Maharashtra by using the conventional measures of project appraisal for the data from 60 orange growers. The study indicated that orange orchards had a pay back periods 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. With a discount rate of 12 per cent.

Menon (1979) studied the feasibility of investment in grape gardens in Bangalore north taluk. The estimated middle life of the vineyards were 30 years 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, 460, 96 per hectare 1.76 and 49.06 per cent.

Patil and Pramod Kumar (1986) studied the economic viability of investments in Alphanso 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 economically viable proposition. The B:C ratio was 1.38, NPV was (21.78) the

internal rate of return was higher than interest rate of Bank (18%) and pay back period was 10 years.

Raikar (1990) in his findings of the study indicated that per ha. NPV was found to be Rs. 28.440.58 in case of small orchard, Rs. 16780.84 in large orchard and Rs. 21034.59 in average orchard. The B:C ratio at 12 per cent discount ratio was 2.87 in small orchard 12.25 in large orchard and 2.49 in an average orchard. The pay back period was 8.90 years 9.38 years and 9.18 years in small, large and over all orchards, respectively. The internal rate of return was found to be 20:22, 17:88 and 18:88 per cent in small, large and average orchard respectively.

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 Rs26257.00 for apples. Rs. 89222.00 for peaches, Rs. 117837.00 for plums and Rs. 160541.00 for apricots. The internal rate of return were 22, 33 and 47 per cent respectively. The benefit cost ratios were 1.36, 3.87, 4.62 and 5.10 respectively.

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 per cent and six years respectively.

Koujalagi (1992) 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 per cent discount) was 1.53. The pay back period was 6.56 years and internal rate of return was 15.55 per cent.

Sundarevarodarayan and Ramanathan (2003) reported that B:C Ratio and IRR for new plantations were 1.42 and 34.36 per cent, while for old plantations it was 1.06 and 17.17 per cent respectively. Further, they suggested that need to create an awareness to adopt improved varities (HYV). Which not only reduce the cost of cultivation but also to increase the net income among the different size group of farmers.

2.3 COST AND RETURNS IN CULTIVATION OF FRUIT CROPS

Balvirverma *et al.* (1964) in their study on economics of banana in Gujarat state found that the cost of farmyard manure and fertilizers (Rs. 282 per acre), expenditure on planting and interculture (Rs. 128 per acre) and irrigation charges (Rs. 1005 per acre) were the important items of expenditure. The total cost of cultivation of banana was Rs. 1557 per acre and average fruit yield was Rs. 200 quintal per acre. The grass income was estimated at Rs. 3500 and net income was Rs. 18743 per acre.

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 per cent interest on the value of land was taken as fixed capital and included in the total cost.

Bore (1968) worked out the cost of cultivation of banana per acre in Jalgoan district at cost ‘A’, as Rs. 2030.69, at cost ‘B’ as Rs. 2482 and at cost ‘C’ was Rs. 2711.78 with a gross income per acre of Rs. 4875.00. The net profit worked to be at cost ‘A’ was Rs. 2845.37, at cost ‘B’ Rs. 2393.44 and at cost ‘C’ Rs. 2164.21. He also pointed out that cultivators using electrical pumping for irrigation spent about 50 per cent of the cost on labour in irrigation operations. However, expenditure on irrigation charges, manures and fertilizers and human labours accounted the major portion of total cost (84%) of cultivation in banana.

Patil *et al.* (1969) studied the cost of grape cultivation in Sangli district, and production and marketing of mango in Ratnagiri district, through survey under taken 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 per cent was incurred during first year of establishment itself. The gross returns 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 periods. The cost incurred by the former was divided into fixed, working capital and operating assets and later into pre harvest and post harvest charges. Simple interest on fixed assets at three per cent, depreciation by straight-line method. Simple interest at 6.25 per cent 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 per cent 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 cost amounted to Rs. 589.49 per hectare per year. The net returns from the inter crops during the three years 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.

Maore (1974) found that the total cost required for banana cultivation in Parbhani district was Rs. 2, 423.63 considering the cost concepts A, B and C. The average yield per acre was 142.25 quintal, which was worth of Rs. 4, 271.60 and net returns of Rs. 1, 848.05. The average cost, gross value and net profit per quintal of banana were to the extent of Rs. 16.98, Rs. 29.95 and Rs. 13.07 respectively and per plant it was to the extent of Rs. 1.69, Rs. 2.92 and Rs. 1.28, respectively.

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

Subrahamanyam and Mahandoss (1982) estimated the costs and returns from Coorg Mandarin oranges in Karnataka. They found that the Mandar in orange tree requires seven years to establish and starts bearing from eighth year. The average cost of maintenance from the eighth year on words 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 grass returns per acre was Rs 992.00.

Sunderesan and Thanasekaran (1984) studied the costs and returns from cultivation of Muscat grapes in Mudurai district of Tamil Nadu. The study revealed that on an average Rs. 49, 465,00 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 form the fifth to eight year and Rs. 2.29 per kg after eighth year.

Subrahmanyam (1986) studied the cost of cultivation of lime and sweet orange in Andhra Pradesh. He included the establishment cost (planting as well as maintenance cost upto bearing) and maintenance cost after bearing. The total cost of establishment for lime and sweet orange was found to be Rs. 4,664.08 and Rs. 5,484.61 per ha, respectively. The cost of maintenance up to bearing stage of sweet orange was Rs. 260 per ha compared to Rs. 16 per ha on the cost of lime. The average net returns were Rs. 4,617.25 and Rs. 5,102.32 per ha in the case of lime and sweet orange, respectively.

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 were Rs 1200 in Karnataka. As indicated by the study the pay back period was 11 years. Internal rate of return was 30 per cent and B: C ratio was 2.00 indicating that the investment was profitable.

Thomas and Gupta (1987) studied the economics of banana cultivation in Kottayam district of Kerala. The study revealed that the expenditure on manures and fertilizers were the major item of cost of cultivation of banana followed by labour cost. He found that an amount of more than Rs. 6000 per ha can be gained as profit by undertaking banana cultivation.

Koujalagi (1990) studied the pattern of investment in pomegranate orchards in Bijapur district, Karnataka. The establishment cost (Rs. 24229.53) consisted of material cost in the initial year (85.65) and maintenance cost (49.35%) upto bearing three years. The per hectare total establishment cost worked out to be (Rs. 24.224.53) and returns per orchard was Rs. 45429.96.

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 the highest (Rs. 3.787.61). 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.

Hiremath (1993) in his study on economics of production and marketing of lime in Bijapur district, Karnataka revealed that the per ha cost of establishment for the four year gestation period was Rs. 56,424.58 in small, Rs. 49,179.62 in medium and Rs. 47.143.09 in large orchards. The intercrops reduced the establishment cost by 58.82,53.90 and 46.68 per cent in three size group of orchards, respectively. The per hectare cost of cultivation (8^{th} to 30^{th} year) was high in medium (Rs. 12,454.34) followed by large (Rs. 1,203.76) and (Rs. 11, 399.60) small orchards. The average yield of lime was 340.59, 366.98 bags in small, medium and large orchards, respectively.

Batra *et al.* (1994) observed that the banana yield ranged between 358 q per ha and 464 q per ha and those of expenditure between Rs. 4995/ ha and Rs. 5518 per ha according to the prevailing labour rates and material inputs in Gujarat state, India. Input cost was Rs. 18.76 per ha for basheri variety and Rs. 25.75 per q for Shinduri variety as compared to Basheri variety.

Sinthilnathan and Srinivasan (1994) estimated the costs and returns of poovan cultivar banana production in study area over a period of three years. With the per hectare total cost of cultivation of Rs. 1, 24,668.11. The gross income obtained was Rs. 2, 86,913.80 with the net income of Rs. 1, 62,235.69. The study clearly showed the high profitability of poovan variety banana with a high returns cost ratio 2.3:1 in the study area.

Deepak Shah (1996) studied the production and marketing pattern of grapes in Maharasthra. The study showed sharp increase in per acre annual gross maintenance cost as well as returns of grapes orchards. In general about 67% of gross maintenance cost of grape production was spent on various production related operations and the remaining 33 per cent owed it to investment on various marketing functions. The profitability in grape cultivation was considerably high in the state of Maharashtra.

Maurya *et al.* (1996) studied the profitability of banana production in Hajipur district of Bihar state, India, during 1993-94. The study revealed that banana production was the most profitable crop production activity in this area, as it provided a net income of Rs. 29748.05 per ha with a total expenditure of Rs. 2.160,70 and gross income of Rs. 49,958.75.

More (1999) studied the economics of production and marketing of banana in Marathwada region of Maharashtra state. He found that the crop of small, large and pooled farmers. The independent variables included in the function were land, labour, machine power, farmyard manure, nitrogen, phosphorus, potash, capital, irrigation and bullock labour. The dependent variable was yield of banana. The coefficient of multiple determination were 73:67 and 85 per cents, respectively for the three categories of farmers. Land and capital had significant influence on yield in all three categories of farmers and others were non – significant.

Mali *et al.* (2001) studied the economics of production and marketing of banana in jalagaon district of western Maharashtra found that the per hectare cost of cultivation of banana worked out to Rs. 133477.36. The gross returns per hectare of banana were Rs. 214867.24 and net returns of Rs. 66761.87.

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

Sundaravardarajan and Ramanathan (2003) estimated the establishment cost of cashew plantation for the first year at Rs. 7690, Rs. 8664 and at Rs. 9491 for marginal, small and large farmers, respectively. The maintenance cost of cashew plantations in the case of marginal forms were Rs. 4059, Rs. 4410, Rs. 4910, Rs. 5385, Rs. 841 Rs. 6332 Rs. 6771 and RS 6990 for second, third, fourth, fifth, sixth, seventh, eight, ninth year respectively and in case of large forms the maintenance cost were Rs. 5040, Rs. 5250, Rs. 5764, Rs. 6145, Rs 6558, Rs. 7021 Rs. 7438, and Rs. 774 for second, third, fourth, fifth, sixth, seventh, eight and ninth year respectively. The input output ratio per ha were 1.43, 1.55 and 1.83 for respective farms.

Umesh *et al.* (2005) observed that the establishment cost of cashew was Rs15631 per ha in all the varieties studied during the first three years. The maintenance cost per ha from fourth year on wards varied from Rs 5881 to Rs 8254 in Chintamani –1, Rs. 5640 to Rs 8254 in Ullal–4, Rs. 5812 to Rs. 7882.In Ullal- 3 and Rs. 5821 to 7229 in ullal at the net returns of cashew orchard per ha being fairly high were in the order of Rs. 61314, Rs 62425, Rs. 49672 and Rs. 34231 in Chintamani–1 Ullal –4, Ullal-3 and Ullal- 1.

2.4 MARKETING CHANNELS, MARKETING COST AND PRICE SPREAD

Sidhu and Kahlon (1967) 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 per cent to commission agents in the market and only 3.65 per cent through direct sales to consumers. The main reason for leasing the orchards 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 their produce to the pre-harvest contractors, 20, 38 per cent to the distant terminal markets and rest to the local whole salers and retailers and directly to consumer.

Singh and Kahlon (1968) reported that the sale of grapes in Punjab through retailer was highest (41.05%) followed by sales through commission agents (40.60 per cent). Wholesalers (11.26%) and pre-harvest contractors (4.53%).

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 orchards 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 R. 25.06 per thousand fruits and incurred expenses of Rs. 24.24. Commission charges 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 producers share in the consumer's price was highest in apple, followed by mango and guava. The cost of marketing was higher in guava than in 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 consumer's 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 → wholesalers → Retailers → consumer (middle men sales) and producer → pre-harvest contractor → commission Agents-wholesalers → 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 sale 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---Retrailers consumers and

b. Producer- Pre harvest Contractors- Retailers- consumers

He 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 cashew nut in Karnataka, identified six channels of trade namely,

1] Grower ---→ Itinerant Trader ----→ Processor

2] Grower ----→ Pre – Harvest Contractor ----→ Itinerant Traders ----→ Processor

3] Grower ---→ Village merchant ---→ Processor

4] Grower ----→ Traders ----→ Processor

5] Grower ----→ Processor

6] Grower ----→ Commission agent ----→ Trader ---→ Processor.

The results further revealed that producers share in consumer's price was more (52%) in channel-3. this share was reduced to 37.50 per cent when producer sold his crop to pre-harvest contractors.

Koujalagi and Kunnal (1991) made an attempt to identify the marketing channels and estimated the marketing costs of pomegranate in Bijapur district. They have identified two channels.

Channel-1: producer → pre-harvest contractor→commission agent cum wholesaler →retailer → consumer.

Channel–II : producer →commission agent cum wholesaler →retailer →consumer.

The total marketing cost incurred by pomegranate producer seller was Rs. 71.94 per quintal. The four items namely commission, transportation, packing material and harvesting together formed 95.88 per cent of total marketing cost. The other items namely labour charges and miscellaneous expenditure constituted the remaining part of marketing cost.

Satihal (1993) reported that a single marketing channel was observed in Bijapur district for ber crop. The per- quintal marketing cost of producer seller was the highest in Bangalore market (Rs. 119.73) followed by Hubli market (Rs. 114.35) and Bijapur market (99.88). The net returns realized per quintal was the highest in Hubli market Rs. (379.25) followed by Bijapur market (Rs. 356.61) and Bangalore market (Rs. 247) because of the price received by producer in Bangalore market was high as compared to other markets.

Gummangolmath (1994) studied the economics of production and marketing of mango in Dharwad district, Karnataka and identified the different channels of transfer of mangoes from the farmer to the consumer.

Channel-1 Producer →commission agent →Retailer →consumer

Channel-2 Producer → Pre-harvest contractor (wholesale) → Retailer → Consumer

Channel-3 Producer →Processing Units Agents → Retailer →Consumer.

Channel –4 Producer →Pre harvest Contractor → Commission agent → Retailer → Consumer.

Senthilnathan and Srinivasan (1994a) identified the following channels of banana marketing in Trichirapalli district of Tamil Nadu.

Channel-1 : Farmer → Pre-harvest contractor → secondary wholesaler

Channel-II : Farmer→pre- harvest contractor → commission agent →wholesaler → retailer →consumer.

Channel –III :Farmer→ Regulated market wholesaler → Retailer → consumer

Channel –IV : Farmer →Regulated market → secondary wholesaler.

Among these, channel-1 and channel-4 dropped for the study because of the involvement of secondary wholesaler in poven marketing, which was very limited. It was found that channel-2 was relatively efficient than that of channel-3 since the share of producer in consumer's rupee in channel-3 (71.60%) was higher than that of channel-2 (61.27%) mainly due to distress sale to the pre- harvest contractors who were the usual financiers for the farmers.

Singh (1996) studied price spread of citrus fruit in mid hill of Jammu and Kashmir. An overall view of results revealed that producers share in consumer's rupee was 35.71 per cent in channel-1 (producer → pre- harvest contractor→ retailer →consumer) and 81.25 per cent in channel-2 (producer→ retailer → consumer).

More (1999) in his study on economics of production and marketing of banana in Maharashtra state identified two important channels through which banana from the study area passed from the production to the ultimate consumers. They were,

Channel –1: Producer → Commission agent – Cum – Wholesaler → Retailer → consumer

Channel –II : Producer -→ Commission agent -→ Distant market

The estimated marketing cost of producer – seller was Rs. 15.17 per quintal, while it was Rs. 38.01 per quintal in commission agent – cum wholesaler and Rs. 52.24 per quintal in retailer. The producers share in consumer's rupee was 58.44 per cent.

Sundararadarayan and Jahanmohan (2002) studied the marketing cost, margin, price spread and marketing officers of cashew in Tamil Nadu, observed following five different marketing channels of cashew.

1] Farmer →village trader→wholesaler →processor→trader

2] Farmer →cooperative marketing society.

3] Farmer →commission agent → wholesaler→ processor.

4] Farmer→processor.

A majority of the farmers (60%) adopted channel –1. followed by channel-2 (26.25%), channel 3 (10%)and channel 4 (3.75%).

Gangal (2002) studied the performance of banana plantation in North Karnataka and identified two important marketing channels through which banana was transferred from produce to ultimate consumer's.

Channel –I: Producer →commission agent – cum – wholesales → Retailers → consumers.

Channel-II: Producers → village traders → consumers.

Nearly 70% of the farmers as well as produce were sold through commission agent cum wholesale and remaining 30% was sold through village level trades.

2.5 PROBLEMS IN PRODUCTION AND MARKETING

Hiremath (1993) expressed that, The absence of processing facility, absence of cold storage facility, fluctuations in prices were the major problems expressed by cent per cent

farmer's, and other problems were absence of cooperative marketing of lime, non-availability of packing material at reasonable price and difficulty in transportation.

Gummagolmath (1994) identified the problems through the opinion survey revealed that the problem of alternative bearing was expressed by 100 per cent orchardists in all categories of farmers. Problem of non-availability of labour was expressed by most of the medium orchardists (66.67%) followed by small orchardists (40%) and large orchardists (33.37%). Among the marketing problems, the problem of price fluctuation was expressed by 44.44 per cent of small, 36.80 per cent of medium and 50 per cent of large orchardists and other problems were high commission and existence of mutual understanding between wholesaler and commission agents.

Senthilnathan and Srinivasan (1994b) studied the problems in poovan banana cultivation in Trichy, Lalgudi and Kulithali taluks of Rrichirapalli district of Tamil Nadu. They reported that, in Trichy taluk 20 farmers expressed high initial investment, 16 wind damages, 12 price fluctuations and 10 disease problems. In Lalgudi taluk, 17 farmers expressed high initial investment, 11 price fluctuations, 13 diseases incidence and nine wind damage. In Kulithali, disease incidence expressed by 2, wind damage by 20, initial investment by 18 and price factor by 14 farmers.

Deorukhakar *et al.* (1995) studied the constraints in technology adoption of cashewnut cultivation in the Sindhudurga district of Konkan region, Maharashtra. They found that two third of the growers opined that there was no need to use of fertilizers and plant protection chemicals, high cost of fertilizers (13%) and plant protection chemicals (27%) were other constraints expressed by the cashew growers. They further reported that the 41 and 32 per cent of the respondents expressed the high cost of improved planting material and irregular supply of this input, respectively.

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

Gunjate (1997) reported problems of cashew plantation management at regional fruit research station, Vengurla, Maharashtra, he observed that some problems in cashew plantation management that non-availability of right kind of inputs, inadequate funds, non-availability of suitable form equipments and machinery, non-availability of qualified and experienced personnel. It was necessary to make available the grafts of the choicest variation in all the region replanting the gaps should be done as early as possible and it should never be lift beyond second year. The prophylactic sanitary measures recommended found to be quite affective against stem and root bores.

Khunt *et al.* (2001) studied economics of production and marketing of pomegranate and found that dying of young plant, problem of mite, inadequate irrigation water and its poor quality and short supply of electricity were major problems faced by pomegranate growers of Bahavnagar district.

III. METHODOLOGY

This chapter outlines briefly the characteristics of the study area, the methods adopted in the selection of the samples, the nature and sources of data and the various statistical tools and techniques employed in analyzing the data. These items are described under the following sub heads.

3.1 Description of the study area

3.2 Sampling procedure

3.3 Nature and sources of data

3.4 Analytical techniques

3.5 Definition of terms and concepts used

3.1 DESCRIPTION OF THE STUDY AREA

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

Karnataka comprises 27 districts, of which 12 districts are located in Northern parts of the state, two districts namely Belgaum and Dharwad districts from Northern Karnataka are chosen for study purposively due to higher concentration of area under sapota.

3.1.1 Belgaum district

The district is located in the interior of the Deccan peninsula and lies between 15°23[1] and 16°58[1] N latitude, 74°05' and 75°28' E longitudes. It is bounded on the north by Sangli district and in west Kohlapur and Rathnagiri districts of Maharashtra. On the east it is bounded by Bijapur, Bagalkot and Dharwad districts and on the west by Uttar Kannada district.

The climate of the district is divided into three zones viz. Hilly zone, North transition Zone and Northern dry zone. The average annual rainfall distribution is 808 mm. Temperature ranges from 19.5°C to 35.7°C. There are three main types of soils namely black, red sandy and sandy loam. The soils are slightly acidic and are good in organic matter. The main food crops are jowar, paddy, bajra, maize, wheat, and other cereals.Among the commercial crops tobacco, cotton, sugar cane are more popular.Major fruit crops grown in this area are grape, mango, sapota, banana,guava, pomegranate, papaya, etc.

3.1.2 Dharwad district

Dharwad district falls in the northern part of Karnataka state (Fig. 1). It is situated in the interior of the Deccan peninsula and lies between the Northern latitudes of 15°15' and 15°35' and East longitudes of 75° and 75°20'. It is bound on the North by Belgaum district, while on the South by Haveri district, on the East by Gadag district and on the West by Uttar Kannada district.

Fig. 1 : Map of Karnataka showing the study districts

The district has three distinct agro climatic belts namely Malnad, Transition and Dry tracts. The average annual rainfall of the district is around 670 mm with a bimodal distribution. The first peak occurs in May-June while the second in October. The maximum temperature is 38°C with minimum of 16°C in April-May and December-January respectively.

The soils of the district are predominantly red sandy loams with patches of black soils. The soils of the Dharwad district are practically homogeneous and red sandy loams with medium to deep black soils.

Most of the area of the district comes under rainfed condition and depends more or less absolutely on rain fall. The total geographical area of the district is 4.27 lakh hectares, which is about 2.22 per cent of the state. The district has five taluks *viz.*, Dharwad, Hubli, Kalaghatagi, Kundgol and Navalgund.

The main food crops are jowar, paddy, bajra, maize wheat, and other cereals. Among the commercial crops tobacco, cotton, sugar cane are more popular. Major fruit crops grown in this area are grape, mango, banana, sapota, guava, pomegranate, papaya, etc.

3.2 SAMPLING PROCEDURE

North Karnataka was purposively selected for undertaking the study in Karnataka state.

A multistage purposive sampling procedure was adopted for the purpose of selection of representative districts, taluks and villages. Which are detailed below:

3.2.1 Selection of the study area

As it has been already mentioned, Belgaum and Dharwad occupy preeminent position in cultivation of sapota in Northern Karnataka, with 7.2 and 5.4 per cent of the total area of the state respectively (table 3.1).

Sapota has been cultivated in twelve districts of Northern Karnataka. However, the large-scale cultivation of Sapota is concentrated primarily in Belgaum and Dharwad districts. These two districts together (2668 ha) accounted for 34.83 per cent area in the Northern Karnataka. These districts are agro-climatically almost homogeneous. Hence, these two districts were specifically selected for the study.

3.2.2 Selection of the sample taluks

Sapota is cultivated in all taluks of Belgaum and Dharwad districts. However, the large-scale cultivation of sapota is concentrated in Khanapur (1044 ha) and Belgaum (340 ha) in Belgaum district; Khalaghatagi (373 ha) and Hubli (332 ha) taluks in Dharwad district. Hence, these taluks were selected for the study.

The taluk wise area under sapota during 2004-05 in Belgaum and Dharwad districts is given in Table 3.2 and 3.3 respectively.

3.2.3 Selection of the sample villages

From the selected sample taluks of Belgaum and Dharwad districts a list of villages having more area under sapota is prepared in consultation with the Assistant horticulture officers of the selected taluks.

Table 3.1. District wise area, production and Productivity of sapota in Karnataka state (2002-03)

Sl. No.	Districts	Area (ha)	Production (tons)	Productivity (t/ha)
1.	Bangalore (urban)	798	8398	11
2.	Bangalore (rural)	1666	16380	10
3.	Kolar	3185	35066	11
4.	Tumkur	222	2220	10
5.	Chhitradurga	888	10206	11
6.	Davanagere	405	4860	12
7.	Shimoga	199	2097	11
8.	Mysore	382	3960	10
9.	Chamarajanagar	163	1630	10
10.	Mandya	896	6773	8
11.	Kodagu	1170	14040	12
12.	Dakshina Kannada	139	1334	10
13.	Udupi	951	14265	15
14.	Hassan	552	4509	8
15.	Chikkamagalur	1339	13390	10
16.	Belgaum	1520	17337	11
17.	Bijapur	256	2560	10
18.	Bagalkot	710	7921	11
19.	Dharwad	1148	12432	11
20.	Gadag	593	5932	10
21.	Haveri	1050	10494	10
22.	Uttar Kannada	146	1030	7
23.	Gulbarga	207	2070	10
24.	Raichur	1155	11550	10
25.	Koppal	457	4660	10
26.	Bellary	786	8050	10
27.	Bidar	30	300	10
	Total	21013	**223464**	**279**

Source: Horticultural crop statistics of Karnataka state at a glance 2002-03.

3.2.4 Selection of the sample respondents

The list of sapota cultivators was obtained from the revenue records mainted at the selected villages. A proportionate sample of 20 percent cultivators from each village was selected randomly. In all 90 sapota cultivators were selected from 8 villages of 4 taluks for the detailed study.

From each district 45 sample farmers were selected randomly thus forming a total sample size of 90 farmers.

3.2.5 Selection of wholesale cum commission agent and retailers

In the study area as a whole, 10 commission agents cum wholesale traders and 10 retailers were selected at random for the study.

3.3 NATURE AND SOURCES OF DATA

3.3.1 Primary data

The data needed for the study were collected from the respondents by personal interview method using pre-tested schedule. The data pertained to the agriculture year 2005-06. Majority of the respondents did not maintain records of the expenditure and income from sapota cultivation. Hence, data collected was based on the memory of the respondents. At the time of interviews, personal bias of the sample farmers was minimized by convincing them about the genuinity of the purpose for which the data were collected. The data collected were to fulfill the objectives of the study from the selected respondents. Data were based on the entire operations in establishing and maintaining the Sapota orchards and the consequent costs and returns including marketing. Similarly, the data on marketing aspects from wholesaler-cum-commission agents and retailers were collected by personal interview method with help of structured schedule. Similarly the problems in production and marketing were collected through opinion survey.

3.3.2 Secondary data

The secondary data on area, production and productivity of Sapota at district wise in Karnataka were collected for a period of 9 years from 1994-95 to 2002-03 from Directorate of Horticulture, Lalbagh, Bangalore.

3.4 ANALYTICAL TOOLS AND TECHNIQUES

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

1. Tabular analysis
2. Growth rate analysis
3. Financial analysis

3.4.1 Tabular analysis

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

Table 3.2. Taluk wise area, production and yield of sapota in Belgaum District (2004-05)

Sl. No.	Taluks	Area (ha)	Production (t)	Productivity (t/ha)
1	Athani	14	168	12
2	Belgaum	340	3400	10
3	Bailahongal	42	504	12
4	Chikkodi	17	170	10
5	Gokak	50	600	12
6	Hukkeri	44	440	10
7	Khanapur	1044	12528	12
8	Ramadurga	26	260	10
9	Raibhag	209	167.5	0.80
10	Saudathi	46	598	13
	Total	**1832**	**18835.5**	**101.8**

Source: Horticultural crop statistics of Belgaum district at a glance 2004-05.

Table 3.3. Taluk wise area, production and yield of sapota in Dharwad District (2004-05)

Sl. No.	Taluks	Area (ha)	Production (t)	Productivity (t/ha)
1	Dharwad	314	3768	12
2	Hubli	332	3984	12
3	Kalaghatagi	373	5595	15
4	kundagol	108	1080	10
5	Navalgund	6	60	10
	Total	**1133**	**14487**	**59**

Source: Horticultural crop statistics of Dharwad district at a glance 2004-05

Table: 3.4. List of selected villages

Sl. No.	Districts	Taluks	Villages
1.	Belgaum	Khanapur	Bailur Olamani
		Belgaum	Belagundi Karle
2.	Dharwad	Hubli	Mavanur Katnur
		Kalaghatagi	Kuruvina koppa Ugganikere

3.4.2 Growth rate analysis

For evaluating the trend in area, production and productivity under sapota in Karnataka state and in the study districts. The following growth model was employed.

$$Y_t = ab^t u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

Y_t = area/production/productivity in the year't'

a = intercept indicating Y in the base period (t = 0)

b = Regression coefficient

T = Time period in years

u_t = Disturbance term for the year 't'.

Equation (1) was converted into the logarithmic form in order to facilitate the use of linear regression. Taking logarithm on both sides of the equation (1).

$$l_n Y = l_n a + t\, l_n\, b + l_n U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

This is of the following form,

$$Q_t = A + B_t + e_t$$

Where,

$Q_t = l_n\, Y_t$

$A = l_n a$

$B = l_n b$

$e_t = l_n e_t$

The linear regression of the above form was fitted separately for area, production and productivity of sapota. The values of 'a' and 'b' were estimated by using ordinary least squares technique.

Later, the original 'a' and 'b' parameters in equation (1) were obtained by taking anti-logarithms of 'a' and 'b' values as,

a = Anti A

b = Anti B

Average annual compound rate was calculated as

b = 1 + g

g = b – 1

To obtain percentage compound growth rate the value of g was multiplied by 100.

3.4.3 Financial analysis

The techniques used for the financial analysis were:

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

3.4.3.1 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 9.5 per cent was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by

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

Where,

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

r = refers to the discount factor

I = Initial investment

3.4.3.2 Benefit Cost Ratio

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

$$B:C \text{ ratio} = \frac{\text{Discounted cash inflows}}{\text{Discounted cash outflows}}$$

3.4.3.3 Internal Rate of Return (IRR)

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:

$$IRR = \text{Lower discount rate} + \text{the two discount rates} \frac{\text{Difference between}}{\left(\begin{array}{l}\text{Present worth of cash flows}\\ \text{at lower discount rate}\end{array}\right)} \over \left(\begin{array}{l}\text{Absolute difference between}\\ \text{Present worth cash flows}\\ \text{Stream at the two discount rates}\end{array}\right)}$$

3.4.3.4 Pay Back Period (PBP)

Pay back period represents the length of time required for the stream of cash proceeds produced by the investment to be equal to the original cash outlay. i.e. the time required for the project to pay for it self. In the present study, pay back period was calculated

by successively deducting the initial investment from the net returns until the initial investment is fully recovered.

3.5 DEFINITION OF TERMS AND CONCEPTS USED

The procedure used to compute the following concepts are given below:

1. Hired human labour

Hired human labour was estimated in terms of 8 hours of work. The women labour days were converted into men days on the criteria that one women day is equal to 0.6 men days on the basis of wage rate equivalence. Similar methodology was adopted by Gummagolamath (1993). The prevailing wage rates were Rs. 50 per day for male labour and Rs. 30 per day for female labour.

2. Machine power

It is measured in pair hours. Here one pair means one hour of work by a tractor and a man required to operate this tractor. It was valued at the rate of Rs. 400 per hour.

3. Planting material

Seedlings purchased from nursery at the rate prevailing in the study area was treated as planting material cost.

4. Farm Yard Manure (FYM)

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

5. Fertilizers

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

6. Irrigation charges

The charges for electricity or fuel paid towards lifting well water were allocated to the sapota crop in proportion to the area under each crop.

7. Implement charges

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

8. Land revenue and other taxes

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

9. Rental value of land

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

10. Interest on fixed capital

Interest on fixed capital was calculated at the rate of 11 per cent on fixed capital at which the banks charge for the long-term loan.

11. Interest on working capital

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

12. Price spread

The difference between the price paid by the consumer and price received by the producer was the marketing margin or price spread.

13. Gross income

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

14. Net returns

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

15 Commission agents

Commission agent is a licensed market functionary operating in APMC receives the produce from the sellers and arrange for sales. The commission agent is suppose to collect commission from the buyers of the produce as per KAPM (R) Act-1966.

16 Trader

Trader is licensed market functionary who purchases the notified commodities in APMC from either producer seller or commission agent and sells the same to different buyers.

17 Retailers

Retailers sell the sapota directly to the consumer in the market. They purchase the produce either from trader or commission agent and sell it to consumers.

IV. RESULTS

This study was conducted in Belgaum and Dharwad districts of Karnataka. The necessary data was collected from the sample farmers spread over four taluks in above mentioned districts. The data was subjected to various statistical tools to draw meaningful conclusions. The main results of the study are presented in this chapter under the following heads.

4.1 General characteristics of sample farmers

4.2 Growth and status of area, production and productivity of sapota in Karnataka

4.3 Cost and returns from sapota orchard

4.4 Financial feasibility of investment in sapota orchard

4.5 Marketing of sapota

4.6 Problems in production and marketing of sapota

4.1 GENERAL CHARACTERISTICS OF SAMPLE FARMERS

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

From the table, it could be seen that the average age of the sapota growers was about 47 years and the main occupation of them was agriculture. It could be further observed that majority of the respondents were literate (81%), having their education ranging from primary to college level. The remaining 19 per cent of growers were illiterates.

From the Table it could also be seen that the average size of the family was about seven and average land holding was 2.65 ha, of which 1.3 ha was irrigated and remaining 1.29 ha was dryland. And average area under sapota cultivation in Belgaum, Dharwad district and pooled was around 1.58, 1.47 and 1.52 ha respectively.

4.2 GROWTH IN AREA, PRODUCTION AND PRODUCTIVITY OF SAPOTA IN KARNATAKA

Growth rates of area, production and productivity of sapota in Belgaum and Dharwad district as well as state as a whole for the period from 1994-95 to 2004-05 have been depicted in the Table 4.2.

It was seen from the Table that negative growth in area was observed in the Belgaum district, positive for Dharwad district and state as a whole, And with respect to production and productivity the growth rate was negative for Belgaum district, Dharwad district and state as a whole.

However, growth rates in area and production of sapota in case of Dharwad district were found the highest. The corresponding figures were 3.73 and -4.77 per cent respectively. Whereas Belgaum district registered an growth rate of -3.07 per cent in case of area, -9.18 per cent in production and -6.30 per cent in case of productivity. On the contrary a higher growth rate were observed in case of state as a whole, which registered a positive growth rate of area (4.54%) and negative growth rate of production (-1.98%) and productivity (-6.24%) of sapota.

Table 4.1. General characteristics of sample farmers

Sl. No.	Particulars	Unit	Belgaum	Dharwad	Pooled
			n=45	n=45	n=90
1	Age	Years	47.14	47.16	47.15
2	Occupation				
	Main (agriculture)	No.	38	39	71
	Agriculture as Subsidiary occupation	No.	7	6	14
3	Education				
	Illiterate		10(22)	7(16)	17(19)
	Primary		18(40)	15(33)	33(37)
	High school		10(22)	13(29)	23(26)
	College		7(16)	10(22)	17(19)
	Total		45(100)	45(100)	90(100)
4	Area under sapota	Ha	1.58	1.47	1.52
5	Variety		Kalipatti and cricket ball	Kalipatti and cricket ball	Kalipatti and cricket ball
6	Plant population	Plants/Ha	93.3	95.99	94.645
7	Family size	No	6.48	6.98	6.73
8	Land holdings				
	Irrigated	Hectares	1.38	1.22	1.3
	Dry land	Hectares	1.51	1.08	1.29
	Total	Hectares	2.89	2.44	2.65

Note: Figures in parenthesis represent percent to the total

Table 4.2. Growth rate of area, production and productivity of sapota in the study area (1994-95 to 2004-05)

(% Per annum)

Sl. No.	Particulars	*Compound growth rate*		
		Area	**Production**	**Productivity**
1	Belgaum	-3.07	-9.18	-6.30
2	Dharwad	3.73	-4.77	-8.20
3	Karnataka	4.54	-1.98	-6.24

Table 4.3. Investment pattern in sapota orchards

(Rs./ha)

Sl. No.	Particulars	Belgaum district		Dharwad district	
		Value	**%**	**Value**	**%**
A.	**Investment costs**				
1	Rental value of Land	3750	3.16	3745	3.29
2	Well	15000	12.64	15000	13.17
3	Pump set	30000	25.28	30000	26.33
4	Pump house	5860	4.94	5540	4.86
5	Sprayer	750	0.63	750	0.66
6	Plant material	4025	3.39	3325	2.92
7	Investment in digging of pits and planting	6387.5	5.38	6387.5	5.61
8	Staking	450	0.38	345.5	0.30
9	Fencing	1050	0.88	955.5	0.84
	Total	**67272.5**	**56.69**	**66048.5**	**57.97**
B.	**Maintenance cost up to bearing period**				
	I year	11422.57	9.63	9465.03	8.31
	II year	12611.33	10.63	11933.13	10.47
	III year	12921.51	10.89	12712.31	11.16
	IV year	14438.65	12.17	13768.42	12.09
	Sub total (I+II+III+IV)	**51394.06**	**43.31**	**47878.88**	**42.03**
	Total establishment cost (A+B)	**118666.56**	**100.00**	**113927.38**	**100.00**

4.3 COST AND RETURNS FROM SAPOTA ORCHARDS

4.3.1 Establishment cost of sapota orchard

The establishment cost per ha of sapota orchard was estimated, considering the quantity of inputs and labour used and their respective market price and wages prevailed in the study area.

The details of the findings on the establishment cost are presented in Table 4.3.and presented in the following sub heads.

The establishment of sapota orchards needs four years the establishment cost in sapota orchards are classified into investment cost and maintenance cost. The investment cost includes the cost on rental value of land, well, pump set, pump house, sprayer, plant material, investment in digging of pits and planting, staking and fencing. The maintenance cost includes cost on digging labour for various operations and material cost and fixed cost during gestation period

The results of the analysis of cost of establishment in two different districts were presented in Table 4.3. The investment costs were considered for beginning period of the establishment with the maintenance cost was for four years period up to the bearing stage. The per hectare total cost of establishment were Rs.118666.56 for the orchards in Belgaum district and Rs. 113927 for the orchards in Dharwad district.

Belgaum district : It was observed from the Table that the share of investment cost in the total establishment cost was Rs. 67272.5 (56.59%). The value of Pumpset accounted for Rs.30000 (25.28%)The next major item contributing for the investment cost was well Rs.15000 accounted for 12.64 per cent the other item of costs were pump house, fencing, cost on digging of pits and gap filling, staking, plant material ,land value constitute 4.94, 0.88, 5.38, 0.38, 3.39,3.16 per cent respectively

The maintenance cost which are considered for the gestation period increasing from Rs.11422.57 to Rs.14438.06 the total maintenance cost up to bearing period accounted for Rs.51394.06 (43.31%) to the total establishment cost.

Dharwad district: It can be observed from the Table that the share of investment cost in the total establishment cost was Rs.66048.5 (57.97%). The value of Pumpset accounted for Rs.30000 (26.33%)The next major item contributing for the investment cost was well Rs.15000 accounted for 13.17 per cent the other item of costs were pump house, fencing, cost on digging of pits and gap filling, staking, plant material , land value constitute 4.86, 0.84, 5.61, 0.30, 2.92, 3.29 per cent respectively

The maintenance cost which are considered for the gestation period increasing from Rs.9465.03 to Rs.13768.42 the total maintenance cost up to bearing period accounted for Rs.5147878.88 (42.03%) to the total establishment cost.

4.3.2 Maintenance cost during gestation period of sapota orchard

4.3.2.1 Belgaum district

It was observed from the Table 4.4 that the average per ha establishment cost incurred by sapota growers during gestation period was Rs. 51394.06. Out of this the labour, material and fixed costs accounted for about 46.78, 14.30 and 37.72 per cent, respectively.

The major item of labour cost was on irrigation, watch and ward (Rs. 9300) which formed 18.10 per cent of total establishment cost followed by land preparation (Rs.2736), fertilizer application (Rs.4315.5) weeding (Rs.3929), fencing (Rs.412.5) and others contributed 5.32, 2.00, 7.65, 0.08, and 4.49 per cent of the total establishment cost respectively.

The material cost amounted to Rs. 7976.44, out of which cost of FYM (7.88%), cost of fertilizer (2.93) and cost of PPC (0.57%) and others contributed about 2.57 per cent to total establishment cost.

The fixed cost accounted for Rs. 19386, of which major item was imputed rental value of land paid to land (29.19%) followed by depreciation (4.77%) interest on fixed capital 3.57 per cent. respectively.

4.3.2.2 Dharwad district

In case of Dharwad district the average per ha cost incurred by sapota growing farmers was Rs. 47878.88 Out of this the labour, material and fixed costs accounted for about 44.85, 14.66 and 40.49 and per cent, respectively.

The major item of labour cost was on irrigation, watch and ward (Rs. 8489) which formed 17.73 per cent of total establishment cost followed by land preparation (Rs.2736), fertilizer application (Rs.3639) weeding (Rs.2720), fencing (Rs.412.5) and others contributed 5.71, 1.71, 5.68, 0.88, and 4.82 per cent of the total establishment cost respectively.

The material cost amounted to Rs. 7020.67, out of this cost of FYM (6.86%), cost of fertilizer (3.07) and cost of PPC (0.45%) and others (3.13%) Contributed to total establishment cost.

The fixed cost accounted for Rs. 19386 of which major cost was of imputed rental value of land (31.33%) followed by depreciation 5.11 per cent interest on fixed capital 3.48 per cent and land revenue 0.21 per cent. respectively.

4.3.2 Maintenance cost of sapota orchard during bearing period

Maintenance costs were the recurring costs incurred after the establishment of the orchard i.e., from fourth year onwards for upkeep of the plants so that good yield can be obtained over the economic lifespan of the plants. The maintenance cost included the expenditure towards the use of labour and other material inputs per year along with fixed cost for different age group of orchards.

4.3.2.1 Belgaum district

It was observed from the Table 4.6 that the average use of labours per ha was amounted to Rs. 8661.1which formed of 51.01 per cent to the total maintenance cost. Out of the items major contribution of cost was made through harvesting (18.49%) followed by irrigation, watch and ward, Ploughing/harrowing, FYM application weeding and application of PPC, which accounted for 12.57, 5.77, 5.32, 4.46 and 1.33per cent respectively.

The total cost of maintenance was Rs16952.38 from fourth year onwards. It was observed that annual average cost of FYM was Rs.1101.6, which formed 6.49 per cent of the total maintenance cost, followed by fertilizer Rs 581.28 (3.42%) plant protection chemicals Rs 799.20 (4.71) of the total maintenance cost.

Fixed cost constitutes cost of rental value of land 22.12%, apportioned establishment cost 5.70 % and depreciation 3.32 % to total cost.

4.3.2.2 Dharwad district

It was observed from the Table 4.6 that the average expenditure on labourers per ha was amounted to Rs. 8170.30, which formed of 52.17 per cent to the total maintenance cost. Out of the items of labour cost major item was harvesting (21.61%) followed by irrigation, watch and ward Ploughing/harrowing, FYM application, weeding and application of PPC, which accounted for 13.61, 5.76, 2.74, 4.48, and 1.05 per cent respectively.

Table 4.4. Maintenance cost of sapota orchard during gestation period in Belgaum District

(Rs./ha)

Sl. No.	Particulars	I year	II year	III year	IV year	Total	%
I.	**VARIABLE COST**						
A	**Labour cost**						
1	Land preparation		912	820	1004	2736	5.32
3	Gap filling		147	69		216	0.42
4	FYM application	1012.5	1076	1111.5	1115.5	4315.5	8.40
5	Fertilizer application	210	239	278	301	1028	2.00
6	Weeding	806	1008.4	1025.2	1090	3929.6	7.65
7	Fencing			162.5	250	412.5	0.80
9	PPC spraying			212.5	281.5	494	0.96
10	Irrigation, watch and ward	2250	2300	2400	2350	9300	18.10
11	Miscellaneous	400	400	400	400	1600	3.11
	Total labour cost (A)	**4678.5**	**6082.4**	**6478.7**	**6792**	**24031.6**	**46.76**
B	**Material cost**						
1	Seedlings for gap filling		175			175	0.34
2	Manure	1260	902	935	952.6	4049.6	7.88
3	Fertilizers	111.40	133.18	136.78	1127	1508.37	2.93
4	PPC			70.5	225	295.50	0.57
5	Others	378.41	335.82	312.24	296.62	1323.09	2.57
	Sub Total	**1749.81**	**1546.00**	**1454.52**	**2601.22**	**7351.56**	
	Interest on working capital @ 8.5%	148.73	131.41	123.63	221.10	624.88	1.22
	Total material cost (B)	**1898.55**	**1677.42**	**1578.15**	**2822.32**	**7976.44**	**15.52**
	Total Variable Cost A+B	**6577.05**	**7759.82**	**8056.85**	**9614.32**	**32008.04**	
II	**FIXED COST**						
1	Rent value	3750	3750	3750	3750	15000.00	29.19
2	Land revenue	25	25	25	25	100.00	0.19
3	Depreciation	614	616	628	591	2449.00	4.77
4	Interest on fixed capital @ 9.5%	456.52	460.51	461.65	458.32	1837.02	3.57
	Total fixed cost II	**4845.52**	**4851.51**	**4864.65**	**4824.32**	**19386.02**	**37.72**
	Total cost (I+II)	**11422.57**	**12611.33**	**12921.51**	**14438.65**	**51394.06**	**100.0**

Table 4.5. Maintenance cost of sapota plantation during gestation period in Dharwad District

(Rs./ha)

Sl. No.	Particulars	I year	II year	III year	IV year	Total	%
I	**VARIABLE COST**						
A	**Labour cost**						
1	Land preparation		912	820	1004	2736	5.71
3	Planting and gap filling		147	69		216	0.45
4	FYM application		978	1499	1162.5	3639.5	7.60
5	Fertilizer application	168.50	189	206	256.5	820	1.71
6	Weeding	628.4	661.2	690	740.4	2720	5.68
7	Fencing			162.5	250	412.5	0.86
8	Stalking	345.2				345.2	0.72
9	PPC spraying			212.5	281.5	494	1.03
10	Irrigation, watch and ward	2050	2117	2210.5	2111.5	8489	17.73
11	Miscellaneous	400	400	400	400	1600	3.34
	Total labour cost (A)	**3592.10**	**5404.2**	**6269.5**	**6206.4**	**21472.2**	**44.85**
B	**Material cost**						
1	Seedling		175			175	0.37
2	Manure	495	902	935	952.6	3284.60	6.86
3	Fertilizers	73.51	133.18	136.78	1127	1470.47	3.07
4	PPC			70.5	147	217.50	0.45
5	Others	378.41	335.82	312.24	296.62	1323.09	2.76
	Sub total	**946.92**	**1546.00**	**1454.52**	**2523.22**	**6470.66**	**31.51**
	Interest on working capital @ 8.5%	80.49	131.41	123.63	214.47	550.01	1.15
	Total material cost (B)	**1027.41**	**1677.42**	**1578.15**	**2737.69**	**7020.67**	
	Total Variable Cost (A+B)	**4619.51**	**7081.62**	**7847.65**	**8944.09**	**28492.87**	**14.66**
II	**FIXED COST**						
1	Rent value	3750	3750	3750	3750	15000.00	31.33
2	Land revenue	25	25	25	25	100.00	0.21
3	Depreciation	614	616	628	591	2449.00	5.11
4	Interest on fixed capital @ 9.5%	456.52	460.51	461.65	458.33	1837.02	3.84
	Total Fixed Cost II	**4845.52**	**4851.51**	**4864.65**	**4824.33**	**19386.02**	**40.49**
	Total cost (I+II)	**9465.03**	**11933.13**	**12712.31**	**13768.42**	**47878.88**	**100.00**

Table 4.6. Maintenance cost of sapota orchard in bearing period (IV year onwards)

(Rs./ha/year)

Sl. No.	Particulars	UNIT	Belgaum			Dharwad		
			QTY	VALUE	%	QTY	VALUE	%
I.	**Variable cost**							
A.	**Labour cost**							
1	Ploughing/Harrowing	PD	5.64	902.40	5.32	5.64	902.40	5.76
2	Application of FYM	MD	19.59	979.50	5.78	8.58	429	2.74
3	Application of Fertilizers	MD	4.61	230.50	1.36	3.12	156	1.00
4	Application of PPC	MD	4.53	226.50	1.34	3.29	164.5	1.05
5	weeding	MD	18.91	756.40	4.46	17.56	702.4	4.48
6	Irrigation, watch and ward	MD	42.63	2131.50	12.57	42.63	2131.5	13.61
7	Harvesting	MD	62.69	3134.50	18.49	67.69	3384.5	21.61
8	Miscellaneous		300	300	1.77		300	1.92
	Total labour cost			8661.3	**51.09**		8170.3	**52.17**
B	**Material cost**							
1	FYM	Tonnes	4.59	1101.6	6.50	2.59	621.6	3.97
2	Fertilizers	Kgs	57.61	581.28	3.43	36.67	370.00	2.36
3	PPC	Liters	4.44	799.2	4.71	3.84	691.2	4.41
	Total material cost			2482.08			1682.80	
	Sub total (A+B)			11143.38			9853.10	
II	**FIXED COST**							
1	Rental Value of land			3750	22.12		3750	23.94
2	Land revenue			25	0.15		25	0.16
3	Apportioned establishment cost			967	5.70		967	6.17
4	Depreciation			563	3.32		563	3.59
5	Interest on fixed cost			504	2.97		504	3.22
	Total fixed cost			5809			5809	
	Grand total (I+II)			**16952.38**	**100.00**		**15662.10**	**100**

The total maintenance cost was Rs. 15662.10 from fourth year onwards. It was observed that annual average cost of FYM was Rs. 621.6, which formed 3.97 per cent of the total maintenance cost, followed by fertilizer (2.36%) and plant protection chemicals (4.11%).

Fixed cost includes the cost incurred on rental value of land (22.12%), apportioned establishment cost (6.17%) followed by depreciation (3.59%) and interest on fixed capital (3.22 %) to the total cost.

4.3.3 Yield and return structure of sapota

It could be seen from Table 4.7 that the average yield of sapota obtained by the sample farmers from Belgaum district worked out to 11.09 tons per ha and returns were about Rs. 57679.26.

Similarly the average total yield of sapota obtained by the sample farmers from Dharwad district worked out to be 11.57 tons per ha and returns were about Rs. 60149.26.

4.3.4 Cash flows in sapota orchard

The cost incurred and returns obtained in sapota orchards are presented in Table 4.8 and 4.9.

4.3.4.1 Belgaum district

The cost per ha in sapota orchard from the fifth year was Rs. 16592.38 and it remained same until the thirtieth year. Then it declined to 13427.23 in fortieth year. On the other hand the return from the fifth year was Rs. 12740 and in seventh year it was Rs. 35724. Further the discounted net returns at 9.5 per cent, in fifth year was Rs. 120.62 And in seventh year it was Rs. 10976.12 and then in fortieth year it decreased to Rs. 307.87.

4.3.4.2 Dharwad district

From the Table 4.9 it is evident that the cost per ha in sapota orchard from the fifth year was Rs. 15023 and it remain same until thirtieth year. Then it was decreased to Rs.10266.23, in the fortieth year. On the other hand the return from the fifth year was Rs. 13780 and in seventh year it was Rs. 36764. Further the discounted net returns at 9.5 per cent, in fifth year was Rs. -781.59 and in seventh year it was Rs. 11518.10 and then in fortieth year it decreased to Rs. 833.46.

4.4 FINANCIAL FEASIBILITY OF INVESTMENT IN SAPOTA ORCHARD

To evaluate the feasibility of investment in sapota enterprise, the criteria such as Net Present Value/worth, Benefit-Cost Ratio, Pay Back Period and Internal Rate of Return were employed and the results are presented in Table 4.10.

4.4.1 Net Present Value (NPV)

Net present worth of an investment is the difference between the present value of series of inflows (returns) and outflows (costs) over the economic life period of the sapota enterprises. Net Present Worth for the orchards in Belgaum district was Rs. 136720.87 per ha. Where as in Dharwad district it was 165438.68 per ha at 9.5 per cent discount rate.

4.4.2 Benefit Cost Ratio (BCR)

This criterion indicates the rate of return per rupee invested in sapota enterprise. The benefit-cost ratio at 9.5 per cent discount rate was 3.10 for the orchards in Belgaum district and it was 3.61 in Dharwad district.

Table 4.7. Yield and return structure of sapota in the study area

Sl. No.	Particulars	Belgaum district		Dharwad district	
		Yield	Total value	Yield	Total value
	Period	(t/ha)	(Rs.)	(t/ha)	(Rs.)
1	5th	2.45	12740	2.65	13780
2	6th	4.66	24232	4.86	25272
3	7th	6.87	35724	7.07	36764
4	8th	9.85	51230	10.35	53830
5	9th	9.95	51750	10.45	54350
6	10th	10.05	52260	10.55	54860
7	11th	11.05	57481	11.55	60081
8	12th	11.54	60008	12.04	62608
9	13th	12.63	65676	13.13	68276
10	14th	12.63	65676	13.13	68276
11	15th	12.63	65676	13.13	68276
12	16th	12.63	65676	13.13	68276
13	17th	12.63	65676	13.13	68276
14	18th	12.63	65676	13.13	68276
15	19th	12.63	65676	13.13	68276
16	20th	12.63	65676	13.13	68276
17	21st	12.63	65676	13.13	68276
18	22nd	12.63	65676	13.13	68276
19	23rd	12.63	65676	13.13	68276
20	24th	12.63	65676	13.13	68276
21	25th	12.63	65676	13.13	68276
22	26th	12.63	65676	13.13	68276
23	27th	12.63	65676	13.13	68276
24	28th	12.63	65676	13.13	68276
25	29th	12.63	65676	13.13	68276
26	30th	12.63	65676	13.13	68276
27	31st	12.63	65676	13.13	68276
28	32nd	12.63	65676	13.13	68276
29	33rd	12.63	65676	13.13	68276
30	34th	12.05	62660	12.55	65260
31	35th	11.1	57720	11.60	60320
32	36th	10	52000	10.50	54600
33	37th	9.53	49556	10.03	52156
34	38th	9.05	47060	9.55	49660
35	39th	8.41	43732	8.91	46332
36	40th	7.52	39104	8.02	41704
	TOTAL	**399.32**	**2076454**	**416.42**	**2165373.60**

Table 4.8. Cash flow analysis of sapota orchard in Belgaum district

Sl No.	Cash outflow	Cash inflow	Net cash flow	D.F at 9.5%	Discounted net cash flow
0	67272.5	0	-67272.5		
1	4082.43	0	-4082.43	0.913	-3404.79
2	9896.13	0	-9896.13	0.834	-7537.43
3	12712.31	0	-12712.31	0.762	-8842.35
4	13768.42	0	-13768.42	0.696	-9576.96
5	16952.38	12740	-4212.38	0.635	-2675.82
6	16952.38	24232	7279.62	0.580	4223.03
7	16952.38	35724	18771.62	0.530	9944.95
8	16952.38	51230	34278.02	0.484	16584.51
9	16952.38	51750	34798.02	0.442	15375.43
10	16952.38	52260	35307.62	0.404	14247.12
11	16952.38	57481	40528.42	0.369	14934.97
12	16952.38	60008	43055.62	0.337	14489.73
13	16952.38	65676	48723.62	0.307	14974.62
14	16952.38	65676	48723.62	0.281	13675.46
15	16952.38	65676	48723.62	0.256	12489.00
16	16952.38	65676	48723.62	0.234	11405.48
17	16952.38	65676	48723.62	0.214	10415.96
18	16952.38	65676	48723.62	0.195	9512.30
19	16952.38	65676	48723.62	0.178	8687.03
20	16952.38	65676	48723.62	0.163	7933.36
21	16952.38	65676	48723.62	0.149	7245.08
22	16952.38	65676	48723.62	0.136	6616.51
23	16952.38	65676	48723.62	0.124	6042.47
24	16952.38	65676	48723.62	0.113	5518.24
25	16952.38	65676	48723.62	0.103	5039.49
26	16952.38	65676	48723.62	0.094	4602.27
27	16952.38	65676	48723.62	0.086	4202.99
28	16952.38	65676	48723.62	0.079	3838.35
29	16952.38	65676	48723.62	0.072	3505.34
30	16952.38	65676	48723.62	0.066	3201.22
31	15563.02	65676	50112.98	0.060	3006.86
32	15563.02	65676	50112.98	0.055	2745.99
33	15563.02	65676	50112.98	0.050	2507.75
34	15563.02	62660	47096.98	0.046	2152.35
35	14569.50	57720	43150.50	0.042	1800.91
36	14569.50	50050	35480.50	0.038	1352.33
37	14569.50	45650	31080.50	0.035	1081.85
38	13427.23	35050	21622.77	0.032	687.35
39	13427.23	30102	16674.77	0.029	484.07
40	13427.23	25040	11612.77	0.027	307.87
	Total				**212794.88**

Table 4.9. Cash flow analysis of sapota orchard in Dharwad district

Years	Cash outflow	Cash inflow	Net cash flow	D.F at 9.5%	Discounted net cash flow
0	66048.5	0.00	-66048.5		
1	18107.72	0.00	-18107.72	0.913	-16536.73
2	4082.43	0.00	-4082.43	0.834	-3404.79
3	12712.31	0.00	-12712.31	0.762	-9682.38
4	13768.42	0.00	-13768.42	0.696	-9576.96
5	15023.00	13780	-1243.00	0.635	-789.59
6	15023.00	25272	10249.00	0.580	5945.61
7	15023.00	36764	21741.00	0.530	11518.10
8	15502.66	53830	38327.74	0.484	18543.87
9	15662.10	54350	38688.30	0.442	17094.35
10	15662.10	54860	39197.90	0.404	15816.91
11	15662.10	60081	44418.70	0.369	16368.56
12	15662.10	62608	46945.90	0.337	15798.95
13	15662.10	68276	52613.90	0.307	16170.26
14	15662.10	68276	52613.90	0.281	14767.36
15	15662.10	68276	52613.90	0.256	13486.17
16	15662.10	68276	52613.90	0.234	12316.14
17	15662.10	68276	52613.90	0.214	11247.62
18	15662.10	68276	52613.90	0.195	10271.80
19	15662.10	68276	52613.90	0.178	9380.63
20	15662.10	68276	52613.90	0.163	8566.79
21	15662.10	68276	52613.90	0.149	7823.55
22	15662.10	68276	52613.90	0.136	7144.80
23	15662.10	68276	52613.90	0.124	6524.93
24	15662.10	68276	52613.90	0.113	5958.84
25	15662.10	68276	52613.90	0.103	5441.86
26	15662.10	68276	52613.90	0.094	4969.74
27	15662.10	68276	52613.90	0.086	4538.57
28	15662.10	68276	52613.90	0.079	4144.82
29	15662.10	68276	52613.90	0.072	3785.22
30	15662.10	68276	52613.90	0.066	3456.82
31	14523.25	68276	53752.75	0.060	3225.25
32	14105.36	68276	54170.64	0.055	2968.33
33	14563.02	68276	53712.98	0.050	2687.90
34	14563.02	65260	50696.98	0.046	2316.87
35	14569.50	60320	45750.50	0.042	1909.42
36	13569.50	54600	41030.50	0.038	1563.86
37	13569.50	52156	38586.50	0.035	1343.11
38	12427.23	49660	37232.77	0.032	1183.56
39	11254.23	46332	35077.77	0.029	1018.31
40	10266.23	41704	31437.77	0.027	833.46
	Total				**212034.17**

Table 4.10. Financial feasibility of investment in sapota orchard

Sl. No.	Particulars	Units	Belgaum	Dharwad
1.	Net Present Value (At 9.5 % discount rate)	Rs./ha	136720.87	165438.68
2.	Benefit Cost Ratio (At 9.5 % discount rate)		3.10	3.61
4.	Internal Rate of Return	Per cent	18	21
3.	Pay Back Period	Years	6.03	5.79

4.4.3 Pay Back Period (PBP)

It is the period required to recover the initial investment incurred in establishing the orchard. In the present study the pay back period was about 6 years for the orchards in Belgaum district and in Dharwad district it was 5.79 years. This clearly indicated that it would take 6 years in Belgaum and 5.79 years to recover the entire investment. However, this criterion neglects the net returns realized by the farmers after 7 years, which may be more significant in the case of long-term enterprise like sapota.

4.4.4 Internal Rate of Return (IRR)

This criterion measures the rate of return that can be realized by investment of the returns in sapota orchard. Hence, the IRR indicates an important basis of investment and better than other criteria of evaluation, which do not consider the reinvestment opportunities. The value of IRR generally depends on the magnitude of returns realized in each year over the economic life period and more particularly in the initial years of sapota enterprise.

It could be noted here that, the IRR was found to be 18% for the orchards in Belgaum district and 21% in Dharwad district, indicating that the investment in sapota orchard was highly profitable, economically feasible and financially viable.

4.5 MARKETING OF SAPOTA

In this section marketing channels were identified and marketing cost, price spread and margins have been worked out.

4.5.1 Marketing channels

Two marketing channels through which sapota in the study area was marketed from the producers to the ultimate consumers, they are:

Channel – I : Producer → Commission agent → Retailer → Consumer.

Channel –II : Producer → Pre harvest contractor cum wholesaler → retailer → Consumer.

In the channel-I producer himself brought the produce to distant market and sold through commission agents. Commission agents acts as a mediator between producer-seller and retailer. For the service he rendered he charged 10 per cent commission of total value of produce marketed.

In the channel-II, Pre-harvest contractor used to enter with producer either during flowering or at fruit sets stage. The producer got advance from Pre-harvest contractor and some time the whole amount was paid to producer at the time of contract it self. The pre-harvest contractors took care of orchards after the agreement. As and when the produce was harvested contractors performed duties of whole saler also, they inturn supplied it to retailer for selling in retail markets.

4.5.2 Marketing cost incurred by the producers

Marketing cost incurred by the producers of sapota has been presented in the Table 4.11.

The major item of cost was commission charges constituting 52.24 per cent (Rs. 700/ton) followed by transportation 22.39 per cent (Rs. 300/ton), the next important items were packing material 7.46 per cent (Rs.100 per ton). Loading and grading charges constitute 3.73 per cent (Rs.50 per ton), personal expenses 2.24 per cent (Rs. 30 per ton), miscellaneous 2.24 per cent (Rs.30 per ton), unloading 1.49 (20 per ton) and weighment charges 0.75 per cent (Rs. 10 per ton).

4.5.3 Marketing costs incurred by market intermediaries

The per ton item wise marketing cost incurred by intermediaries in the Channel-I are presented in Table 4.12.

It could be seen from the Table that in Channel-I i.e., fruit sold at farm level, on an average total market cost incurred by the pre-harvest contractors worked out to Rs. 926 per ton of sapota. The significant item of cost was harvesting charges contributed to an extent of Rs. 300 per ton of sapota. The next important item was transportation charges (Rs. 290 per ton) followed by loading and unloading charges (Rs. 140 per ton). The other expenses incurred were packing cost, weighing charges, miscellaneous charges and tax of pre-harvest contractor accounted for Rs196 per ton of sapota.

Further the Table indicated that the retailers incurred a total cost of Rs. 841 per ton. The major item of costs were towards commission charges 375 per ton, transportation charges (Rs. 200 per ton) followed by miscellaneous cost (100per ton), packing cost (Rs. 50 per ton), weighing charges (Rs. 10 per ton), loading and unloading charges (50), The other costs included license fee, tax , and rent together accounting for Rs. 56 per ton.

4.5.2 Price spread in marketing of sapota

Sapota was marketed through various intermediaries starting from producer to ultimate consumers. The intermediaries involved rendered variety of services in the process of marketing of sapota with a view to earn some profit. The margins of the intermediaries can be act as an indicator of the efficiency of the marketing system.

Table 4.11. Marketing cost incurred by Producer

(Rs/ton)

Sl. No.	Particulars	District market	
		Amount	**Per cent**
1.	Packaging materials	100	7.46
2.	Grading	50	3.73
3.	Loading	50	3.73
4.	Transportation	300	22.39
5.	Unloading	20	1.49
6.	Weighing charges	10	0.75
7.	Labour charges	50	3.73
8.	Personal expenses	30	2.24
9.	Commission charges	700	52.24
10.	Miscellaneous	30	2.24
	Total	**1340**	**100**

Table 4.12 Cost incurred by market intermediaries

(Rs/ton)

Sl. No	Particulars	Pre Harvest Contractor	Percent	Retailer	Percent
1	Transportation cost	290	31.32	200	23.78
2	Packing cost	80	8.64	50	5.95
3	Loading and unloading	140	15.12	50	5.95
4	Weighing	10	1.08	10	1.19
5	Tax	6	0.65	4	0.48
6	Rent	0	0.00	2	0.24
7	Harvesting	300	32.40		
8	License fee			50	5.95
9	commission charges			375	44.59
10	Miscellaneous cost	100	10.80	100	11.89
	TOTAL COST	**926**	**100.00**	**841**	**100**

Table 4.13. Price spread in marketing of sapota in channel-I and channel-II

(Rs./ton)

Sl. No.	Particulars	Channel-I		Channel-II	
		Rupees	Percentage	Rupees	Percentage
1	Price received by producer	7000	73.68	5500	57.89
2	Marketing cost of :	…	…	…	…
a)	Producer	1340	14.11	….	…
c)	Pre-harvest contractor	…	…	926	9.75
3	Profit of Pre-harvest contractor	…	…	1324	13.94
4	Retailers purchase price	7000	73.68	7750	81.58
5	Cost incurred by retailer	841	8.85	841	8.85
6	Retailer's sale price (Consumer price)	9500	100.00	9500	100.00
7	Profit of retailer	1659	17.46	909	9.57
8	Price spread	2500	26.32	4000	42.11
9	Producer’s share in consumer’s rupee	…	73.68	…	57.89

Note: Figures as percentages indicate per cent to total consumer price.

4.5.2.1 Channel-I

Marketing cost and margins of the agencies involved in the marketing of sapota are given in Table 4.13 the producer share in consumer's rupee in channel-I was 73.68 per cent. The total marketing cost incurred by producers accounted for 14.11 per cent of consumer's price. The total marketing cost incurred by intermediaries amounted to RS. 841 Per ton. The price spread in first channel was Rs 2500 (26.32%) of which share of commission agent was 10 per cent from producer and 5 per cent from retailer. This included in marketing cost of producer seller and marketing cost of retailer. Share of retailer amounted Rs 1659 (17.46%) per ton. Though commission agent collected 10 per cent from producer and 5 per cent from retailer, it was not explicitly/separately mentioned in the table.

4.5.2.1 channel-II

Channel-II consisted of producer to pre-harvest contractor cum whole salers and than retailers. The price spread in channel-II is also given in Table 4.18. It shows that producer's share in consumer's rupee is less compared to channel-I (57.89%). The net profit of retailer was 9.57 per cent (Rs.909 per ton) and profit of pre harvest contractors was Rs. 1324 per ton (13.94%) and the price spread is 57.89 per cent.

4.6 PROBLEMS FACED BY PRODUCER IN PRODUCTION AND MARKETING OF SAPOTA

Opinion survey was conducted to know the production and marketing constraints of sapota growers and the results have been presented in Table 4.14 and 4.15 respectively.

4.6.1 Problems in sapota production

Opinion survey conducted to know the problems in the production of sapota are indicated in the Table 4.14. Non-availability of good seedlings was the major problem expressed by most of the farmers (72.22%) the other problems were smaller holdings (94.44) non availability of labour (57.78%), water problem (45.56) high initial investment (62.22%), lack of power supply (57.78%) and lack of improved harvesting technique (68.89%).

Lack of technical guidance was expressed by 62.22 per cent, 48.89 per cent of the farmers were expressed the problem of leaf spot and flat limb disease.

4.6.2 Problems of sapota marketing

From the Table 4.15 it could be seen that 60 per cent of the respondents opined that markets far away from the farm, 83.33 per cent of the respondents opined that higher commission charges was another major problem in marketing of sapota. The other problems were lack of market information (62.22%), storage problem (94.44%), price fluctuations (48.89%). high transportation cost (72.22) and 48.89percent farmers expressed that there was mutual understanding between wholesalers and commission agents which lead to lower prices for sapota growers.

Table 4.14. Problems faced by farmers in production of sapota

Sl. No.	Particulars	Number of farmers (90)	Percentage
1	Small holdings	85	94.44
2	Non availability good quality seedlings	65	72.22
3	Lack of improved harvesting technique	62	68.89
4	Higher initial investment	56	62.22
5	Lack of technical know how	56	62.22
6	Non availability of Labourers	52	57.78
7	Lack of power supply	52	57.78
8	Problem of leaf spot and flat limb diseases	44	48.89
9	Non availability of water	41	45.56

Table 4.15. Problems faced by farmers in marketing of Sapota

Sl. No	Particulars	Number of farmers (90)	Percentage
1	Storage problem	85	94.44
2	High commission charges	75	83.33
3	High transportation cost	65	72.22
4	Lack of availability of market information	56	62.22
5	Markets far away from farm	54	60.00
6	Price fluctuations	44	48.89
7	Mutual understanding between commission agents and traders	44	48.89

V. DISCUSSION

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

5.1 General characteristics of the respondents

5.2 Growth and status in area, production and productivity of sapota in Karnataka

5.3 Cost and returns from sapota orchard

5.4 Financial feasibility of investment in sapota orchard

5.5 Marketing of sapota

5.6 Problems in production and marketing of sapota

5.1 GENERAL CHARACTERISTICS OF THE SAMPLE FARMERS

From the table 4.1, it could be observed that the average age of the sample farmers was about 47 years and the average family size of sample farmers was 6.73. Further, the main occupation of all the respondents in the study area was agriculture and only six farmers were having business as their subsidiary occupation.

So far as the literacy was concerned, it was observed that about 82 per cent of the respondents were literates and had completed the high school education followed by primary and college level. Sapota being a high investment enterprise has been perceived by these respondents mostly due to their education. This might have enabled the respondents to allocate the manageable size of the area under sapota to get higher returns over other crops.

It could also be seen that the average land holding of sample farmers in the study area was 2.65 ha, of which 1.3 ha irrigated land was followed by 1.29 ha of dry land.

5.2 GROWTH AND STATUS IN AREA, PRODUCTION AND PRODUCTIVITY OF SAPOTA IN KARNATAKA

The compound growth rate of area, production and productivity of sapota presented in Table 4.2 are discussed below.

It could be seen from the Table 4.2 that a highly positive and significant growth in area of sapota crop was observed in Dharwad district and state as a whole. This high growth rate in area is because of the drastic increase in the area under the sapota cultivation. This clearly indicated the increasing popularity of this crop in the study area especially in Dharwad district. Whereas the production and productivity is concerned, the growth rate is negative in both the districts and state as a whole, because of decrease in the yield during the last four years.

Further it could be seen from the table that the growth rate for state as a whole was considered indicated the positive growth rate in area and negative growth rate in case of production and productivity. The negative growth rate in production and productivity is because of the constraints like leaf spot and scarcity of water during the recent years.

5.3 COST AND RETURNS FROM SAPOTA PLANTATION

5.3.1 Establishment cost of Sapota orchard

The sapota orchards call for investments on land, fencing, planting material and planting staking and sprayer which together have been grouped as investment cost. Investment on all these were made during the year of establishment of the orchard. During four years, the farmers have to maintain the orchards by spending money on manures, plant protection chemicals, spraying, and irrigation, weeding and earthing up, all these items have been grouped as maintenance cost.

During the establishment period of 4 years, farmers have incurred costs to maintain the orchards. The maintenance cost over the period in both the districts have increased over the years

Sapota is a perennial fruit crop which start bearing from fourth year onwards and continues to bear fruits up to 40 years. The total cost incurred for growing sapota in the first year till its time of bearing constituted the establishment cost.

5.3.1.1 Belgaum district

The results of the study indicated that the average establishment cost incurred per ha was Rs. 63437.38 during the first four years (Table 4.3), which seems to be lower compared to the return from the investment.

The cost of labour, materials and fixed accounted for 49.98, 17.93 and 30.56 per cent of the total establishment cost respectively. The major item of labour cost was on irrigation, watch and ward 14.66 per cent followed by land preparation (Rs. 5484), fertilizer application (Rs. 4315) weeding (Rs. 3929), opening of pits (Rs. 2875), fencing (Rs. 1356), others contributed 8.64,6.80,6.19, 4.53, 2.14, and 10.72 per cent of the total establishment cost respectively. This was mainly due to the fact that the irrigation was given to sapota orchard twice a month during the year of establishment.

The material cost amounted to Rs. 11376.56, out of which the most important cost component was cost of seedlings Rs. 4200 (6.62 %), second one was cost of FYM (6.38%), the other important cost were cost of fertilizers (2.56% to total cost) and cost of seeds PPC (0.47%) Contributed to total establishment cost.

Further the major costs in case of fixed cost was incurred by rental value of land, it alone accounted for 23.65 per cent to total establishment cost.

5.3.1.2 Dharwad district

The results of the study indicated that the average establishment cost incurred per ha was Rs. 47878.88 during the first four years (Table 4.5), which seems to be lower compared to the return from the investment.

The cost of labour, materials and fixed accounted for 49.85, 16.37, and 32.40 per cent of the total establishment cost respectively. The major item of labour cost was on irrigation, watch and ward (Rs. 8489) which formed 14.19 per cent of total establishment cost followed by land preparation (Rs. 5484), fertilizer application (Rs. 4666.5) weeding (Rs. 2720), opening of pits (Rs. 2875), fencing (Rs. 1356), and others contributed 9.16,7.80,4.80,2.27, and 7.09 per cent of the total establishment cost respectively. This was mainly due to the fact that the irrigation was given to sapota orchard twice a month during the year of establishment.

The major item of material cost was on cost of seedlings Rs 3500 (5.85% of total establishment cost). The cost of FYM was the second important cost component and formed 5.49 per cent of total cost the other important cost were cost of fertilizers (2.46% to total cost)

and cost of seeds PPC (0.36% to total cost). Further the major costs in case of fixed cost was incurred by rental value of land, it alone accounted for 25.06 per cent to total establishment cost.

5.3.2 Maintenance cost of sapota orchard

The maintenance cost (Table 4.6) as indicated in the results included the wages of labour as well as cost of materials utilized and fixed costs.

The findings of the study indicated that the overall average total cost of maintenance per ha was 16952.38 in Belgaum district and it was less in Dharwad district i.e., Rs. 15662 per ha. The labour, material and fixed cost accounted for 59.09, 14.64 and 34.26 per cent of total cost in Belgaum district. Similarly in Dharwad district they accounted for 52.17, 10.07 and 37.09 per cent to total maintenance cost respectively.

In both the districts cost of FYM was the major items of material cost that accounted 6.50 per cent in Belgaum district and 3.97 in Dharwad district. The cost incurred by Belgaum district for labour usage was Rs. 8661.3 per ha, of which the major contribution was made by harvesting i.e., Rs. 3134.49, (18.49% to total cost) followed by irrigation, watch and ward Rs. 2131 (17.56 % to total cost). Similar trend was observed in Dharwad district here the total labour cost incurred was Rs. 8170.3 of which major expenditure was towards harvesting i.e., Rs. 3384, (21.61% to total cost) followed by irrigation, watch and ward Rs. 2131 (13.61 % to total cost). In both the districts the major cost incurred in fixed cost was by rental value of land i.e., around 23 per cent of total cost of both the districts, respectively.

5.3.3 Yield and return structure of sapota

The average quantity of fruit produced per ha in case of Belgaum and Dharwad district were 11.09 and 11.57 tons respectively in both the districts the fruits produced in the beginning years fetched better price than the succeeding years, due to its size, taste and external appearance. As the plant grows older the size of fruit reduces and fetch lower price than the earlier once. From the 35th year onwards the yield starts declining. The returns from per ha sapota orchard was Rs. 57679.26 and Rs. 60149.26 from Belgaum and Dharwad district respectively.

5.3.4 Cash flows in Sapota orchard

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

The net returns in Belgaum district by the orchard in the fifth year was Rs. -42122 per ha and it increased to Rs. 34287 per ha in eight year from then onwards it remain same up to 30Th year then on wards it shows declining trend. For these net returns, the discounting factor was worked out at rate of 9.5 per cent to know the financial feasibility of investment in the sapota enterprise. The similar trend followed in Dharwad district in the fifth year the net return was Rs. 13780 and in ninth year Rs. 36764 due to increase in yield it increased up to Rs. 91910 and later in 35th year on wards there was decline in yield along with net returns and in fortieth year it was Rs. 833.40 per ha. For these also the discounting factor is worked at same rate (9.5%).

5.4 FINANCIAL FEASIBILITY OF INVESTMENT IN SAPOTA ORCHARD

To evaluate the feasibility of investment in sapota enterprise, the evaluation criteria such as Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR) and Pay Back Period (PBP) were employed.

Dalton (1967) indicated that the discounted cash flow technique to be a guiding aid for deciding investment. They also indicated that the cost-benefit analysis was a practical tool

for assessing the desirability of the project since it considers a complete enumeration and evaluation of all relevant cost and benefits from the project over the period of time. Those estimates have been presented in Table .

5.4.1 Net Present Value (NPV)

From the table 4.10 we could be seen that the net present values were Rs. 136720.87 for the orchards in Belgaum district and Rs. 165438.68 in Dharwad district at 9.5 per cent discount rate for sapota enterprise. Thus, it could be concluded that investment in sapota enterprise has been economically feasible and financially sound. The higher magnitude of positive net present value might be attributed to the fact that the initial investment and maintenance cost in sapota orchards were lesser compared to returns.

5.4.2 Benefit-Cost Ratio (BCR)

This criterion indicated the returns per rupee of investment in sapota enterprise and a wise investor always expects a higher ratio. The benefit – cost ratio in the Belgaum district was found to be 3.10, indicating that for each rupee invested in sapota enterprise yields Rs. Rs. 3.10 returns. Thus, it could be concluded that investment in sapota orchard was economically feasible and financially viable. Further it was less compared to Dharwad district of Rs. 3.61 because of higher cost and lower returns.

5.4.3 Internal Rate of Return (IRR)

This criteria measures the rate of return that can be realized by the investment in sapota orchard. Hence, the IRR is an important tool and scores over other criteria, which do not consider the reinvestment opportunities. In the present study the IRR was found high (18%) for the orchards in both Belgaum and (21%) Dharwad district. Compared to ruling interest rates. Hence, it can be inferred that the investment in sapota enterprise was found economically feasible, financially sound and highly profitable.

But, however the studies related to perennial crops by Krishnaraya (1981) on arecanut (27%), Ramesh kumar (1989) on jasmine (more than 50%), Subrahmanyam and Mohandas (1982) on Coorg mandarin (30%) showed higher IRR than the discount rate used for evaluating perennial crops as well as much higher compared to the present study.

5.4.4 Pay Back Period (PBP)

The Pay Back Period for sapota orchards in Belgaum district and Dharwad district was 6.03 and 5.79 years respectively. This clearly indicates that a shorter period of less than six years would require getting back the initial investment. This could be attributed with fact that the initial investment itself was lower, besides higher rate of returns.

The pay back period in sapota was found to be lower than that of other perennial horticulture crops such as arecanut (with gestation period of 8 years) by Krishnaraya (1981). Subrahmanyam (1982) has observed that pay back period in the case of Coorg Mandrin in Karnataka was 9 years. From this it can be concluded that sapota gardens pay back period is shorter than that of other perennial crops.

5.5 MARKETING OF SAPOTA

It was found during the investigation that farmers marketed their produce through various intermediaries. The farmers in the study area sold their produce through commission agents. Farmers selling through commission agent bring their produce to district markets (Belgaum, Dharwad and Hubli); Farmers who marketed their produce through above mentioned agencies were entered into contract even prior to harvesting of the crop as farmers got advance from those agencies and were bound to market their produce to them.

5.5.1 Marketing channels

In this study there were two 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 distant market. As all the villages are located on main roads the farmers had no difficulty in transporting of their produce. Commission agents used to negotiate the price on be half of producer and he did not posses title of the goods. For the service he rendered he collected 10 per cent commission from the producer and 5 per cent from purchaser. This practice of collecting 10 per cent commission from the producer was prevailing, since, the commodity was not notified. The method of sale was also through negotiations. It implies that there is no orderly market for sapota at present in the study area.

In the second channel, Pre-harvest contractor used to enter into contract with producer either during flowering or at fruit setting stage. They took care of orchard until the fruits were harvested from the day of contract. farmers got advance from Pre-harvest contractor and were obliged to sell the produce to them however farmers had good opinion about Pre-harvest contractor due to their timely financial assistance. The Pre-harvest contractors had got their storage houses at district level, there they stored the harvested fruits and sold it to the retailers. The retailers purchased the produce on cash as well as on credit basis and it were on the same day repaid after selling it in the market. The packing material was provided by Pre-harvest contractor.

Though the price received was lesser compared to others in the second channel the farmers preferred Pre-harvest contractor due to risk aversion i.e. shifting of risk to Pre-harvest contractor. In case of severe losses due to climatic variation, in some instances farmers showed concession to Pre-harvest contractor. But in case of high profit to them the farmer did not get any premium over the agreed amount, because of agreement.

5.5.2 Price spread in marketing of sapota

It was clear from the table 4.13 that the share of producer in consumer's rupee was higher (73.68%) in channel-I as compared to channel-II (57.89%) which was due to presence of additional market intermediaries in channel-II. Apart from commission agent and retailers, there was Pre-harvest contractor. Also the price received by producer from Pre-harvest contractor's was low 5500 per ton as against 7000 per ton when marketed through Pre-harvest contractor's gives low price for the produce he was popular because of fluctuation in the open market price, which enabled the produce to avert the risk.

5.6 PROBLEMS FACED IN PRODUCTION AND MARKETING OF SAPOTA

The problems faced by the producers of sapota in production and marketing are presented in the previous chapter (Table 4.14) have been briefly discussed as follows:

5.6.1 Problems faced in production

All the sapota growers in the study area expressed the problem of non-availability of labour and non-availability water. Sapota is a labour oriented crop there was a problem of availability of the labour especially during the peak time of harvesting and some of the other operations. There was continues drought during the last three years so non-availability of water was one of the major problem in the production of sapota.

About 62.22 per cent of the respondents expressed that the non-availability of the technical know how for the improved sapota cultivation in the study area. And about 62.22 per cent of the farmers opinioned that the enterprise requires higher initial investment, the small

farmers faced problems in getting credit facilities from institutional agencies. Other constraints in sapota production were irregular power supply, lack of improved harvesting technique, and problem of leaf spot and flat limb there is a need to provide technical know how financial assistance and providing the remedies for the pest and diseases by the university.

5.5.2 Problems in marketing

The problems faced by the farmer's in marketing of sapota presented in the previous chapter (Table 4.15) have been briefly discussed below.

All the sample farmers opined the problem of the transportation *viz*., poor road conditions, lower frequencies of vehicles for transportation, minimum of 5-6 tonnes was must for the economic transportation.

Majority of the farmers (83.33%) expressed high commission charges as the major problem in marketing. The commission agents charged 10 per cent commission from the producer, which ultimately reduced the producer's net price and also farmers expressed that there was conspiracy among commission agents and wholesalers. To over come above problem there is need to strengthen the HOPCOMS which can reduce the marketing costs including the heavy commission as well as transport arrangements can be made by the HOPCOMS.

Another major problem was lack of availability of market information as it was opined by 62.22 per cent of the respondents. The latest market information was not available to the producer and he was not knowing day to day price prevailing in the market. Since price fluctuation in marketing of fruits was another major problem expressed by 48.89 per cent.

Further as indicated by the table it could be seen that storage was also one of the major problem in marketing of sapota which was expressed by 94.44 per cent of the farmers. As there was no adequate storage facility for the fruit the farmer had to sell the produce as soon as harvested other wise it gets spoiled. Due to this reason the farmers most of the times were forced to sell the produce at lower price. To over come this problem proper storage facilities should be created and there is a need to provide infrastructure for processing and generate the different by products which can also provide value addition besides creating employment.

VI. SUMMARY AND POLICY IMPLICATIONS

Agriculture continues to be the mainstay of our economy as it occupies the central place in rural life. The contribution of agriculture towards national income was about 22.1 per cent in 2003-04 besides 64 per cent of population still depending on it.

In Karnataka, sapota crop occupied 21274 ha during 2002-03 and spread in all 27 districts. However in Northern Karnataka, Belgaum and Dharwad covered mere area (2668 ha). In recent years sapota growers are facing several production and marketing problems. The problem in production includes non-availability of genuine plant material, high incidence of pests and diseases have hindered the cultivation of sapota.

Therefore, an attempt is made in the present study to examine the economics of production as well as marketing of sapota in Northern Karnataka with the following specific objectives:

1. To estimate growth and status of area, production and productivity of sapota in Karnataka.
2. To study the feasibility of investment in sapota cultivation
3. To examine costs and return structure in sapota production
4. To identify marketing channels and to estimate price spread in sapota marketing.
5. To identify constraints in production and marketing to suggest corrective measures to improve the production and marketing of sapota.

Sampling

The study was conducted in the year 2005-06 in Belgaum and Dharwad districts which ranks first and third respectively in area under sapota in North Karnataka. From each district 45 sample farmers will be selected randomly thus, forming a total sample size of 90 farmers. To study the marketing aspects of sapota 10 commission agents cum wholesaler and 10 retailers were randomly selected.

ANALYTICAL TOOLS AND TECHNIQUES

Four major analytical tools were used in the study.

The tabular analysis was used to work out the costs and return structure of sapota orchard.

Compound growth rate analysis was employed to know the growth rate in area production and productivity of sapota cultivation.

Financial analysis was employed to measure the financial feasibility of investments in sapota garden. The standard capital budgeting techniques used were Net Present Value (NPV), Benefit Cost Ratio (BCR), Pay Back Period (PBP) and Internal Rate of Return (IRR).

FINDINGS

The growth rate analysis for area, production and productivity of sapota in Belgaum, Dharwad and state as a whole revealed that there was a negative growth rate in area in Belgaum district. And positive in Dharwad district. On the contrary the production and productivity was negative in both the district. And state as a whole there was positive growth rate with respect to area,. While the production and productivity were negative.

The cost of establishing a sapota orchard was classified into the investment cost and maintenance cost up to bearing. The cost of establishment per hectare in Belgaum district was found to be Rs.118666.56 of which investment cost constituted to be 56.69 per cent and maintenance 57.97 per cent and in Dharwad district the cost of establishment per hectare Rs.113927.38 of which investment cost constituted to be 57.97 per cent and maintenance 42.03 per cent.

The per ha average total maintenance cost incurred by respondents the orchards in Belgaum district was Rs. 51394.06 during the first four year. The labour, material and fixed costs accounted for 46.76, 15.50, and 37.72 per cent, respectively. While the cost was Rs. 47878.88 in Dharwad district where labour, material and fixed cost accounted for about 44.85, 14.66, and 40.49 per cent, respectively.

The average per ha maintenance cost incurred in Belgaum district was Rs. 16952.38 of which, labour material and fixed cost accounted for 59.09, 14.64 and 34.26 per cent to the total maintenance cost. While the maintenance cost was Rs. 15662.10 in Dharwad district where the labour, material and fixed cost accounted for 52.17, 10.07 and 37.09 per cent to the total maintenance cost.

The per ha average yield in Belgaum district was 11.09 tonnes and the net returns obtained were Rs. 12740 in fifth year, Rs. 35724 per ha in ninth year. Similarly the average yield of Dharwad district was 11.57 tonnes per ha. And the net returns were Rs.13780from fifth year, and Rs. 36764 from ninth year.

The investment appraisal analysis revealed that the net present value of investment for the orchards in Belgaum and Dharwad districts was Rs. 136720.87 per ha and Rs.165438.68 respectively at 9.5 per cent discount rate for sapota enterprise. The pay back period was found to be 6.03 years In Belgaum and 5.79 years in Dharwad. The discounted benefit cost ratio was 3.10 in Belgaum and 3.61in Dharwad district and the internal rate of return was found to be 18 per cent and 21 per cent respectively.

Two major marketing channels were traced out for marketing of sapota in the study area.

Channel-I: Producer → Commission agent → retailer → consumer.

Channel-II: Producer → pre-harvest contractor → wholesaler → retailer → consumer.

The marketing cost incurred by farmers when producer sold at the distant market to commission agents was Rs.1340, of which major items of costs accounted were commission charges 52.24 per cent transportation 22.39 per cent. And other costs like, packing, loading and unloading weighment all together accounted for 25.37per cent of total marketing cost.

The cost incurred by market intermediaries were Rs.926 per ton by pre harvest contractor and the cost incurred by retailers was Rs. 841 per ton.

The channel-I was the most popular channel among the farmers in study area for disposal of sapota. Producers share in consumer's rupee was high in channel-I (73.68%) and was low in channel-II (57.89%).

Opinion survey was conducted to know the problems faced by sapota growers in production and marketing. The farmers expressed that non-availability of good seedlings, non-availability of labour during peak season and water scarcity were the major problems in sapota production followed by non-availability of technical guidance and higher initial investment. Marketing problems were selling of produce to distant markets, high commission charges, lack of availability of market information, existence of mutual under standing among middle men and whole sellers and lack of storage problem were the major problem faced by the sapota growers in marketing of sapota.

POLICY IMPLICATIONS

Major policy implications based on the findings of the study are summarized below:

1. The growth rate analysis indicated that the increase in production was due to area, rather than productivity, which calls for intensive efforts to increase productivity of sapota in the study area as well as Karnataka as a whole.

2. As indicated by the financial measurements, the investment in sapota orchard was found to be financially feasible. And as there is higher initial investment in sapota orchards the farmers who wish to establish the orchards, financial assistance may be provided by the institutional agencies at prevailing rate of interest.

3. The demonstrations need to be conducted to educate the farmers to adopt recommended application of fertilizers, plant protection chemicals, since they are being under used.

4. Non-availability of scientific storage facility was one of the major factor contributing to lower returns from sapota. Therefore, suitable storage facilities are essential to stabilize the returns of sapota growers by increasing the storage life of the fruit.

5. The share of sapota growers in the consumer rupee was very low as it was evident by the study due to the irregularities in marketing. Hence sapota may be included in the list of notified agricultural commodities and to be brought under the preview of Karnataka Agricultural produce marketing committee (Regulation) Act 1966.

6. Most of the farmers expressed the incidence of leaf spot, sooty mould and flat limb disease as a major problem, the gravity of which has increased due to lack of technical guidance. Hence, there is an urgent need to evolve an integrated pest and disease management programme besides strengthening the extension system in imparting knowledge about prevention and control of pest and diseases.

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PRODUCTION AND MARKETING OF SAPOTA IN NORTHERN KARNATAKA - AN ECONOMIC ANALYSIS

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ABSTRACT

The objective of the study was to analyse the production and marketing of sapota in Northern Karnataka. Random sampling procedure was adopted in selection of the study area, districts (2) and respondents (90).

The results revealed that the Belgaum and Dharwad districts were found to be having negative growth rate in area and production (-3.07 and-9.18% and 3.73and -4.77%, respectively). While the productivity of both the districts was negative viz., -6.30 and -8.20 respectively. On the contrary, a lower but positive and significant growth rate was observed in sapota area for the state as a whole, whereas the production and yield showed negative trend (-1.98 and –6.24 respectively).

The per ha establishment cost of sapota was found to be Rs. 118666.56 and Rs.113927.38 in Belgaum and Dharwad districts respectively. The maintenance cost worked out to be as Rs. 16952.38 and Rs. 15662.10 in Belgaum and Dharwad district respectively.

The average per ha yield from Belgaum district was 11.09 tonnes and from Dharwad district was 11.56 tonnes. And net returns were Rs. 57679.27 from Belgaum district and Rs. 50149.26 from Dharwad district.

Financial analysis revealed that of 9.5 per cent discount rate, the sapota enterprises has maximum NPV (Rs.136720.87&165438.68), BCR (3.10&3.61), BCR (3.10%3.61), PBP (6.03&5.79 years) and IRR (18%&21%) in Belgaum and Dharwad district respectively.

Two marketing channels were identified in which the producer's share in consumer rupee was highest in channel-I 73.68% and it was 57.89 per cent in channel-II.

Higher incidence of diseases, scarcity of water, distant markets and high commission charges were the main problems confronting the cultivators. Adoption of recommended cultivation practices, provision of adequate credit would help in expanding the area and also in increasing the productivity of sapota.