

**PRODUCTION, PROCESSING AND MARKETING OF
KOKUM (Garcinia indica) IN KONKAN REGION OF
MAHARASHTRA
– AN ECONOMIC ANALYSIS**

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1. INTRODUCTION

Since the time immemorial horticultural activity forms an important component of the farming system and does well under hard terrain exposed to the vagaries of the climate. The horticultural products *viz.*, fruits, vegetables and their processed products are contributing significantly towards human dietary and the nutritional requirements. Thus, these crops contribute to the economies of the world.

India is known for its diverse tropical and sub-tropical agro-climatic conditions, which are conducive to grow various types of fruits and vegetables. Thus, horticultural crops in the country have occupied 15.97 per cent of gross cropped area and forms an important part of the agricultural sector. At present the agricultural sector is contributing 18.50 per cent to Gross Domestic Product (GDP) of Indian economy (2006-07).

India stands second after Brazil in fruit production accounting for about 27.8 million metric tones. Among the fruits, mango occupies the top position with an annual production of 10 million metric tones accounting for about 65 per cent of the world production and is followed by banana, citrus, grape, apples, pineapple and guava. It is also observed that, in the country large number of minor fruits are being produced to the extent of 5.53 million metric tones. Some of the important fruits in this category are Amla (*Emblica officinalis*), Beal (*Aegle marmalos*), Ber (*Zizyphus mauritiana*), Cashew (*Anacardium occidentale*), Custard apple (*Anona sqomasa*), Jackfruit (*Artocarpus heterophylus*) Karonda (*Carrica caranda*), Kokum (*Garcinia indica*), etc.

The major and minor fruits are being termed as protective foods, since they are rich sources of vitamins and minerals. On the other hand, these are markedly differentiated based on the shelf life from food grains and grouped under highly perishable commodity category. In addition to this, fruits have the short harvesting season which forced to divert all the produce to the markets. These market do not have good facilities for handling, storage and transportation of the fruits to the distinct places. In addition to these situations, the adverse climatic condition during the peak harvesting seasons greatly influence the shelf life of the fruits. It is estimated that, about 25 to 30 per cent of the fruits perish due to these reasons. Further, the extent of utilization of horticultural commodities for processing in India is low (less than 1 per cent) as compared to developed countries like USA, Brazil, Australia and Israel where it ranges between 40 to 60 per cent of their horticultural produce.

The fruit juice industry has become one of the world's major agribusiness. The share of developing countries in the world trade related to the fruit and vegetable juices is reported to be 50 per cent. At present India's share in the world market for fruit juices is dismal (0.3%), which is contributed mainly by mango pulp. On the contrary, Indian domestic market has also registered a steady growth in demand for fruit juices. The growth rate of soft drinks industries currently estimated at 21 per cent and is expected to generate the demand for fruit based drinks to an extent of 20 per cent. With this favourable situation the horticultural commodities production during recent past observed to be significant. However, the level of output and processing of horticultural produce are much lower when compared to many countries. In this regard suitable intervention with action plan and their execution would help in sorting out the problems associated with production and handling of fruits.

Kokum

Kokum (Garcinia indica Choisy) belongs to the family cruciaceae and genus *Garcinia* which is a large genus of polygamous evergreen trees and shrubs native of Asia, Southern Africa and Polynesia (Anthony, 1997). The genus *Garcinia* comprises of 200 old world tropical species of which 20 species are found in India. As a part of traditional material and medica of India, *Garcinia indica*, *Garcinia mangosteena* and *Garcinia morella* are documented in Ayurvedic medicine which are generally known as 'Red Mango'.

Kokum (Garcinia indica) is one of the most important indigenous tree spice and is reported to be introduced to India from the Zanzibar (Williams, 1949). *Kokum* is a moderate to large size evergreen dioceous tree with drooping branches observed up to an elevation of about 800 meters from the Mean Sea Level. Its leaves are ovule to oblong, lanceolate, broad, dark green above and pale beneath. The flowers of *kokum* are unisexual, axillary or terminal or solitary. The fruits are generally globes or spherical, dark purple when ripe, enclosing 5 to 8

large seeds. *Kokum* tree starts flowering during the month of November-December and fruits are harvested during April-May. It takes about 7 to 10 years for economical bearing. Its cultivation is confined to the coastal hilly region of Maharashtra and Goa States, popularly known as "*Ratamba*". Some *kokum* trees are observed in the western ghat forest of Karnataka, Kerala and in areas west of the Mumbai (Muhammed *et al.*, 1994) as well as part of the West Bengal, Assam and Gujarat States (Krishnamurthy *et al.*, 1981).

In Maharashtra state *Kokum* trees have been observed all over the state, however, predominantly seen only in the low lying belt of Konkan region. *Kokum* is one of the most important minor fruits which is of commercial value and found to grow luxuriously in forest of the western Ghat of Maharashtra (Shingre *et al.*). In this region cultivation of *kokum* is observed to be under natural forest habitat, till the beginning of the last decade of the 20th century. Despite commercial / medicinal importance, this crop remained neglected and not much attention is paid for research and development. According to the survey reports in the state of Maharashtra, out of the total 46,000 *Kokum* trees 43,000 trees are existing in Ratnagiri and Sindhudurg districts alone. Thus, Konkan region is enjoying the monopoly status with respect to *Kokum* fruits production. After realizing the importance of naturally existing *Kokum* trees in these districts, Government of Maharashtra started encouraging the farmers of this region to grow *Kokum* by planting orchards in systematic manner as orchard under Employment Guarantee Scheme and District Rural Development Agency. With this systematic conduct of research and development of *kokum* orchards and the maintenance of the naturally existing *kokum* plants in the forests, the present production level of *kokum* is estimated at 10,200 tones from 1200 ha area (Karnik *et al.*, 2001) in Maharashtra with productivity of 8.50 tones/ha. Due to the existence of corporate activities, the concentration of *kokum* trees was observed more in Ratnagiri and Sindhudurg district of Maharashtra with total area amounts to about 1598 hectares with annually producing of 2442 metric tones.

The nutraceutical studies on *kokum* indicated enormous medicinal properties. Hence, it is termed as a antihelminthic and cardiogenic. It is also useful in curing piles dysentery, tumor pains and cardiac problems. Eversince Dr. John Lowenstein, a biochemist in USA discovered the inhabiting effect of Para hydroxyl citric acid, present in *Garcinia* fruits, on lipogenesis (fat production) and subsequently development of medicine in great of interest in the *Garcinia* sp. (Mathew *et al.* 2001). In the pharmaceutical industry, it is already making ways, some fat reducing tablets and capsules based on *kokum* are available in the market (Vishwaprasad Sedyapu, 2001). Apart from this, it is widely used as fish preservatives and good source of acid for coagulating rubber. The fruits of *kokum* have commercial importance, since the rind of which is used to impart an acid flavour to curries instead of tamarind. The soft drink and derivative of *kokum*, popularly known as *kokum* syrup generally consumed as a natural soft drink to quench thirst during summer.

The kernels of *kokum* seed contains about 33 to 44 per cent oil, which is commercially known as "*kokum* butter". It is considered as nutritive, demulcent, astringent and emollient. In addition, due to its suitability for ointment, suppositories and other pharmaceutical purposes *kokum* is commodifying greater export potentiality. The ointment is used for the local application for treating ulcer, fissures of lips, cracks/cuts in chopped hands and feet etc. Due to high content of disaturated and monosaturated glycerides, it is in great demand as a substitute for cocoa an extender in chocolate and confectionery products preparations. Hydroxy citric acid (HCA) is one of the ingredient of *kokum* and used as an anti obesity agent for keeping fatty acid symbiosis at lower level. Apart of HCA *kokum* contain garcinol and relatively it is found to be more potential from the point of antioxidant properties, which include citric acid, malic acid, polyphenols, carbohydrates, anthocyanin pigment and ascorbic acid. *Kokum* seed is reported to contain a compound which could turn liquids in to solids. It can be used in the manufacture of wine, champagne and liquor. It could be a ideal substitute for grapes in the wine industry. As *Kokum* reduces fat, cools body, purifies blood, fights cholesterol, wine and liquors made from *Kokum* will attract health conscious people (Vishwaprasad Sedyapu, 2001).

To take the advantages of *kokum*, the value addition to the *kokum* fruits through processing assumes an important activity because raw/ripe fruits need to be processed before their consumption. In this context, *kokum* crop has attained the status of economical importance. The resultant of this activity creates employment opportunities at rural area and on the other hand develop suitable products for earning the foreign exchange through the

export of *kokum* derivatives. The medicinal and antioxidant properties of *kokum* butter and flowers also priced to be very high and much useful in cosmetic application. As a result of this many pharmaceutical industries have shown keen interest in *kokum* and its derivatives. With this situation, India is the only country enjoying the monopoly with respect to *kokum* production in the world

With this market driven encouragement to the *kokum* crop and employment Guarantee Scheme linked horticultural development programme since 1990-91 in the State and District Rural Development Agencies, the combined effects have encouraged to initiate large number of *kokum* processing units at *kokum* growing belt. In view of recent developments the dimension of *kokum* crop based activities have brought in lot of changes with respect to nursery activities, production technologies, marketing and value addition. Due to this, the socio-economic aspects of the region also experienced marked changes and in the process many of bottlenecks have been experienced at different levels. Reliable information regarding the area of this crop in India is lacking because it is seldom planted in the form of an orchard and generally scattered trees are found in coconut, arecanut gardens and wastelands (Shingre *et al* 2001). Moreover, till this point of time no systematic documentation work has been performed to document the phasewise developments observed with *kokum* crop production, marketing and value addition activities, employment generation through setting up of *kokum* processing unit *etc.* in south Konkan region of Maharashtra state. Keeping this in view the present study has been undertaken with an overall objective of assessing the cost and returns of *kokum* cultivation, value addition for different *kokum* products and efficiency measures, marketing efficiency in the study area. The study also aims to undertake a study on growth pattern of area and production in the study area and export of *kokum* products from India.

Further, the study was intended to make a attempt to identify the problems related to *kokum* grower in production and marketing and also problems related to processor as well as various market functionaries involved in marketing of *kokum* and *kokum* products. The study will also help the planners and policy makers to frame appropriate policies related to the *kokum* production, processing and marketing.

The specific objectives, keeping in view the imperatives of the study area are as follows.

Objective of the study

1. To estimate the establishment cost incurred in the development of *kokum* orchard
2. To study the maintenance cost and return structure concerned to *kokum* cultivation
3. To analyze the financial feasibility of investment in the *kokum* orchard
4. To study the economics of processing of *kokum* fruits
5. To study the marketing of fresh *kokum* fruits and value added *kokum* products
6. To study the export trend of *kokum* fruits and its products.
7. To document the constraints experienced in *kokum* production processing, marketing and suggest suitable policy measures

Hypotheses

1. Investment in *kokum* plantation is financially feasible.
2. *Kokum* is profitable horticultural enterprise.
3. *Kokum* fruits processing is profitable enterprise.
4. *Kokum* fresh fruits and value added products are marketed efficiently in Konkan region.
5. *Kokum* export is increasing over years.

Plan of the thesis

For the referential convenience the study has been organized into seven chapters. A brief introduction to the problems under investigation with specific objectives and are

presented in Chapter I, Chapter II provides a review of theoretical and empirical literature on the subject and its related areas conducted earlier. Chapter III covers the details on methodology followed in evaluating the present study. Chapter IV presents the findings of the study and chapter V attempts to interpret and give reasons for the findings. The findings are summarized in chapter VI and at the end conclusions and policy implications are presented. Chapter VII lists the sources of the research material, books, research reports and papers referred for the purpose of conduct of the present investigation.

2. REVIEW OF LITERATURE

The knowledge of similar research work previously carried out relating to the problem under study is useful as it provides a guidance and helpful in understanding and formulating the whole methodological framework. In this chapter, a review of past research relating the economics of *kokum* cultivation, processing, marketing, export and other relevant aspects are presented under the following sub- heads.

- 2.1. Studies on cost, return and other related aspects
- 2.2. Studies on economic and financial feasibility
- 2.3. Financial ratio analysis
- 2.4. Processing marketing aspects
- 2.5. Analytical tools
- 2.6. Production, processing and marketing constraints.

2.1. COST, RETURN AND OTHER RELATED ASPECTS

Anonymous (1981) worked out the cost of production of Alphonso mango in Ratnagiri district. Overall per hectare yield was 126.26 crates, with an average selling rate of Rs.34 per crate and the gross returns of Rs.4258.84 per hectare was obtained. The cost of cultivation was Rs.1918.19 and the net return at cost C was Rs.2340.65. In Deogad taluk, where mango cultivation is being more commercialized, per hectare yield was 164.98 crates, with a net selling rate of Rs.40.25 per crate, the gross return of Rs.6646.45 was obtained. Under this situation after deducting the cost of cultivation of Rs.3165.55, net returns of Rs.3474.90 per hectare was realized when compared to Ratnagiri district.

Thorat (1986) estimated per hectare cost of maintenance of mango in Ratnagiri district (M.S.), which varied from Rs.4433.26 to 5625.89 in different size groups. The yield for overall size and age groups was found to be 174 crates per hectare. Per hectare yield was the highest (306 crates) for 21-40 year old small orchard. The overall gross returns for small size orchards was Rs.19,864 and for large size orchards it was observed to be Rs.10,451.00. Among different groups mango yield was the highest in small size groups.

Patil (1988) in his assessment of Alphonso mango in Konkan region (M.S.) observed that the per hectare annual cost of maintenance of mango orchard was higher in large size orchard (Rs.2102), as compared to medium (Rs.1835) and small (Rs.1326) size orchards. The results revealed that the cost of maintenance increased as the age and size of orchard increased. He also observed that the share of variable inputs was about 80 per cent of the maintenance cost. The per hectare yield of Alphonso mango was the lowest (56 crates) for 6 to 20 years of small size of orchards and the highest (248 crates) for the orchards of age group above 40 years of large size group of orchards.

Borude *et al.* (1990) in their study on economics of mango production in Konkan region (M.S.) recorded the per hectare maintenance cost (cost-C) incurred on adult mango orchard by following recommended package of practices was worked to be Rs.18764 per hectare and the average gross return was Rs.30,000 by which per hectare net margin of Rs.11,236 was realized under this situation.

Kshirsagar *et al.* (2001) analyzed the cost of cultivation and establishment cost of *kokum* plantation at RFRS Vengurle wherein the total establishment cost was worked to be Rs.62,884/ha (including land). Further, the year wise establishment cost per hectare of *kokum* production was worked out which showed that, it was reducing from Rs.20,780/- in the first year to Rs.12,441 in third year but it was increasing from fourth year onwards and it was observed to be Rs.13,807/- and Rs.14,654/- for fourth and fifth year respectively. Thus the study concluded that, over period of time the expenditure for establishment of *kokum* was reduced.

Rane *et al.* (2001) analyzed the cost and return structure for *kokum* in Hodawada village of Vengurle taluk of Sindhudurga district (Maharashtra). It was observed that the net profit of Rs.43,228/-ha realized from the production of 8.40 tonnes of *kokum* fruits. During the

production process sample farmers had incurred Rs.16,197/ha and Rs.21,038/ha as input cost and rental value of land.

Gummagolmath *et al.* (2002) conducted a study on mango cultivation in Dharwad district in Karnataka. They observed that the per hectare total variable cost was Rs. 5840.91 in small, Rs.6859.58 in medium and Rs. 6659.60 in large orchards. The flow of returns from intercrops and mango started increasing from 5th year onwards and observed to be maximum from 51st year onwards. This was mainly attributed towards the change in yield pattern with the increased age of the orchard.

Bisen *et al.* (2003) in their study on intercropping and cultural practices on growth and yield of mango orchard conducted at Agricultural Research Station, Sarkanda, Bilaspur in (M.P.) gave the results which indicated that, the mango orchard alone (without inter-crops) was unprofitable. But it became profitable when intercropping of vegetable was done in the available interspace in mango orchard. The highest net returns and net cost benefit ratio were recorded with chilli as inter-crop, followed by chilli-soya bean and okra-gram, respectively.

2.2. ECONOMIC AND FINANCIAL FEASIBILITY

Borude *et al.* (1990) they determined the economic viability of investment in mango by using different criteria. The pay back period was found to be 15 years. The benefit cost ratio for 10 per cent and 12 per cent discount rates were 1.71 and 1.39 respectively. The internal rate of return was 15.5 per cent annum. This indicated that the investment in mango orchard was economically viable and worthwhile.

Gurao (1993) conducted a study on economics of investment in mango plantation in Ratnagiri district (M.S.) and estimated that the plantation of Alphonso mango was profitable with net return of Rs.30,000 with an internal rate of return of 19.33 per cent. The benefit- cost ratio was greater than one. The pay back period was estimated to be 11 years. The per hectare cost of cultivation worked out to Rs.24.926 and cost of marketing was Rs.17,469.

Talathi *et al.* (2001) studied economic feasibility of *kokum* plantation established on the research farm coming under Konkan region of Maharashtra and they stated that, this crop will play unique role in improving the incomes of rural people and it will generate lot of employment opportunities for rural masses. Further study indicated that, crop is equally remunerative when compared to other crops, and the cost incurred on the establishment of *kokum* orchard per hectare worked to Rs.56,699/- and pay back period was 9 years. Net present value (NPV) was positive at 14 per cent discount rate within the stated period and Benefit cost ratio was greater than one. Internal rate of return (IRR) was also greater than the opportunity cost of capital and hence investment in *kokum* plantation could be considered favorably.

Naik (2002) studied economic feasibility of mango plantation in south Konkan of Maharashtra for near sea shore orchards (Group A) and away from sea shore orchards (Group B) and worked out the Net present value (NPV) in Group-A at 8,10 and 12 per cent discount rates. For these rates the NPV was Rs. 2,52,770, Rs. 1,50,270 and Rs. 86,400 respectively. The respective figures for Group-B were Rs. 156020, Rs. 85580 and Rs. 41740. All the NPV's were positive indicating viability of mango plantation in study area. Further, the pay back period (PBP) was 14,15 and 16 years in Group - A and 15, 17 and 19 years in Group-B for the respective discounting rates. However, without discounting the pay back period in for the both groups was observed to be 12 years. This indicated that mango plantation project required 12 years period for recumbent of investment. The value of IRR was 17.97 per cent in Group-A and 15.38 per cent in Group-B. In both the groups these values were greater than prevailing rate of interest (13%) on borrowings. The study indicates that Group A orchard had better comparative advantage were compared with Group B orchards performance.

Gangwar *et al.* (2008) undertake study on economic evaluation of Peach cultivation in North Indian plains by calculated with the help of different investment appraisal methods. The Net Present Value (NPV) worked out to be Rs.44807, the Benefit Cost Ratio (BCR) as 1.41 and Internal Rate of Return (IRR) as 22.20 under the present value summation method. Under the amortization method also the Net Present Value (NPV) and Benefit Cost (BC) ratio were similarly at Rs. 42877 and 1.28 respectively, indicated that Peach cultivation in Panjab and Uttarakhand (North Indian Plains) were a profitable venture.

2.3. FINANCIAL RATIO ANALYSIS

Flink and Grunewald (1969), in United States of America, examined solvency of the firm in terms of whether its total assets equal or greater than or less than the obligation of the firm to its creditors, the liquidity in terms of its ability to meet its current obligations and profitability in terms of its overall efficiency of the business over and above the amount put into business for transactional purpose.

Page *et al.* (1970) studied the financial position of agricultural co-operatives of the United States of America by using the magnitude of current ratio as a test of liquidity. The total liability to net worth ratio and fixed assets to net worth ratio were used to test the solvency position of co-operatives and net earnings to net worth in order to test profitability of the co-operatives.

Hopkin *et al.* (1973) stated the financial progress of a business firm could be evaluated with the help of liquidity, solvency and profitability ratios and optimal that, relatively low volume of transactions might be offset by high efficiency performance and *vice versa*.

Natarajan *et al.* (1980) analyzed the working of consumers co-operative in Andhra Pradesh. He mentioned that the current ratio of 2:1, quick ratio of 1:1, inventory ratio, net profit margin, return on assets and return on share capital were the best standards of evaluation.

Ananth (1984) used financial ratios to analyze the performance of Bangalore Grape Growers Marketing and Processing Co-operative Society, Bangalore. The study revealed that the society had a satisfactory financial structure. He indicated that the society could grow further by augmenting its infrastructural facilities, opening more retails selling outlets and providing better transport and storage facilities for the grapes procured from the farmers.

Rao (1985) studied the business performance of CAMPCO and observed that the co-operative institution had sound financial structure, earning reasonable profits. He found that major parts of the assets were maintained as liquid assets in consonance with the need for trading activities.

Mohammed Ali (1992) analyzed the financial performance of fruit and vegetable processing units under Private and Public sector. He observed that the solvency position of the private sector was sound which was supported by lower solvency value, but for public sector it was high. The liquidity ratios, in general revealed that the private sector unit was in a better position than Public sector. The profitability ratios indicated more efficient utilization of assets as well as owned funds in case of Private sector unit. The turnover ratios were also low in case of Public sector unit when compared to Private sector unit.

Reddy (1994) studied the financial performance of Mulkanoor Co-operative Rural Bank using liquidity, solvency, profitability and turn over ratios. The study revealed that the liquidity position of the bank was found to be sound as indicated by the current (2.09) and quick ratios (1.74). The solvency ratios showed that the Bank has been following the policy of low capital gearing with regard to long term debt (0.17) and high capital gearing with regard to total debt (1.56). The performance of the Bank in relation to its profitability (2.42%) and turnover was not up to the expected level (2.58%) in view of the size and volume of business.

Hosmani (1995) evaluated the performance and impact of Regional Rural Banks, a case study of Malprabha Grameena Bank in Karnataka; it was found that the liquidity and solvency position of the Bank was sound. However, the profitability ratios were negative (-43) due to higher turnover (3.11) compared to spread (2.96) ratio.

2.4. PROCESSING AND MARKETING ASPECTS

2.4.1 Processing aspects

Gupta *et al.* (1971) in their study on setting up of modern rice mills in West Godavari district of Andhra Pradesh, found that in the total cost, 92.69 per cent of cost was incurred on procurement of raw material (paddy) cost, the fixed cost was 1.75 per cent, while processing and other variable costs accounted for 5.56 per cent.

Singh and Sidhu (1974) studied the economies of scale in groundnut processing industry in Punjab. It was found that, per quintal fixed cost in large, medium and small groundnut mills was Rs.0.50, Rs.1.14 and Rs.0.58 respectively. The variable costs per quintal of groundnut oil were Rs.118.72, Rs.119.74 and Rs.118.27 in large, medium small mills respectively. The per quintal total processing costs in these mills were Rs.119.23, Rs.120.87 and Rs.118.85 respectively and indicated marginal reduction over small and large groundnut mills as compared with medium mills.

Anonymous (1977) carried survey all over India revealed that the cost of fruit processing depends upon location of processing unit. Accordingly, the cost of fruit material utilized in manufacturing orange squash in the orange growing belt was Rs.7.09 per case of 12 bottles of 680 ml each compared to the price range of Rs.9.54 to Rs.10.56 for a similar pack wherein units located away from growing region. The share of fruit material in the total cost of production for units located in orange growing belt was 12.33 per cent as against 17.54 per cent in case of units located in cosmopolitan cities. In case of mix fruit jam, the share of fruit material in total cost of production varied from 5.80 per cent to 8.30 per cent in fruit growing areas as compared to 12.33 per cent in Bombay. The share of prime raw materials in case of pineapple slices in syrup varied from Rs.17.00 to Rs.41.86 per case of 24 cans of 850gm. capacity. In case of bottled products, the cost varied from Rs.18.70 to Rs.23.16 per case of 12 x 680 ml, whereas, in case of canned products such as pineapple slices, costs varied from Rs.42.54 to Rs.52.25 per case of 24 x 850 gm.

Sivanandam *et al.* (1980) worked out the processing cost for per kilogram of cashew kernels in Pudukkottai district of Tamil Nadu and found that the cost of raw material was the major component in the processing cost of cashew kernels which, constituted 73.22 per cent followed by wages (12.10 %) and interest as capital (7.28%). It further revealed that, the unit processing cost of a kilogram of cashew kernel was Rs.20.40 and out turn of kernels from one MT. of cashew nut was 220.91 kilograms or 22.09 per cent.

Muralidharan (1981) compared the processing of sugarcane into sugar, gur, and khandsari in Mandya district of Karnataka. It was found that the processing cost per quintal was Rs.70.51, Rs.43.05 and Rs.116.66 for sugar, gur and khandsari respectively. Share of fixed cost in the total processing cost was 64.24 per cent in sugar units, 30.78 per cent in gur units and 17.29 per cent in case of khandsari units. Whereas variable cost formed 35.76 per cent, 69.22 per cent and 82.71 per cent for sugar, gur and khandsari respectively.

Ipte and Borude (1982) in their study on economics of marketing and processing of cashewnut in Ratnagiri/Sindhudurg district of Maharashtra, found that the per quintal cost of processing worked out to Rs.161.42. The major items of the processing cost were the container (14.44 %), labour charges (21.92 %) and interest on capital (46.03 %). The value added due to processing of raw nuts is to farmers was worked out to 52.66 per cent of the raw nuts costs.

Hassan and Raghuram (1987) in their study on cashew processing and marketing in Prakasam district of Andhra Pradesh observed the following stages in processing that is drying of nuts, roasting of nuts, shelling of nuts, drying of shelled kernels, peeling of kernels, grading of kernels, conditioning of graded kernels and packing of graded kernels. The study reported that 80 kg of raw nuts when processed resulted in 22 kg. of kernels (28 % recovery). The processor incurred Rs.87.06 as processing cost, of which labour constituted 56.6 per cent and material cost stood at 42.5 per cent. Within labour cost, the shelling accounted for higher proportion followed by peeling.

Anant Ram Verma (1989) in his study on economics of processing and marketing of gur in Indore (Madhya Pradesh) found that the average cost of processing of sugar cane under power kohlu units of gur was Rs. 6.80 per quintal. Further it revealed that the cost of processing varied from mill according to the level of capital investment power and sugarcane crushed during the year by the mill.

Dalvi (1989) studied economics of production, processing and marketing of cashewnut in Sindhudurg district of Maharashtra state. The study revealed that overall average working season of processing factories was 257.70 days. The average quantity of nuts processed by factories was 2,06,751 kg per season and 802.29 kg per day. The overall cost incurred on processing by factories was Rs.331.35 per quintal. The overall average gross returns received by factories were Rs.49.56 lakhs and net returns obtained were

Rs.7.94 lakhs. The capital investment per hundred rupees of gross income was Rs.81.61 and overall input output ratio was 1.19.

Nagaraj and Prakash (1989) estimated that the total fixed capital investment in fruit processing unit was Rs.3,38,258. The fixed cost accounted for 12.15 per cent of the total processing cost. The total fixed cost per kg of fruits processed worked out to Rs.0.78 and the total working capital investment was Rs.24,46,631. While the variable cost accounted for 87.85 per cent of the total cost of processing. The out turn of finished product was about 400.62 tones valued at Rs.28.9 lakhs. For every kilogram of finished products the firm incurred Rs.0.84 on overheads and Rs.6.10 on variable expenses. The economics of fruit processing revealed that among the recurring expenses, the cost incurred towards fresh fruits observed to be higher and accounted 48.50 per cent. The other recurring costs include labour (7.00%), advertisement (6.00%) charges and taxes (5.00%) paid towards the receipt.

Veerkar and Borude (1995) studied "economics of mango products in Ratnagiri district (Maharashtra)". They analyzed capital investment in preparing the mango products and observed that, out of total investment of Rs.2.81 lakhs in pickle making 31.42 per cent (Rs.0.88 lakhs) was invested in capital and 55.25 per cent was found to be invested as fixed capital and 59.06 per cent as working capital. Among the three mango processed products the capital investment was highest (Rs.5.04 lakhs) in making raw slices in brine and the lowest (Rs.1.60 lakhs) in chutney making business. They also observed that the share of fixed capital was lower than that of working capital in all the products.

Pawar (2005) studied the kokum processing units, and revealed that, though the processing units were more profitable, they do not get sufficient raw material (fruits) from the area. As the kokum plantation was scatter throughout the region, home scale and cottage scale units were best suited for the Konkan region because they provide more employment opportunities to small entrepreneurs.

Balasubramanian *et al.* (1996) in their study on pricing and transaction trend of raw cashew nut in India observed that the cost of production of kernel per quintal of cashew nut was maximum on raw cashew nut (70.00%) followed by processing labour (10.50%), purchase tax (5.00%), handling charges (5.00%), packing material (4.50%) and so on. The minor item of cost was transportation cost, fuel, unit overhead, administrative overhead and depreciation (0.10% each).

Wadkar *et al.* (2001) studied the economics of fruit processing unit of *kokum* in Ratnagiri district of Maharashtra. The study revealed that, in *kokum* processing industry, on an average 317.07 MT of fresh fruits were used to get dried *kokum* rind and Amrit *kokum*, and 685 kg of fresh fruits used to produce *kokum* butter. The per factory total capital investment made towards processing of dried *Kokum* rind, Amrit *kokum* and *Kokum* butter accounted Rs.1,04,418/-, Rs.3,73,385/- and Rs.2,73,807/- respectively. The cost of processing of one quintal of dried *kokum* rind was Rs.2,143.91/- and of 100 bottle of Amrit *kokum* was Rs.2,031.68 and cost of processing per tin (10 kg) of *kokum* butter was Rs.1,482.14. The study had also identified three marketing channels for the distribution of *kokum* products viz., (1) Producer→ consumer, (2) producer→ wholesaler→ retailer→ consumer and (3) producer→ contractor→ retailer→ consumer. The cost of marketing worked out to Rs.3.90 per kg of dried *kokum* rind, Rs.6.30 per ltr. of Amrit *kokum* and Rs.14.20 per kg of *kokum* butter. Marketing cost items includes octri, transport and sales tax paid on *kokum* products.

Gawas (2002), worked out per quintal cost of processing of dried *kokum* rind and was observed to be Rs. 2143.91. Out of which, Rs.1232.50 incurred on the procurement of fresh *kokum* fruits. The other important items of processing cost were labour charges (Rs.362.60), interest on capital (Rs.359.21), container (Rs.65.50) and other charges (Rs.70.42), while the processing cost of *kokum* fruits in to *kokum* was worked out to be Rs.2031.68 per 100 bottles of 650 ml capacity. The analysis on the process of *kokum* syrup showed that expenditure incurred on the purchase of fruits was maximum (Rs.754.00) followed by sugar (Rs. 365.63), interest on fixed and working capital together estimated to Rs.384.73, whereas, labour charges were Rs.215.78. The gross added value estimated in dried *kokum* rind was Rs.911.41 and Rs.1277.68 in *kokum* syrup per quintal of fresh *kokum* fruits. Whereas net added value was Rs.1206.09 in dried *kokum* rind and Rs.968.32 in *kokum* syrup processing, which clearly indicated processing *kokum* fruits with dried *kokum* rind and prepared over *kokum* syrup processing.

Talathi *et al.* (2003) in their study on value addition and employment generation in mango processing factories conducted in Ratnagiri and Sindhudurg districts of Maharashtra state observed that, the gross added value was Rs. 1726.39 (152.41 %) in pulp, Rs. 1522.26 (507.42%) in pickle, Rs. 7782.31 (114.87%) in squash and Rs. 161.25 (53.75%) in case of raw slices in brine. As regards the net added value it was 65.40 per cent, 16.67 per cent, 203.38 per cent and 12.04 per cent, respectively. Pickle was the most profitable product of mango, followed by pulp, squash and raw slices in brine.

2.4.2 Marketing

Singh *et al.* (1990) conducted study on marketing of pineapple in Darchai village under Kailashahar C.D. block, Kumargaht of North Tripura district; where pineapple being cultivated on large scale. Among the different categories of farmers, proportion of marketed surplus showed direct relation with the number of pineapple grown on farm, i.e. larger the production higher the marketable surplus. The pineapple grown in the village was marketed to different market viz., Village co-operative, Paniachara (local), Kailashahar, Dharmanager and Karimgani. Important markets were Village co-operative and Pahiachara local market which accounted for 15.26 per cent and 13.09 per cent of the total produce and were patronized by 25 and 15 per cent of the producers, respectively.

The channels of marketing identified in the present investigation were:

- i) Producers→ Village-cooperative→ TSIC(processing)wholesalers→ Retailers→ Consumers.
- ii) Producers→ Traders→ Retailers (Pahiachara market)→ Consumers.
- iii) Producers→ Local beoparies→ Wholesalers→ Retailers→ Consumers.
- iv) Producers→ Traders→ Commission agents→ Wholesalers→ Retailers → Consumers.
- v) Producers→ Traders→ Commission agents→ Retailers→ Consumers.

Nagesh *et al.* (1990) conducted study to estimate price spread of cashew in two largest cashew nut growing district (Uttar kannada and Dakshina kannada) of Karnataka; The study concluded that the cashew growers share was more (64.87%) when they sold their produce directly to the processors. This share was reduced to 37.80 per cent when they sold their produce to pre-harvest contractors. The grower's shares in consumer rupee remain almost constant when sold through village traders (55.30%) and wholesaler (55.26%) but decline to 53.58 per cent if sold through itinerant traders due to the realization of low prices by growers for their raw nuts. In this study the analysis, the cost incurred in marketing of cashew nut by the growers and itinerant traders were less than one percent of the consumers price, whereas, it was 4.28 per cent and 4.54 per cent in case of village traders and wholesalers, respectively. The margin earned by pre-harvest contractor was found to be the highest (16.12%) among the all intermediaries, followed by itinerant traders (10.74%) village traders (3.27%) and wholesaler (4.88%).

Yasodha and Padmanaban (1996) conducted field survey in Pollachi taluk of Coimbatore in Tamil Nadu and found that there were three major market functionaries viz., the local traders, commission agents and the wholesalers through whom the coconut growers sold their produce. The sample farmers in different villages vary in their disposal of nuts and markedly observed that, 98.13 per cent to 73.10 per cent of the sample farmers sold to local traders and very meagre quantity of nuts were sold to the commission agent and wholesalers from the farmers because of immediate sales and high transport cost associated in relating later market intermediaries.

Tripathi (1997) estimated the relationship between producer's share in consumer's price and the factors interrelated with the marketing of apple fruit using linear simple regression analysis. It was found that coefficient of multiple determination was highly significant at 1 per cent level of probability for grading and packing, total marketing cost and commission of the middlemen and indicated 47.97 per cent, 62.40 per cent and 74.10 per cent variation in the producer's share due to the variation in these factors, respectively. The grading and packing and total marketing cost provided positive and highly significant regression co-efficient (b_i) at 1 per cent level of probability which indicated that these factors have remarkable favorable impact on the producer's share in the apple marketing. The negative and significant b_i of middleman's commission indicated that this factor had

remarkably adverse impact on apple marketing and played an important role in reducing the producers share in consumers rupee. The transportation indicated non-significant b_i which portrays that this factor had no significant influence on producer's share in apple fruits at the existing pattern of the marketing in U.P. hills; and concluded that, the producers share in consumers rupee can be increased through increasing investment on grading and packing operation on one hand and the rationalization of middleman's commission on the other hand.

Dangat *et.al* (1997) Studied marketing of grapes in Maharashtra state and observed the following marketing channels in the sale of grapes.

- i) Channel I : Producer → Retailer → Consumer
- ii) Channel II : Producer → Commission agent → Wholesaler → Retailer → Consumer
- iii) Channel III : Producer → Co-operative marketing society → Exporter → Retailer → Consumer
- iv) Channel IV: Producer → Co-operative marketing society → Wholesaler → Retailer → Consumer

It was also found that more than half of the quantity of grape was sold through marketing channel-IV, indicating the important role played by the co-operative organization in sale of grapes. The sale of grapes by sample growers in different market showed that 58 per cent of the total produce of grapes was marketed in Delhi and Ludhiana markets, followed by 23 per cent in Mumbai, 16 per cent sold in garden itself and 3.73 per cent to exporters.

The cost of marketing of grape on per kilogram basis was the lowest i.e. Rs.0.11/- only for sale of grapes in the garden itself. It was Rs.6.08, Rs.6.82, Rs.19.33 and Rs.23.45 for sale of grapes in Mumbai, Delhi, Dubai and England markets respectively. The major item of marketing cost was the packing accounting for more than 40 per cent of total cost of marketing and 33 per cent for transportation. The cost on account of commission charges ranged from 15 to 23 per cent in different markets.

Shah (2000) studied marketing channels and market cost in grape; he found that majority of grape grower sold their produce in the domestic market. The estimation of marketing cost was attempted for domestic market only. The following channels were visualized in the case of marketing of grapes in the domestic market.

Producer → Forwarding Agent → Wholesaler

Producer → Commission Agent → Wholesaler

Producer → Wholesaler

Producer → Pre-harvest contractor → Wholesaler

Estimation of marketing cost, the total cost of marketing was broadly classified into three component of cost such as (i) cost of preparation of fruits which includes cost of picking, assembling, grading, packing and packing material. (ii) Cost of transportation which included local transportation cost and expenditure on loading/unloading and (iii) Various marketing charges (freight for transport, octri, sales tax, commission and fees and other expenses).

In case of grape marketed through forwarding agent in the wholesale marketing cost was estimated at Rs.12.35 of the total marketing cost; 40% was accounted for preparation of fruit alone; 6 per cent was for local transportation. The study showed that producers share in consumers rupee was found to be very high (59.49%) in domestic market.

Pagire (2000) employed multiple regression analysis technique for accounting the simultaneous effect of all the factors under consideration in the marketing of grapes. The value of coefficient of multiple determination i.e. R^2 has turned out to be 0.5869, meaning thereby that 59 per cent variation in the per quintal net prices received for grapes was explained by all factors which had turned out to be significant at different level of significance. The significant factors were quantity of grapes sold in the form of lots in quintal (X_1), place a sale of grapes in terms of distance of market place in km. (X_2), Sales to Exporters and the dummy variable representing the grade I quality. The significance of variable x_1 indicates that with increase in quantity sold (at a time) in different lots fetches higher price. However, low magnitude of the regression coefficient; (0.5372) revealed that, there was no substantial

addition in the total returns. The factor x_2 , representing the place of sale was highly significant indicating thereby that if the grapes sold in distance market of say, for example, with a distance of 100 km. from the place of production, on an average the grape growers would get an additional price of Rs.15.73 per quintal over that of farm gate sale (zero km. distance). The regression coefficient representing X_3 variable turned out to be non-significant. The magnitude of regression coefficient of D_{A3} variable was 73.30 with 5 per cent level of significance. It implied that if the grape grower would sell their grapes to exporter, trader, they would get the additional Rs.73.30 per quintal over that of retailers. The regression coefficient had turned out to be highly significant, implies that the grape grower would get a premium of Rs.237/- per quintal over that of grade II produce. The time factor represented by dummy variable was not significant.

Wadkar (2001) studied distribution pattern of *kokum* products at household level. Generally, three distribution methods were followed to dispose the *kokum* products viz. home consumption, distribution between relative and friends and for sale. In south Konkan region of Maharashtra it was observed that 48.88 per cent dried *kokum* rind, 50 per cent Amrit *kokum* and 19.75 per cent *kokum* butter were used at home and remaining quantities of different *kokum* products were sold in the local and distance market through small traders.

Dhage and Rahane, (2003) estimated the per quintal cost of marketing of grapes in Nashik district; The study revealed that at the overall level the average per quintal cost of marketing worked out to Rs.557.10, and the major items of cost of marketing were packing (35.32%) followed by transport (32.23%) and commission (19.39%). Per quintal cost of marketing observed to increase with an increase in size group of holding.

Ladaniya and Wanjari (2003) conducted a study on marketing pattern of 'Mosambi' sweet orange in selected district of Maharashtra. In the study, it was noticed that, farmers with small mosambi plantations were more inclined to sell produce to pre-harvest contractors. This type of decision making by the producers it was attributed to lack of will to take risks associated with marketing and lack of financial assistance required during mosambi production process, while growers with large plantations farmers sold mosambi fruits themselves in distance market. Market efficiency was higher when farmers themselves marketed fruit in distance market. It was also opined that, as the market distance and number of intermediaries increased in marketing cost and margins of cost marketing also increased. Further it was noticed that the market efficiency and share of farmers in consumer's price was decreased.

Mali *et al.* (2003) studied marketing of banana in Jalgoan district of Maharashtra. To market banana in Delhi market they had identified three marketing channels viz., farmers direct sale through co-operatives marketing societies, private traders sale through co-operative fruit sale societies and sale through Local merchants/group sale agencies. Further, the grade wise quantities of banana were sold by banana growers to various marketing agencies. For this purpose, the entire produce of banana was graded into 5 grades, according to weight of the bunches as 'Super' grade (above 16 kg.), 'A' grade (14 to 16 kg.), 'B' grade (12 to 14 kg.), 'C' grade (10 to 12 kg.), and 'D' grade (below 10 kg.) by all sample growers among the five grades, the highest quantity of the produce was of 'A' grade (27.30%) and the lowest (8.06%) of the 'D' grade produce was realized by the sample farmers. Among the three marketing agencies, 57 per cent of total quantity was marketed through local traders (group sale agencies) and it was followed by the private traders through co-operative fruit sale societies (26 %). Only 17 percent of the total produce was marketed directly in Delhi market through co-operative fruit marketing societies.

The grade wise per quintal marketing cost and net price realized from banana for on farm sale through different marketing agencies were studied and it was noticed that, at overall level the average per quintal gross price realized by the farmers was Rs.369.44 for all grade together. The per quintal marketing cost was Rs.27.55 and the net price realized at the overall level was Rs.341.89. Whereas the per quintal cost of marketing was the highest (Rs.29.47) in case of local traders, followed by co-operative fruit sale societies selling the produce to the private traders (Rs.27.32). Per quintal cost of marketing was the lowest (Rs.16.50) in case of co-operative fruit marketing societies selling the produce in Delhi market.

Khunt *et al.* (2003) conducted study on utilization and disposal pattern of pomegranate in the Bhavnagar district of Saurashtra region, Gujarat. It was evident from the

study that marketable surplus was 98.38 per cent. The share of home consumption, relatives and religious purposes were negligible and loss due to damage was only 0.83 per cent.

The disposal pattern of pomegranate marketable samples in different market stated that majority of the farmer (33) had disposed off 59.01 per cent of their pomegranate production in the local market i.e. Bhavnagar city. A few of the pomegranate grower (5) sold their fruits in Rajkot city (12.31%) very little portion of their pomegranate production was sold in other distance places.

The marketing cost of pomegranate showed that, transport cost i.e. Rs.29.52 per quintal (50.46%) formed that total market cost and other important items of marketing cost were packing charges (18.08%), grading cost (16.26%) and loading-unloading charges (11.47%). All items put together the total marketing cost per quintal amounted to Rs.58.50 and the net price received by the growers was Rs.859.66 per quintal.

Navadkar *et al.* (2005) conducted study on marketing of vegetables grown around Pune city and revealed that, per quintal cost of marketing of selected vegetables was more in terminal market (Rs. 112.67 per quintal) than in primary market (Rs. 57.84 per quintal). The proportionate share of transportation and commission charges to total marketing cost were significantly more in terminal market. The producers' share in consumers' rupee was observed to be the least in terminal market for vegetable like cabbage and the highest in bhendi in the same market.

2.5 ANALYTICAL TOOLS

Reviews on various analytical tools followed to analyze the data are presented in the following subheads.

2.5.1 Resource use efficiency in Horticultural crops

Paranjape and Borade (1978) conducted study on resource use efficiency in Alphonso mango production in Deogad taluk of Ratnagiri district. The regression co-efficient for age, cost of plant protection chemicals were significant at 0.01 level in both Cobb-Douglas and Linear functions. The co-efficient of human labour was significant at 0.01 levels in both functions while the co-efficient for proportion of bearing trees was significant at 0.01 levels in Cobb-Douglas function and at 0.05 levels in Linear function. This indicate that age of orchard, use of plant protection chemicals, human labour and proportion of bearing trees had made positive contribution in the production of Alphonso mango. The sum of total of elasticity's in Cobb-Douglas function was 2.9035, which indicated increasing return to scale. The R^2 value indicated that the variation explained by the selected variables was 79 per cent in Cobb-Douglas function and 83 per cent in Linear function. This showed that linear function gave comparatively better fit.

Thomas and Gupta (1987) in a case study worked out the cost of cultivation of banana in Kottayam district of Kerala. The Cobb-Douglas production function was used and the result showed increasing returns to scale. The response of gross income to an increase in the expenditure on suckers, plant protection chemicals, baskets, transportation and marketing was highly significant and positive.

Throat *et al.* (1989) made an attempt to estimate the resource productivity in Alphonso mango production and factors contributing to the yield in Ratnagiri district (M.S.). The study revealed that age of the orchard, number of the bearing trees and bearing score were important factors contributing in the yield of Alphonso mango. Further, marginal value product or factor cost ratios of cash input factors indicated the scope to intensify use of manures and chemical fertilizers and plant protection measures. It was indicated that expenditure on human labour needed to be curtailed.

Gummagolmath *et al.* (2002) conducted a study on mango cultivation in Dharwad district. They observed that, among the estimates of Cobb-Douglas type of production function the manure had a maximum influence on gross returns of small and large orchards. The regression co-efficient of manure for small and large farmers was significant at 1 per cent level; whereas it was non-significant in case of medium size orchards. The regression coefficient of plant protection chemicals for large orchards was also significant and non significant in case of small and medium size orchards. The production elasticities were

negative with respect to land in medium and large orchards and it was positive but non-significant in case of small orchards.

Wadhvani *et al.* (2003) estimated per hectare yield as dependent variable and per hectare use of human labour, land preparation, FYM, chemical fertilizers, seed/seedlings and number of irrigations as independent variable by using Cobb-Douglas form of production and MVP of inputs used in production of Cauliflower and Cabbage and he concluded that, the coefficient of multiple determination (R^2) of the Cauliflower and Cabbage had 33 and 36 percent variability in production of these two crops was explained by the variables included in the model. The human labour and FYM was found influencing the production of both crops significantly. The MVP's were also significant there by implying that, per hectare yield of these could be increased economically by increasing the use of these inputs. The coefficient of cost of seedling was found negative influence on the yield of the Cabbage and MVP was also negatively significant, indicated its excess use.

Naik (2005) analyzed resource use efficiency for mango in South Konkan region of Maharashtra. The study indicated that in the production of mango, farmers were found to use excess quantity of labour and less quantity of insecticides. The marginal value productivity (MVP) was compared with its factor cost (FC) to assess the efficiency of resource use. The ratio of MVP to FC for human labour and manures observed to be less than unity which, indicated excess utilization of these resources and showed that the use of insecticides and fertilizers should be curtailed down for maximization of profit.

Sharma *et al.* (2008) studied the resource use productivity of Himachal Pradesh State Agriculture by dividing it into four agroclimatic zones as the NARP classification. They revealed that, the coefficient of multiple determination of the production function, barring maize (HYV) and paddy in zone-I were significant at 5 per cent level of profitability indicating that the independent variable included in the model viz. FYM, fertilizers, male labour, female labour, tractor/bullock charges and seeds explained a reasonable percentage of variation from 15 per cent to 50 percent in the returns from different crops in the zone-I and zone-II. The expenditure made on FYM affected paddy and wheat significantly, whereas for maize (HYV), it was estimated to be non-significant, that may be due to the fact that the farmers applied sufficient quantity of FYM to which various crops responded. The fertilizers application was found to be significant only in the case of maize local, whereas in case of male and female labour was surplus in the area because of small and marginal holding and its excessive use had a non-significant effect on the production of the crops. The ratios of MVP to MFC were found to be more than one for all the crops in different zones.

2.5.2. Growth rate and trend analysis

Growth rates are the measures of past performance of economic variables. They are commonly used as summaries of trends in time series data. They are not developed to predict but to describe the trends in a variable over time. Policy decisions are often made based on such growth rates which depend on the nature and structure of the data.

Alagh and Sharma (1980) studied the growth of agricultural production in India from 1960-61 to 1969-70 (Period-I) and from 1969-70 to 1978-79 (Period-II). The estimated growth rates in period II were generally higher than those for period I. The variation around the trend was observed to be large. It was indicated that most of the growth rates achieved for the period II were lower than those which were required to achieve desired objectives in medium and perspective periods.

Chengappa (1981) estimated the growth rates of area, production and productivity of coffee in India. A linear model of the type $Y_{(t)}=a+b_t$ and an exponential model of the type $Y_{(t)}=ab^t$ were used to work out the growth rates. The exponential function indicated a good fit of the annual compound growth rate of production with 5.68 per cent for Arabics and 7.4 per cent for Robusta varieties.

Das *et al.* (1985) analyzed the trends in coffee exports in relation to general exports from India for the period 1956-57 to 1982-83. The annual compound growth rates of exports in general had fallen during the period 1972-73 to 1982-83 in spite of buoyant world demand and high domestic production. The share of coffee exports in total exports, in value terms, had increased in both the periods; 1956-57 to 1971-72 and 1972-73 to 1982-83. However, unit value, quantity and export value recorded chronic instability during the same period.

Prakash (1986) evaluated the growth rates of production, consumption and export of Indian coffee using a modified exponential growth function of the form $Y_t = a + bt + ct^2$. The production of coffee in India increased at 4.51 per cent per annum during 1962-63 to 1981-82. The growth rate of consumption during the same period worked out to a 1.69 per cent annum. However, exports registered a significant increase during the study period recording a compound growth rate of a 6.94 per cent per annum.

Subha Rao and Nageswara Rao (1986) studied the growth rates in area, production and yield per hectare of barley and tobacco in India as compared with other barley growing countries of the world during the period of 1967 to 1989 and they concluded that these other countries have relatively lower contribution in the world production of barley and tobacco.

Thakur *et al.* (1988) estimated the growth rates of area, production and productivity of oilseeds in Bihar over two periods. The first period covered 10 years (1961-62 to 1970-71) preceding the green revolution and the second period 13 years after the green revolution. The production and productivity of oilseeds in general increased substantially in the post-green revolution period as compared to those in the pre-green revolution period. The area under oilseeds registered a negative growth rate in both the periods with the exception of linseed in the post-green revolution period.

Chand and Tewari (1991) studied the growth of Indian exports and imports, particularly of agricultural commodities for the period 1970-88 using the exponential trend equation. The total merchandise imports exhibited significantly a higher growth rate at 13.27 per cent per annum compared to exports at 9.87 per cent per annum.

Jeromi and Ramanathan (1993) examined the growth and instability in world pepper market for the period 1975 to 1990. An exponential model of the type $Y_t = ae^{bt}$ ($\ln_e Y_t = \log a + b_t$) was fitted to estimate the growth rate of paper trade and the instability index was calculated using the residuals of the exponential trend equation. Among the exporting countries, Sri Lanka recorded the highest annual compound growth rate of 24.59 per cent with a high degree of instability (1.04). This was mainly due to its low base in the initial year. Positive and statistically significant growth rate and stable index was recorded in case of India. In contrast, the growth rate in total exports from the other producing countries was statistically non-significant. The growth rates of pepper imports ranged from a negative level of 2.56 per cent for Argentina to a high and positive level of 11.64 per cent for Saudi Arabia. The instability indices varied between 0.07 (Japan) to 0.55 (Egypt).

Jalajakshi (1994) analysed the growth of exports of shrimps from India for the period 1966-91. Exponential model of the type $Y = ab^t$ was used to work out the growth rates. Frozen shrimp exports recorded a positive growth rate due to high demand in the importing countries. The negative growth rate observed for dried and canned shrimps were attributed to declining demand in the importing countries and increased cost of production in India.

Venkatesa and Suresh Kumar (1994) estimated the compound growth rates of cashew export, by using the formula $\text{Log } y = a + bt + ut$. The result showed that the export of cashew from India to the world market had a declining trend, though the world market price was increasing over the years. That was mainly because of increasing domestic consumption. The compound growth rates of export price showed increasing trend. The compound growth rates of area and production also showed significant increase.

Lakshman (2005), Studied the growth and instability of pulses economy in India, and revealed that among the selected States the compound growth rate in area of total pulses increased in Andhra Pradesh, Karnataka, Gujarat and Maharashtra of the rate of 0.91, 1.33, 2.80 and 1.40 per cent respectively during the period of 1970 to 2001. Among the major pulses growing States, there was no significant increase in production for overall period except Andhra Pradesh, Gujarat and Tamil Nadu. Where as during overall period, productivity of total pulses increased in Andhra Pradesh, Bihar, Madhya Pradesh, Tamil Nadu, West Bengal and India as whole.

2.5.3. Instability analysis on export performance.

Lincieri (1979) analyzed the instability in agricultural exports from developing and developed countries in term of export values, quantities and unit values. It was concluded that agricultural exports from developing countries recorded high degree of instability which was

detrimental to the countries economic growth. The instability in agricultural exports was also high in developed countries. An inverse relationship between instability and export volume was observed in the world markets implying that smaller the volume of exports in value terms the higher the degree of instability and *vice versa*.

Davis *et al.* (1980) analyzed the instability in agricultural export earnings of the sub-Saharan African economies and concluded that instability in agriculture export earning was primarily associated with variations in quantity exported, rather than with price variability. Hence, it was suggested that Sub-Saharan African countries should be concerned more with quantity adjustment policies rather than pricing policies. The need to undertake research to determine the optimum range of agricultural consistency with high and stable levels of agricultural export earnings was emphasized in this study.

Chand and Tiwari (1991) studied growth and instability of Indian exports and imports of agricultural commodities. They observed that there was a large increase in the export of agricultural produce, in the mid late seventies. However, export of this group stagnated after 1980. The study also reported that the export of fruits and vegetables and coffee and tea showed a remarkable increase and maintained their predominance among the exports.

Gemtes (1991) compared the variability in export earning of Ethiopian coffee over two periods. The first period covered 13 years (1961-74) preceding the revolution and the second period 13 years (1975-83) after the revolution. The change in price variance contributed for a larger share of variance of export earnings. This accounted for 1137.97 per cent increase in the variance of total earnings from coffee.

Katre *et al.* (1992) studied trends and variability in the export of fresh fruits and vegetables from India. They reported that value of fresh vegetables were comparatively more (C.V. 37.39%) than export value of fresh fruits (C.V. 45.59%), which was due to the great variations in the export values of mangoes (C.V. 40.44%), contributing significantly to the export values of fresh fruits..

Pal (1992) examined the magnitude of growth and instability in agricultural export. He worked out the percentage deviation from moving average (3 year), mean positive and negative deviations and coefficient of variation in export earning from various product groups. The export earnings from total merchandise and agricultural export were fairly stable. He further reported that the low instability for total agricultural exports and high instability for various product groups indicated that the diversification in agricultural exports had strong stabilization

Veena (1992) identified price instability as the single largest source (over 60 per cent), contributing to the instability in the total Indian coffee export earnings. The abolition of International Coffee Agreement was observed as one of the main reasons causing instability in prices.

Jalajakshi (1994) studied the instability in the export of shrimps from India for the period 1966-91. The fresh shrimp exports to Japan and USA were found to be stable, but dried-and-canned shrimp exports to Japan, USA, UK and EEC showed a high variability. This was due to the decreased demand in the importing countries and high cost of production in India.

Singh and Mathur (1994) assessed instability in potato production in India by using the co-efficient of variation. It was found that the area and production were unstable because of the response of potato production to prices of competing crops and the adoption of modern technology, respectively.

Prasher and Bahl (1998) studied the growth and instability in agriculture in four districts of Himachal Pradesh by using time series data from 1980-81 to 1989-90. For this purpose, the compound growth rates of area, production and yield of major crops were calculated by using an exponential function. The production and productivity of total food grains indicated a significant and positive trend in Chamba district, with a growth of 4.16 per cent and 4.08 per cent, respectively. Further, the coefficients of variation of area, production and productivity of total pulses and total foodgrains were highest for Chamba district, when compared to other districts. In the State, barley and pulses showed negative growth rates in

area, which implied that the farmers were shifting, the cultivation towards high-value cash crops like fruits and off-season vegetables, which also profitable to the farmers in the long run

Tripathi *et al.* (1998) carried out analysis of growth and instability of pulses production in Orissa. Compound growth rates were computed by using an exponential growth model. The results of period-wise analysis showed that during the first short period (1970-71 to 1979-80), pulse output experienced a significant positive growth rate of 5.03 percent per year and it was attributed to significant expansion of area 97.70 per cent as contribution of yield was found to be negative and significant (-2.48%). To reduce variability in yield, the study suggested the development of varieties suitable to agro-climatic zones.

Talathi *et al.* (2003) in their study on variability in mango exports and export competitiveness, revealed that as regards earnings from export of fresh mango from India, at overall level, the simple growth rate increased significantly (Rs.29020.16 thousand) at current prices and at constant prices (Rs.5573.48 thousand). There were upward and downward swings in the exports of mango (both for volume and value) which indicated instability in quantum and earnings from mango export. Variability in mango export indicated that, the coefficient of variation was more at an overall level for almost all the items of export by quantum and value. There was maximum variability in other mango processed products (79.46%), followed by pulp (36.36%), fresh mango (34.10%), and mango pickle and *chutney* (29.11%).

Lakshman (2005), Studied the coefficient of variation of major pulses and revealed that, among the selected States a maximum variation in area was in West Bengal (39.50%), while minimum variation was found in Madhya Pradesh (5.33%) during the study period of 1970 to 2001.

2.6 STUDIES RELATING TO THE PRODUCTION, PROCESSING AND MARKETING CONSTRAINTS

Gupta and George (1974) in their study on modernization of rice processing industry in Punjab found that lack of financial resources to meet the procurement requirement was the major problem face by the millers. Non-availability of gunny bags and the high moisture content of paddy were the other problems encountered in paddy procurement. One third of the millers had experienced problems in paddy storage.

Rameshwar *et al.* (1986) studied on the production, processing and marketing of linseed in Banda district (UP) and suggested for reducing the processing cost of linseed through establishment of co-operative oil crusher plants in the rural area and arrangement may be made for raw material. These activities would help to create an efficient marketing system and employment in the rural area.

Hemchand (1989) in his study on economies of processing units in Narasinghpur district (MP) found that the main problems of arhar processors were inadequate availability of raw materials, short supply of power leading to under utilization of the plant, declining output inefficient utilization of machinery and labour and problems of transportation of processed material to different destinations.

Nagesh (1990) found that the major problems faced by the cashew Processors in Karnataka were the existence of large number of processing units, inadequate availability of raw cashewnut, poor quality of raw cashewnuts, rise in prices of raw cashewnut, non-availability of skilled labour, increase in wage rate and high taxes. All these problems ultimately resulted in underutilization of the installed capacity.

Ansari (1990) studied the organization and management in Co-operative Sugar Mills in Uttar Pradesh and concluded that the sugar co-operatives of Uttar Pradesh area were in the grip of a number of management problems at various levels. The nature of the co-operatives multiplies their complexity. Lack of professionalisation of management was mainly responsible for this state of affairs besides other things such as vested interests of office bearers.

Venkatashshaiah (1992) found that the major problems faced by the groundnut processors were high competition within the processing units for getting raw material, frequent price fluctuations of raw materials, irregular power supply, high taxes on the

commodities, low percentage of oil recovery due to lack of modernization of machineries and non-availability of sufficient raw material for crushing. All these resulted in low returns and high cost of processing, leading to lower net profit margins.

Veerkar *et al.* (2001) studied constraint in *kokum* processing industry. They found that the common problem faced by the industry was higher transport charges incurred in marketing which was 60 per cent of the processing units, similarly high price of raw material and its non-availability were reported by the same (60%) processing units. On the other hand 70 per cent and 80 per cent of the processing unit faced the problem of non-availability of labour and capital respectively. Similar problems were also reported by the Amrit *kokum* and *kokum* butter processing units. To overcome their problem, more than 70 per cent *kokum* processors proposed to provide long term financial assistance with lower rate of interest by the financial institutions. Further, they suggested increasing the area under *kokum* to stabilize the supply level and to give relaxation on the taxes to be paid by the processors towards the processed *kokum* products.

3. METHODOLOGY

The economic activities related to *Kokum* cultivation, processing and marketing is dominated in this comparative advantageous agro climatic condition, which is directly influencing the socio-economic background of the study area and growers on various agricultural activities carried out in this region. Besides this various physical factors like irrigation facilities, soil type, transport, communication and other infrastructural facilities decide the suitability of a particular crop enterprise in this area. The present study was conducted in the Ratnagiri and Sindhudurg districts of Konkan region, which falls under Agro-climatic Zone-I i.e. very high rainfall area with laterite soil, (VRL Zone) in Maharashtra. Looking to the performance of the crop an economic analysis in tune with cultivation, processing and marketing of *kokum* assumes greater importance. Keeping this in view, brief account of geophysical and socio-economic conditions prevailing in Maharashtra and in South Konkan region in particular are given in this chapter so as to have better understanding of the region, better interpretation of the data and for drawing useful implications. This chapter provides an overview of:

- 3.1. Profile of the Maharashtra State
- 3.2. Profile of the Konkan region
- 3.3. Sampling design and data base
- 3.4. Analytical techniques
- 3.5. Definition of terms used in the study

3.1. PROFILE OF THE MAHARASHTRA STATE

Maharashtra state is located at North latitude 15°40' and 22°00' and East longitudes 72°30' and 80°30' with geographical area of 3,07,713 sq. kms. The state is bounded by Madhya Pradesh and Gujarat in the north by Chattisgarh and Andhra Pradesh in east, by Andhra Pradesh, Karnataka and Goa in south and by the Arabian sea in the west. The state has been divided into four socio-economic regions namely Konkan, Western Maharashtra, Marathwada and Vidarbha. At present, administratively it is divided into 35 districts and 326 taluks. There are 41,251 inhabited villages and 2,613 uninhabited villages. The state has a total population of 9.21 crores. Out of the total area of the state, 68 per cent (2.1 lakh sq.kms.) is cultivable. Like most of the other part of India, the climate of Maharashtra state is tropical monsoon type. Generally, there are three distinct seasons within a year viz. summer from March to May, rainy season from June to September with post monsoon rainfall in October and winter from December to February.

The *Kokum* cultivation in the state is concentrated only in the Konkan region.

3.2. PROFILE OF KONKAN REGION

Konkan region is located on the West coast of India, having narrow strip running from north to south and situated between Sahyadri hills in the east and Arabian Sea in the west. This region lies between 15°37' and 18°40' North latitude and 73°19' and 74°13' East longitude.

3.2.1 Description of the study area

The geographical area of the south Konkan region is 12,963 hundred ha. This region comprises Ratnagiri and Sindhudurg district having geographical area of 7915 hundred ha. and 5048 hundred ha. respectively. This study area lies between the Sahyadri hills in the east and the Arabian Sea in the west beyond which, there are Satara, Sangali and Kolhapur districts, Raigad district to the north, Goa state to the south. South east part of Sindhudurg district is adjoining to Belgaum district of Karnataka state. The region is having an average east-west expansion of about 64 km. The average north-south length of south Konkan region is about 300 km. The total population of the region according to 2003-04 was 25.58 lakhs having a density of population of 189/sq.km. In the total population, proportion of female was higher (53%) than male (47%). The sex ratio (female per 1000 male) of the region was 1160. In the region, high literacy percentage was observed, which was 75.35 per cent in Ratnagiri and 80.52 per cent in Sindhudurg district (Fig.1.)

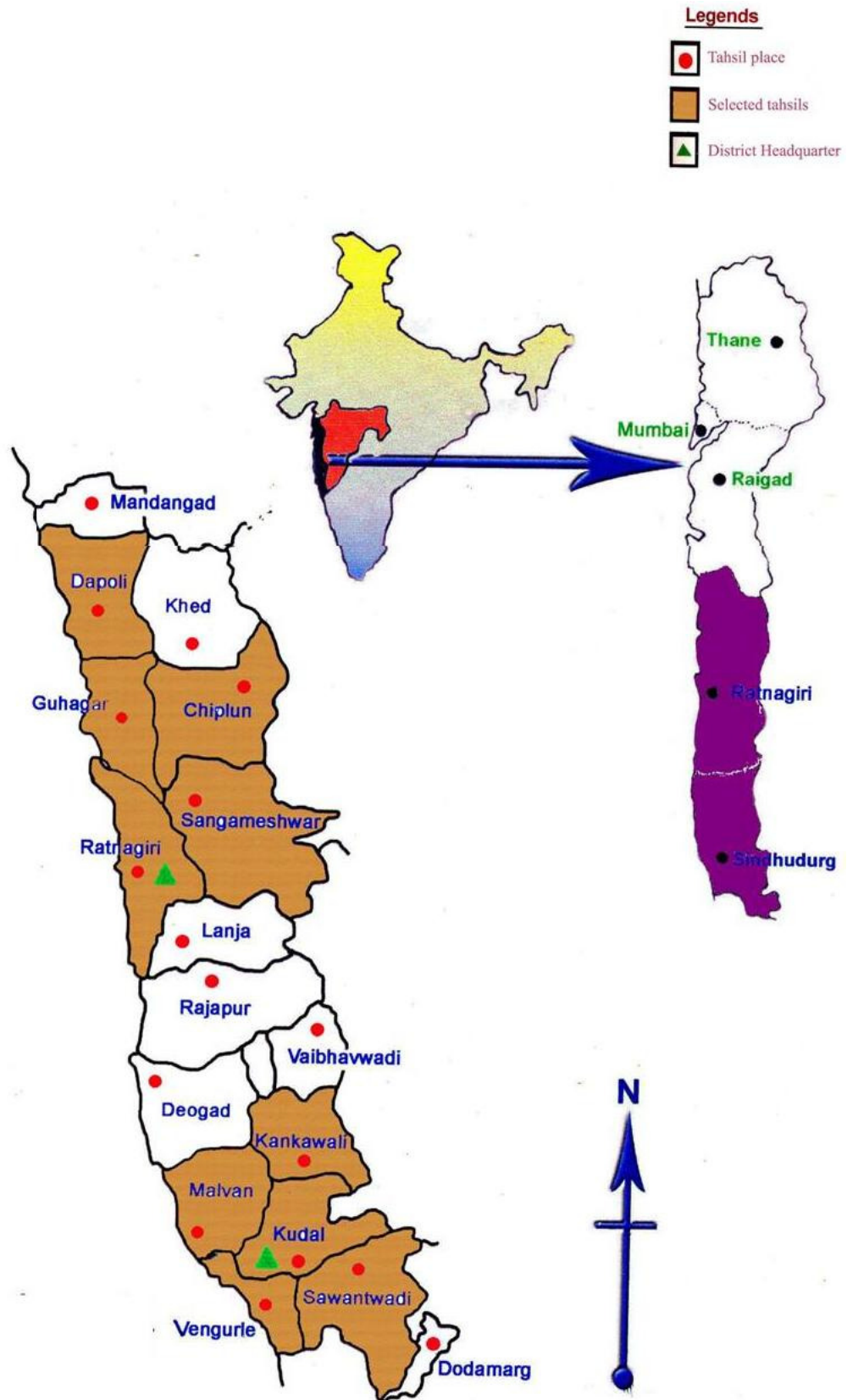


Fig.1. Map showing area of south konkan region

Table 3.1 Land utilization pattern of South Konkan region during 2003–2004

(Area in '00' ha.)

Sl. No.	Land use category	Ratnagiri	Sindhudurg	Total of region
1.	Total area	7915 (100.00)	5048 (100.00)	12963 (100.00)
2.	Area under forest	61 (0.77)	367 (7.27)	248 (3.30)
3.	Land put to non- agriculture use	66 (0.83)	67 (1.33)	133 (1.03)
4.	Barren and uncultivable land	1851 (23.39)	1182 (23.41)	3033 (23.40)
5.	Permanent pasture	395 (4.99)	129 (2.56)	524 (4.04)
6.	Cultivable waste	1398 (17.66)	322 (6.38)	1720 (13.27)
7.	Land under miscellaneous tree crops and groves	797 (10.08)	702 (13.90)	1499 (11.57)
8.	Current fallow	312 (3.94)	275 (5.45)	587 (4.53)
9.	Other fallow	487 (6.15)	636 (12.60)	1123 (8.66)
10.	Net area sown	2548 (32.19)	1368 (27.10)	3916 (30.20)
11.	Area sown more than once	23 (0.90)	32 (2.35)	55 (1.40)
12.	Gross cropped area	2571	1400	3971

(Figures in the parentheses indicate percentages to total reported area)

Source: District statistical abstract 2004-05.

3.2.2 Topography

Considering the physical features, south Konkan can be divided into three parts viz. i) Hilly terrain of Sahyadri and its off-shoots, covering about a strip of 15 km. from Sahyadri ranges, ii) middle part situated in between 15 km. away from Sahyadri ranges about 10-15 km. from sea shore, locally known as “Walati patti”. This belt is best suited for paddy, nagli and horticultural plantation. and iii) Coastal plain (10-15 km. from seashore), locally known as “Khalati patti”, where coconut, arecanut and Alphonso mango, spices, *kokum* and other minor fruit crops are concentrated.

3.2.3. Soils

The soil is associated with high rainfall and other agro-climatic condition, with the following major soil types in the south Konkan region.

- 1) Laterite and lateritic soils: These soils are sandy clay loam to clay in texture, and hence, are susceptible to erosion. These soils are acidic, fairly well supplied with organic carbon and total nitrogen. The available potassium content is variable, but phosphorus content is low. The soils are suitable for cultivation of paddy, millets and horticultural crops like mango, cashew and minor fruits like *kokum*, aonla, jamun and jackfruit etc.
- 2) Coastal alluvial soils: These soils are found on the banks of river/creek in low-lying areas. These soils are clay-loam to loam in texture.
- 3) Coastal saline soil: In spite of heavy rainfall, these soils are highly saline, mostly found in the vicinity of the sea coast. The texture of the coastal saline soil in this region is sandy loam to sandy clay-loam. These soils are most suitable for growing coconut crop and some salt tolerant paddy varieties are grown in this soil.

3.2.4. Climate and Rainfall

The climate of the region is humid, which ranges from 60 to 90 per cent throughout the year and on an average temperature ranges from 15°C to 34°C. This region gets assured annual rainfall in the range of 3000 to 3500 mm from south-west monsoon during the month of June to September.

3.2.5 Land utilization

It is revealed from the Table 3.1 that, the total geographical area of the south Konkan region was 12.96 lakh ha., of which 23.40 per cent was barren and not suitable for cultivation. The proportion of total fallow land was about 13.19 per cent.

The land under miscellaneous tree crops and groves was 11.57 per cent and cultivable waste land accounted for about 13.27 per cent. The area under forest was very meager, about 3.30 per cent and that too, the major area under forest was in Sindhudurg district. The area sown more than once was very less and it was 1.40 per cent.

In Ratnagiri district 32.19 per cent area was observed to be net sown area where as 0.90 per cent area was sown more than once time. The area under forest, bared land, permanent pasture and cultivable waste were observed to be 0.77 per cent, 23.29 per cent, 4.94 per cent, and 17.66 per cent respectively. On the other hand, in case of Sindhudurg district net sown area accounted 27.10 per cent, while cultivable waste, permanent pasture and current fallow were accounted 6.38 per cent, 2.56 per cent and 5.45 per cent respectively.

3.2.6. Cropping pattern

The cropping pattern of the study area was dominated by *kharif* rice, which was main staple food crop of the Konkan region. It is clearly revealed from the Table 3.2 that the area occupied by this single crop was 38.81 per cent. Considering the area under other cereals and pulses crops, the total area occupied by food grown was 48.02 per cent. The area occupied under total food grains was 56.49 per cent in Sindhudurg district during the period as against the 43.40 per cent in Ratnagiri district. It was also observed that by considering gross cropped area, the total area under fruits and vegetables was 17.81 per cent in total south Konkan region, but the maximum area (28.05%) was found to be in Sindhudurg district.

Table 3.2 Cropping Pattern of south Konkan region during 2003-04

(in ha.).

Sl. No.	Crop	Area		
		Ratnagiri	Sindhudurg	Total of South Konkan
1.	Rice	80908 (31.47)	73244 (52.29)	154152 (38.81)
2.	Other cereals	28159 (10.95)	4164 (2.97)	32323 (8.14)
3.	Total cereals (1+2)	109067 (42.42)	77408 (55.26)	186475 (46.95)
4.	Total pulses	2529 (0.98)	1723 (1.23)	4252 (1.07)
5.	Total food grains (3+4)	111596 (43.40)	79131 (56.49)	190727 (48.02)
6.	Sugarcane	5 (Neg.)	298 (0.21)	303 (0.08)
7.	Spices and condiments	107 (0.04)	325 (0.23)	432 (0.11)
8.	Areca nut	1158 (0.45)	506 (0.36)	1164 (0.29)
9.	Mango	19785 (7.70)	16645 (11.88)	36430 (9.17)
10.	Cashew	10499 (4.08)	21457 (15.32)	31956 (8.05)
11.	Total fruits and vegetables(8+9+10)	31441 (12.23)	39286 (28.05)	70727 (17.81)
12.	Total food crops	144307 (56.13)	119764 (85.50)	264071 (66.49)
13.	Coconut	1855 (0.72)	6931 (4.95)	8786 (2.21)
14.	Total oilseed	1950 (0.72)	8472 (6.05)	10422 (2.62)
15.	Fodder crops	108963 (42.39)	11835 (8.45)	120798 (30.42)
16.	Total non-food crop	112768 (43.87)	20307 (14.50)	133075 (33.50)
17.	Gross cropped area	257075 (100.00)	140071 (100.00)	397146 (100.00)

(Figures in the parentheses indicate percentages to GCA)

Source: District statistical abstract 2004-05.

Table 3.3 Area irrigated in the study area (2003 – 2004)

(Area in ha.)

Sl. No.	District	Net irrigated area			Gross irrigated area	Gross cropped area	% of GIA to GCA
		Surface	Well	Total			
1	Ratnagiri	373	2061	2434	3778	257075	1.47
2	Sindhudurg	26496	764	27260	47956	140071	34.24
3	Region Total	26869	2825	29694	51734	397146	13.02

Source: District statistical abstract 2004-05.

However the area under fodder crop was observed maximum (43.39 %) in Ratnagiri district. The proportionate area under Mango, Cashew, Coconut and Oilseeds was comparatively higher in Sindhudurg district than Ratnagiri district.

3.2.7 Irrigation pattern

In Ratnagiri district, well was the main source of irrigation, whereas in Sindhudurg district, surface irrigation was the main source (Table 3.3). The proportion of area irrigated to total cultivated area was 34.24 per cent in Sindhudurg district and only 1.47 per cent in Ratnagiri district. The overall proportion of the irrigated area to the gross cropped area in region was 13.02 per cent.

3.3 DATA BASE AND SAMPLING PROCEDURE

Ratnagiri and Sindhudurg districts in the Konkan region of Maharashtra state have the highest area under *Kokum* cultivation. *Kokum* cultivation is observed in all nine taluks of Ratnagiri district. However, five taluks were selected purposively on the basis of the highest area under *Kokum*. Similarly out of eight taluks in Sindhudurg district, five taluks were selected purposively.

3.3.1 Nature and source of data

The information relating to *kokum* cultivation was collected from the *kokum* cultivators having at least three years old trees and following improved cultivation practices. The data pertained to the year 2005-2006. Pre-tested and well structured schedules were used to collect information from the sample farmers through personal interview method. The secondary data on area, land use pattern and export relating to the *kokum* crop in the study were collected from agriculture department of the concerned district. Secondary data on export was collected from the published web site of Datanetindia private limited New Dehli.

3.3.2 Selection of study area

The cultivation of *kokum* is mainly concentrated in the south Konkan region of Maharashtra. Based on the criteria of highest area under the crop. Ratnagiri and Sindhudurg districts were purposively selected.

3.3.3. Selection of taluks

Talukwise area under *kokum* crop was obtained from the office of the District Agricultural Officer. The *kokum* cultivation is common in all the taluk of Ratnagiri and Sindhudurg districts. Hence, five taluks from each district were selected purposively on area proportionate basis.

3.3.4 Selection of *kokum* growers

From the selected five taluks from each district, in all 60 farmers were randomly selected at the rate of 12 farmers from each taluk. Thus the final sample consisted of 120 *kokum* cultivators. Where as for assessing the establishment cost of *kokum* orchard, 60 farmers were randomly selected at the rate of 6 farmers from each taluk. From the selected farmer, each having both seed origin and grafted *kokum* orchard, therefore from the every farmer information of both type of *kokum* orchard have been collected and analysed.

3.3.5. Selection of *kokum* processor

The number of *kokum* processing units in the taluks was selected on quota sample method. Accordingly, 20 *kokum* processors were randomly selected with quota sample method at the rate of 2 processing units from each taluks.

The selected *kokum* processing units were further classified into four categories based on the annual processing capacity under.

Sr. No.	Category	Annual production capacity in metric tones
1.	Home scale	Up to 10 M.T.
2.	Cottage scale	Above 10 M.T. but less than 50 M.T.
3.	Small scale	Above 50 M.T. but less than 250 M.T.
4.	Large scale	Above 250 M.T.

3.3.6. Sample frame for marketing functionaries

The relevant information on marketing of the *kokum* fresh fruits and its processed products were collected from different categories of market functionaries. The list of authorized *kokum* traders was obtained from APMC of respective district. For this purpose with the help of information obtained from APMC market of the respective district, different market functionaries and market channels were identified and a list of authorized trader was prepared. Further from the list, 50 per cent of authorized *kokum* traders operating in the whole district were selected purposively. However, other intermediaries were selected randomly from respective taluk of the District. From each of the market 6 retailers, 3 itinerant merchants, 3 village traders, were chosen and interviewed personally to elicit required information with the help of well-structured and pre-tested schedule (Table 3.5).

3.4 ANALYTICAL TOOLS AND TECHNIQUES EMPLOYED

3.4.1 Tabular Analysis

Tabular analysis including percentages and averages were worked out to draw meaningful conclusions.

3.4.2 Financial Feasibility

The discounted cash flow technique which has an advantage of reducing cash flow to single point of time was used to facilitate the test of feasibility.

The discounting procedure estimates the present value of an amount either received or paid out in the future. The discounting factor permits the determination of the present value and has found application in evaluation of project. Three financial feasibility techniques were used in the study to evaluate the feasibility of investment in *kokum* cultivation.

i) Net Present Value (NPV)

It is believed to be a more meaningful measure of the long-term investment proposal and useful in comparing the other investment proposal. Net present value is the discounted value of all cash inflows, net of all cash outflows of the project during its life period. Generally, higher the net present value better would be the preference. In calculating the net present value, the present value of benefits was considered at a discount rate of 14 per cent. Net present value criterion is presented below.

Table 3.4. Selection of *Kokum* growers

Sl.No.	District	Name of taluks	No. of <i>Kokum</i> grower selected
A)	Ratnagiri	Dapoli	12
		Guhaghar	12
		Sangmeshwer	12
		Ratnagiri	12
		Chiplun	12
B)	Sindhudurg	Sawantwadi	12
		Vengurle	12
		Kudal	12
		Malwan	12
		Kankawali	12
	Total		120

Table 3.5. Selection of marketing intermediaries

District	Name of taluks	Trader/ Dealer	Village Trader	Itinerant	Retailer
Ratnagiri	Dapoli	10	3	3	6
	Guhaghar		3	3	6
	Sangmeshwer		3	3	6
	Chiplun		3	3	6
	Ratnagiri		3	3	6
Sindhudurg	Sawantwadi	12	3	3	6
	Vengurle		3	3	6
	Kudal		3	3	6
	Malwan		3	3	6
	Kankawali		3	3	6
Total		22	30	30	60

$$NPV = \sum_{i=0}^n \frac{A_i - C_i}{(i+r)^n}$$

Where,

A_i = cash inflow in the i^{th} year

n = no. of years

r = Discount rate (14%)

C_i = cash out flow in the i^{th} year

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

ii) Internal Rate of Return (IRR):

The internal rate of return is that discount rate at which the NPV is equal to zero. The internal rate of return is arrived at, through interpolation technique by using different discount rates so as to see that net present value is equated to zero. The IRR was estimated as follows,

$$IRR = \text{Difference between two discount rates} + \left[\frac{NPV \text{ at lower discount rate}}{\text{Absolute diff. bet. NPVs at the two discount rates}} \right]$$

If the project being analyzed has internal rate of return which is more than the ruling rate of interest, then the investment in the project was considered feasible.

iii) Pay Back Period (PBP)

It indicates the time period required to recover the initial investment made in a project. Shorter the pay back period, better it will be, and then the investment in a project considered feasible. Symbolically, the pay back period equal t^* where, t^* is the lowest value of 't' for which the following inequality holds.

$$\sum_{t=0}^{t^*} C_t = \sum_{t=0}^{t^*} R_t$$

Where,

R_t = Return in period 't'

C_t = Cost in period 't'

iv) Benefit Cost Ratio

The benefit cost ratio of an investment is the ratio of the discounted value of all cash inflows to the discounted value of all cash outflows during the life of *kokum* orchard. It is calculated by using following formula.

$$BCR = \sum_{t=0}^T \frac{R/(1+r)^t}{C(1+r)^t}$$

On the basis of criterion of pay back period, a project is worth undertaking if its payback period is not greater than the investor's desired maximum pay back period. If net present value is positive, the investment is profitable according to the NPV criterion. The investment on the project is economically viable if a project guarantees an IRR, which is greater than the cost of borrowing i.e. prevailing rate of interest on borrowing. Similarly, if the benefit- cost ratio is greater than unity, the investment is profitable by the BCR criterion.

3.4.3 Production function analysis

The production functions analysis was carried out to identify the factors influencing the yield of *kokum* and resource use efficiency in the *kokum*. The following form of Cobb-Douglas production function was used in the present study.

a) Functional form:

$$\ln Y = \ln a_1 + b_1 \ln X_1 + b_2 \ln X_2 + \dots + b_7 \ln X_7 + e^u$$

Where,

Y = Yield (Qtls.) per farm

X₁ = Area of *kokum* orchard (ha)

X₂ = No. of trees per hectare

X₃ = Age of orchard (years)

X₄ = Human labour (man days) per farm

X₅ = Quantity of manures (Qtls) per farm

X₆ = Value of insecticides (Rs.) per farm

X₇ = Value of fertilizers (Rs.) per farm

a = Constant 'intercept'

e^u = error term

b₁, b₂, -----, b₇ are regression coefficient of x₁, x₂--- x₇ respectively

For estimating the function, all the variables were considered on per farm basis.

b) Test of Significance

Variance ratio test i.e. 'F' test was also used to test the significance of coefficient of multiple determination R².

This test was also used to test the significance of various factors influencing the yield of *kokum*.

c) Estimation of marginal values

Marginal Physical Produce (MPP) and Marginal Value Product (MVP) were calculated by using the following formulae.

$$i) \text{ MPP} = \frac{b_i \hat{y}_i}{\bar{X}}$$

Where,

b_i = Production elasticity of ith input

\hat{y}_i = Estimated y at geometric mean levels of X_i

\bar{X} = Geometric mean of ith input

ii) MVP = MPP X unit value of y (output)

d) Resource use Efficiency:

The efficiency of resources was judged by computing the ratio of MVP of resource to its factor cost.

MVP/P_{xi} = 1 ----- Optimum use of resource

MVP/P_{xi} < 1 ----- Excess use of resource

MVP/P_{xi} > 1 ----- Under use of resource

3.4.4 Compound growth rate analysis

Growth rates of area, production, productivity and export of *kokum* products were computed for the period of 10-14 years depending upon the availability of data.

The linear, log linear, exponential and power functions were employed to study the growth rates. Among these, the exponential form of the function $Y_t = ab^t$ which was used. In the present study, compound growth rates in area, production, productivity and export of *kokum* products were estimated by specifying the following relationship.

$$Y_t = ab^t U_t \text{-----(1)}$$

Where,

Y_t : Area, production, productivity, quantity and value of *kokum* exported in years 't'

t : Year which takes value 1, 2.....n

U_t : Disturbance term in year 't'

'a' and 'b' are the parameters to be estimated

The equation (1) was transformed into log linear form and written as;

$$\log Y = \log a + t \log b + \log U_t \text{-----(2)}$$

Equation (2) was estimated by using Ordinary Least Squares (OLS) technique.

Compound growth rate (g) was then estimated by the identify given in equation (3).

$$\hat{g} = \left(\hat{b} - 1 \right) \times 100 \text{.....(3)}$$

Where,

\hat{g} : Estimated compound growth rate in per cent per annum

\hat{b} : Antilog of log b

The standard error of the growth rate was estimated and tested for its significance with 't' statistics.

3.4.5 Trend Analysis

In the present study, orthogonal polynomial regression analysis was adopted to study the trends in area, production and productivity of *kokum* in the selected districts as well as for the state as a whole.

The trend function of the following form was employed.

$$\hat{Y} = \bar{Y} + b_1 Z_1 + b_2 Z_2 + b_3 Z_3$$

Where,

\hat{Y} = The predicted area/production/yield of *kokum*

\bar{Y} = The general mean area/production/productivity for any specific year 'X' via 'Z'

Z_i 's = the orthogonal polynomials

$Z_1 = X - \bar{X}$, $Z_2 = (X - \bar{X})^2 - (n^2 - 1)/12$ etc.

Expressed in terms of equally spaced original 'X's and b's are the regression coefficients whose values are to be determined from the sample data.

Since the objective is to find the polynomial of lowest degree that seems an adequate fit for the data, it is necessary to test for the significance of each 'b' coefficient in successive stages until two successive 'b's turn out to be non-significant.

This method is more suitable for the present study because of absence of prior knowledge regarding the exact mathematical form of the trend functions of *kokum* and computational ease with which step-wise forward polynomial regression analysis is facilitated.

This technique was also used to analyze trends in export of *kokum*.

3.4.6 Instability Analysis in Export

In order to study the variability in export trade of fresh *kokum* products, an index of instability was used as a measure of variability. The coefficient of variation (CV) was calculated by using the following formula

$$CV(\%) = \frac{\text{Standard deviation } (\sigma)}{\text{Mean}(X)} \times 100$$

A linear trend was fitted to original data on various components of export of *kokum* processed products. The trend coefficient was trend rather than variation around mean was used as index of instability. The formula suggested by Cuddy and Della (1978) was used to compute the degree of variation around the trend.

$$CV(\%) = \frac{\text{Standard deviation } (\sigma)}{\text{Mean}(X)} \times 100 \times \sqrt{1 - R^2}$$

The linear trend was fitted by using the following equation

$$Y = a + b_1 t + e$$

Where,

Y = Export in Rs./Q.

t = Time variable (Years)

a = Constant

e = Random term

Coefficient of variation around the mean was multiplied by the square root of the difference between the unity and coefficient of multiple determinations (R^2).

The instability index refers to an average year to year percentage variation in export earning adjusted for constant percentage trend. Higher values of index indicate greater year to year fluctuation around the trend.

3.4.7. Ratio Analysis for Business

3.4.7.1 Measurement of capital efficiency in processing units.

Capital efficiency was measured by using following standard formulae.

i) Rate of capital turnover (%)

$$\text{Rate of capital turnover} = \frac{\text{Gross income}}{\text{Average capital investment}} \times 100$$

ii) Rate of return on capital investment (%)

$$\text{Rate of return on capital investment} = \frac{\text{Return on investment}}{\text{Average capital investment}} \times 100$$

Where,

Return on investment = Gross income – Total cost except interest on capital.

iii) Capital investment per hundred rupees of gross income (Rs.)

$$\text{Capital investment per rupee of gross income (Rs.)} = \frac{\text{Total capital investment}}{\text{Gross income}} \times 100$$

iv) Input-output Ratio

$$\text{Input – output ratio} = \frac{\text{Gross income}}{\text{Total expenses}}$$

3.4.7.2 Measurement of Labour efficiency in Processing unit:

Labour efficiency was measured by using following standard formulae:

i) Per worker gross return (Rs.)

$$\text{Per worker gross return} = \frac{\text{Gross income}}{\text{No. of workers}}$$

ii) Per worker Net return (Rs.)

$$\text{Per worker net return} = \frac{\text{Net income}}{\text{No. of workers}}$$

iii) Quantity processed per worker

$$\text{Quantity processed per worker} = \frac{\text{Total quantity processed}}{\text{No. of workers}}$$

3.4.7.3 Test of Profitability ratio

Though service occupies a prime place in the processing unit, the importance of profit cannot be ignored, as profit is a measure of efficiency of any organization and is key for survival and expansion of the organization. The profitability ratio measures the financial status of the *Kokum* processing units and overall efficiency. Following ratios were used to study profitability.

i) Net profit to total assets

This ratio indicated the rate of profit on the total assets. An increase in this ratio over the years showed improvement in the overall efficiency of the processing unit. This ratio was computed as follows:

$$\text{Net profit to total assets} = \frac{\text{Net profit}}{\text{Total assets}}$$

ii) Net profit to owned fund ratio

This ratio showed the extent of profitability in relation to investment of owned funds in the business. Higher ratio would indicate higher percentage of income generated on the equity.

$$\text{Net profit to owned fund ratio} = \frac{\text{Net profit}}{\text{Owned fund}}$$

iii) Net profit to fixed assets ratio

This ratio was computed by dividing net profit by fixed assets of the firm. A higher ratio indicates a better utilization of fixed assets by the processing unit and that they are in a better position to meet the long term obligation.

$$\text{Net profit to fixed assets} = \frac{\text{Net profit}}{\text{Fixed assets}}$$

iv) Net profit total sale ratio

This ratio is used to judge the overall efficiency of the business of the processing unit.

$$\text{Net profit to total sale ratio} = \frac{\text{Net profit}}{\text{Total sale}}$$

3.4.7.4 Estimation of break-even point Production

The formula used for estimation of break-even point production is given below.

$$Q = \frac{FC}{(P - VC)}$$

Where, Q = Quantity of break-even point production

FC = Total annual fixed cost

P = Per unit selling price

VC = Per unit variable cost

3.5 DEFINITIONS OF TERMS USED IN THE STUDY

Retailer: The retailer is a person who purchase produce directly from producers or village merchants in the retail market or purchases' the produce through commission agent-cum-wholesaler in the wholesale market and sell them to consumer in the retail market.

Village trader: A village trader is a person, who purchases the produce in the village directly from the producers or farmers for subsequent selling in regulated markets or other places.

Trader: Trader performs the duties of buying and selling of the commodities in bulk at wholesale market,

Itinerant merchant: Itinerant merchant is nothing but hawkers, who collect the seed, scraps and other material from the villages and sale them to wholesaler or trader

Variable costs: The variable costs include cost on manure, fertilizer, and wages of human and bullock labour, plant protection chemicals, irrigation, interest on operational capital and repairs and maintenance charges.

Kokum fruit: Rind, pulp, juice and seeds from ripe fruits are used for making different food, medicine and cosmetic products.

Lonawala kokum: Green unripe fruits are cut in to longitudinal halves keeping seed intact and sundries. In Gujarati kitchen this product is used in culinary preparation in place of *Amsool*.

Kokum ghul: The seed from unripe and ripe fruits are removed and the rind is simply sundried without any treatment.

Kokum syrup: It is prepared by using rind pieces and sugar (1:2) *Kokum* syrup on dilution is a cooling and refreshing natural drink.

Kokum agal: It is a brine concentration of *kokum* juice obtained from the fruit pulp.

Kokum seed: Among the part of *kokum* fruit, seed is important part which yields edible oil.

Kokum butter: The oil extracted from *kokum* seed known as *kokum* butter which remain solid at room temperature

Kokum rind: Ripe fruits are cut in to two pieces, the seed and pulp is removed. The juice extracted from the pulp and salt used in it. The rind is soaked in juice and sun dried. This dip-dry process repeated for 7 to 8 days. This rind is also called as *Amsool* and used as condiments in culinary preparation in Maharashtra and Goa.

Kokum RTS: It is diluted ready to serve soft drink prepared from *kokum* syrup

Hydroxy Citric Acid: Can be extracted from the rind, which is anti-obesity agent.

Farmyard manure: The prevailing price per tractor load was used to impute the value of farmyard manure produced at the farm.

Fertilizers and plant protection chemicals: The cost of fertilizers and plant protection chemicals was based on the actual prices paid by the sample farmer including the cost of transportation and other incidental charges, if any.

Labour: The cost of hired labour was calculated at the prevailing wage rates paid per day (8 hours) in the study area for men, women and bullock pairs during the study period. The same wage rates were imputed for family labour, while expressing labour in mandays.

Interest on working capital: The working capital consists of the expenditure on labour, farmyard manure, fertilizers and plant protection chemicals, irrigation and staking materials. The interest on operational capital was calculated at the rate of 13 per cent per annum.

Repair and maintenance charges: Repair and maintenance charges of implements and machinery used in the cultivation were computed on the basis of actual expenses incurred by the respondents. The amount of these expenses was apportioned to these crops based on the acreage.

Fixed costs: The fixed cost includes depreciation on farm implements and machinery, interest on fixed capital, land revenue and rental value of land.

Per unit cost and return for *kokum* process product: The per unit cost and return for the raw material used in *kokum* processing were arrived by taking the ratios of total quantity of individual raw material to the total amount of processed product produced in the season by the processing unit. Added value over raw material: It means gross returns minus raw material cost.

Net cost of processing: It means gross added value over raw material minus raw material cost.

Depreciation Charges: Depreciation on each capital equipment and machinery owned by the farmers was calculated for each individual farmer separately based on the purchase value and using the straight-line method. The average life of the asset as indicated by each farmer was used in the computation of the depreciation. The average value of the asset after its useful life as estimated by respondents was considered for the calculation of junk value. The depreciation cost for each equipment was apportioned to the crop based on its percentage use.

Interest on fixed capital: Interest on fixed capital was calculated at the rate of 10 per cent, as the fixed deposits in commercial banks would fetch this rate of interest. The items considered under fixed capital were implements and machinery. Interest was considered on the value of these assets after deducting the depreciation for the year. No interest was charged on the land value since the rental value of owned land was considered. Then the amount so calculated was apportioned to the crop acreage based on duration of the crop.

Land revenue: Land revenue was taken at the rates levied by the government.

Rental value of land: Rental value of land was estimated at 1/6th of gross value of produce.

Cost concepts

Cost concepts defined by Commission of Agricultural Costs and Prices (CACP).

Cost A = All actual expenses in cash and kind incurred in production by the producer. The items covered in cost A are costs on: i) third human labour, ii) hired bullock labour, iii) owned bullock labour, iv) plant protection chemicals, v) home produced/purchased manure, vi) fertilizers, vii) insecticides and pesticides, viii) depreciation on farm machinery, equipment and farm building, ix) irrigation, x) land revenue, land development tax and other taxes, xi) interest on working capital, xii) interest on crop loan and xiii) miscellaneous expenses and xiv) rent paid for leased-in land.

Cost B = Cost A + Interest on fixed capital assets+ Rental value of owned land (net of land revenue) +Amortization value

Cost C = Cost B + Imputed value of family labour + supervision charges

The costs and returns per quintal of *kokum* were calculated by using the following ratios.

$$1. \text{ Gross returns per rupee of investment} = \frac{\text{Gross return}}{\text{Total cost}}$$

$$2. \text{ Cost of production per quintal} = \frac{\text{Total cost (Rs./ha.)}}{\text{Yield (q/ha.)}}$$

$$3. \text{ Gross returns per quintal} = \frac{\text{Gross return (Rs./ha.)}}{\text{Yield (q/ha.)}}$$

Estimation of capital investment for establishment of *kokum* orchard

Input wise per hectare cost of establishment of *kokum* orchard was estimated for first five years separately for each year and added together to obtain the total capital investment for plantation of *kokum* orchard.

Amortization cost

The amortized cost for establishment of *kokum* orchard is considered to represent the annual fixed cost component of orchard maintenance. The capital investment made in first five years for establishment was divided into equal annual installments for the economic life of *kokum* orchard starting sixth year, and to spread over amortization cost, through out its economic life, for this purpose, the average life of *kokum* orchard was taken as 50 years because after 50 years generally, *kokum* orchards become uneconomical. Amortization cost was calculated by using following formula.

$$A = (C \times r) \times (1+r)^t / (1+r)^t - 1$$

Where, A = Annual amortization cost in rupee

C = Initial capital investment in rupee

r = Discount rate (per cent)

t = Expected life of the orchard in years.

The discount rate was taken as 12 per cent per annum and expected life of orchard was taken as 50 years.

Marketing channel

The marketing channel consisted of agencies that perform various marketing functions in a sequence as the produce moves from producer-seller to the ultimate consumer.

Marketing channel

In the study area following marketing channels were identified

1) Marketing channels For *Kokum* grower

Channel I: Grower → Trader → Processor

Channel II: Grower → Itinerant → Trader → Processor

Channel III: Grower → Village Trader → Processor

2) Marketing channels for *Kokum* Processor

Channel I: Processor → Retailer → Consumer

Channel II: Processor → Dealer → Retailer → Consumer

Price spread (PS) or marketing margin (MM)

The price spread is referred to the difference between producer's net price (PNP) and retailer's selling price (RP). PS or MM = RP – PNP.

In other words, it includes (i) the total costs of marketing (TMC) incurred by producer-sellers and market intermediaries excluding the commission charges paid to the commission agent-cum-wholesaler; and (ii) the net profit (NP) accrued to the intermediaries in the process of moving the produce from producer-seller to the consumer.

$$PS = TMC + NP$$

Producer's share in the consumer's rupee: This refers to the farmer's net price expressed as percentage of the retailer's sale price of the produce.

$$PSCR = \frac{PNP}{RP} \times 100$$

Producer's net price: This refers to the price per unit of output that a producer realizes after deducting the marketing costs from the gross price, which is the price that he receives from the market intermediaries when he sells his produce.

4. RESULTS

Keeping the objectives in view the data were collected from sample *Kokum* growers, processors and market intermediaries, to draw meaningful conclusion. The data were analyzed by using appropriate techniques and the results are presented under the following sub-heads.

- 4.1 Growth rate and instability in area, production and productivity of *kokum*
- 4.2 Demographic and socio-economic features of sample *kokum* growers
- 4.3 Cropping pattern of sample *kokum* growers
- 4.4 Establishment cost of *kokum* orchards
- 4.5 Cost and return from cultivation of *kokum* orchards
- 4.6 Per farm production and return from *kokum* orchard
- 4.7 Economic evaluation of investment in *kokum* orchard
- 4.8 Resource use efficiency in *kokum* cultivation
- 4.9 Disposal pattern and marketing cost of *kokum* fruits
- 4.10 Processing in *kokum*
- 4.11 Marketing of *kokum* and *kokum* processed products
- 4.12 Export performance of *kokum*
- 4.13 Constraints in production, processing and marketing of *kokum*

4.1 GROWTH RATE AND INSTABILITY IN AREA, PRODUCTION AND PRODUCTIVITY OF *KOKUM*

The compound growth rate and instability in the area, production and productivity of *kokum* for the period 1990-2004 were estimated and presented as under.

4.1.1 Growth rate of area, production and productivity of *kokum*

The results of the compound growth rate analysis of area, production and productivity of *kokum* in the study area are presented in Table 4.1.

In Sindhudurg district during the study period, *kokum* area and production significantly increased at the rate of 0.74 per cent and 0.53 per cent, respectively. While in the case of productivity, the growth rate was positive but non significant (0.04%).

While in Ratnagiri district, the *kokum* area and production grew at the rate of 3.54 per cent and 3.71 per cent which were positive and significant and observed to be higher than that of Sindhudurg district, while, productivity showed a similar trend as observed in Sindhudurg district in growth rates.

4.1.2 Instability analysis in area, production and productivity of *kokum*

Table 4.1 indicated that in Ratnagiri district instability with respect to area and production were observed to be 81.90 per cent and 83.75 per cent respectively. Where as the instability figures are observed to be comparatively low in Sindhudurg district, which accounted only 53.37 per cent and 49.26 per cent. The *kokum* productivity in both districts was observed to be stable with a variability value of about 15.87 and 15.86 per cent respectively.

4.2 DEMOGRAPHIC AND SOCIO-ECONOMIC FEATURES

The demographic and socio-economic features for the *kokum* growers in the study area are furnished below.

Table 4.1. Compound growth rate and coefficient of variation in area, production and productivity of *Kokum* in Ratnagiri and Sindhudurg districts (1990-2004)

(in per cent)

Sl. No.	Particulars	Sindhudurg		Ratnagiri	
		CGR (%)	CV (%)	CGR (%)	CV (%)
1	Area	0.74**	53.37	3.54**	81.90
2	Production	0.53**	49.26	3.71**	83.75
3	Productivity	0.04	15.86	0.04	15.87

** Significant at 1% level
 CGR: Compound growth rate
 CV: Coefficient of variation

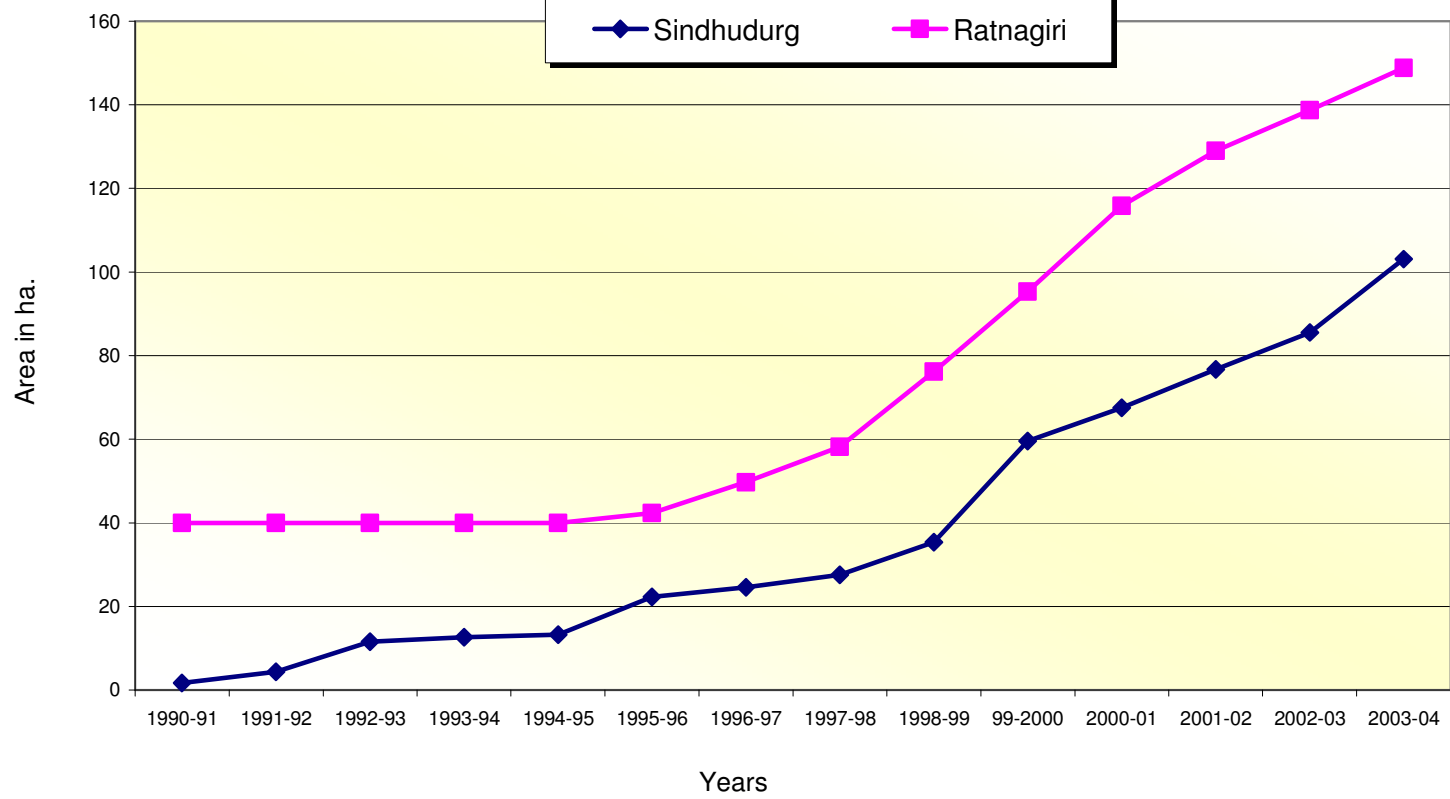


Fig. 2. Growth in area of *kokum* cultivation under Sindhudurg and Ratnagiri district

Fig.2. Growth in area of kokum cultivation under Sindhudurg and Ratnagiri district

4.2.1 Social-characteristics of *kokum* growers

The information on social characteristics such as family size, age, education and occupation pattern for selected *kokum* growers in Sindhudurg and Ratnagiri districts are presented in Table 4.2.

The overall average age of *kokum* growers was 48 years for both Sindhudurg and Ratnagiri districts combined together. In Sindhudurg district average age of *kokum* grower was 46 years while in Ratnagiri district it was 50 years. This indicated that the majority of the *kokum* growers belonged to the middle age group in all the selected taluks of both the districts.

The educational status of selected *kokum* grower was up to 9th standard in both Sindhudurg and Ratnagiri districts.

The occupation pattern for the sample *kokum* growers indicated that 88.33 per cent in Sindhudurg district and 85.00 per cent in Ratnagiri district indicating agriculture as their main occupation. About 6.67 per cent of total sample *kokum* growers in both Sindhudurg and Ratnagiri districts were in service. In Sindhudurg district whereas 3.33 per cent and 1.67 per cent of *kokum* growers stated agricultural labour and dairy farming as their main occupation respectively. In the case of Ratnagiri district, 3.33 per cent each of *kokum* growers took up dairy farming and agricultural labour as their main occupation, only 1.67 per cent of the *kokum* growers has artisans' category who had taken up *kokum* cultivation as subsidiary occupation.

In the total family size of *kokum* growers at overall level, the working members and non-working members accounted for 50.62 per cent and 49.38 per cent respectively. The breakup between these two categories in Sindhudurg district indicated 60.41 per cent as working and 39.59 per cent as non-working members. While, in Ratnagiri district the proportion of working and non-working members accounted for 30.21 per cent and 69.79 per cent respectively.

4.2.2 Operational land holding of *kokum* growers

The average size of operational land holding for sample *kokum* grower is presented in Table 4.3.

The average operational land holding of *kokum* growers at overall level in the study area was 5.12 ha. and majority of land was owned by them (99.41%). The irrigated and unirrigated land at overall level, were 0.64 ha (12.11%) and 4.48 ha (87.30%), respectively. It was observed that very small size of aggregated land amounted to 0.03 ha was leased in by sample growers in districts together, while no sample respondent was found to be leased out his land to other farmer.

The districtwise average size of operational land holding, for Sindhudurg district was 3.21 ha of which 0.32 ha (9.97%) was irrigated and 2.89 ha (89.41%) were unirrigated. On the contrary, in Ratnagiri district, average size of operational land holding was comparatively higher than Sindhudurg district, which accounted for 13.96 ha. of which 1.89 (13.18%) ha and 12.07 ha. (86.46%) land was irrigated and unirrigated respectively.

4.2.3 Land use pattern of *kokum* growers

The analysis of average land use pattern of sample *kokum* growers (Table 4.4) indicated that at an overall level 79.13 per cent, 13.54 per cent and 1.48 per cent of total land was observed to be cultivated land, temporary fallow land and non-agriculture land respectively. The rock land, bunds, gullies and roads consisted 1.26 per cent, 0.07 per cent, 0.07 per cent and 0.07 per cent respectively of total land under non-agriculture category.

In Sindhudurg district 85.98 per cent of total land was cultivated, while 13.16 per cent and 0.94 per cent of lands were temporary fallow and non-agricultural use respectively. The permanent fallow land consist of rocks (0.62%), gullies (0.31%) and road (0.62%).

On the other hand, in Ratnagiri district cultivated land accounted for 53.32 per cent while temporary fallow and non-agriculture land were accounted to 43.12 per cent and 3.32 per cent of total land respectively. Non-agriculture land of *kokum* grower of Ratnagiri district consisted of rocks (3.02%), bunds (0.071%), gullies (0.07%) and road (0.07%).

Table 4.2. Social characteristics of sample *kokum* growers in the study area

(N = 120)

Sl. No.	Particulars	Sindhudurg	Ratnagiri	Overall
I	Age (Years)	46.00	50.00	48.00
II	Educational score (std)	9.00	9.00	9.00
III	Occupation			
i.	Agriculture	53.00 (88.33)	51.00 (85.00)	104.00 (86.67)
ii.	Service	4.00 (6.67)	4.00 (6.67)	8.00 (6.67)
iii.	Artisan	0.00 (0.00)	1.00 (1.67)	1.00 (0.83)
iv.	Dairy	1.00 (1.67)	2.00 (3.33)	3.00 (2.50)
v.	Agri labour	2.00 (3.33)	2.00 (3.33)	4.00 (3.33)
	Total	60.00 (100)	60.00 (100)	120.0 (100)
IV	Family size			
A	Working			
i.	Up to 14 yr.	0.03	0.05	0.04
ii.	Above 14 yr.	4.67	1.08	2.83
	Total	4.70 (60.41)	1.13 (30.21)	2.87 (50.62)
B	Non-working			
i.	Up to 14 yr.	2.28	1.38	1.83
ii.	Above 14 yr.	0.80	1.23	0.97
	Total	3.08 (39.59)	2.61 (69.79)	2.80 (49.38)
	Grant Total	7.78 (100)	3.74 (100)	5.67 (100)

(Figures in the parentheses indicate percentage to the total)

Table 4.3. Average operational holding of sample farmers in the study area

(Area in ha)

Sl. No.	Particular	Sindhudurg	Ratnagiri	Overall
I.	Owned land			
a.	Irrigated	0.32 (9.97)	1.84 (13.18)	0.62 (12.11)
b.	Unirrigated	2.87 (89.41)	12.07 (86.46)	4.47 (87.30)
	Sub Total	3.19 (99.38)	13.91 (99.64)	5.09 (99.41)
II.	Leased- in- land			
a.	Irrigated	0.00 (0.00)	0.05 (0.36)	0.02 (0.39)
b.	Unirrigated	0.02 (0.62)	0.00 (0.00)	0.01 (0.19)
	Sub Total	0.02 (0.62)	0.05 (0.36)	0.03 (0.58)
a.	Irrigated	0.32 (9.97)	1.89 (13.54)	0.64 (12.50)
b.	Unirrigated	2.89 (90.03)	12.07 (86.46)	4.48 (87.50)
III.	Gross total(I+II)	3.21 (100.00)	13.96 (100.00)	5.12 (100.00)

(Figures in the parentheses indicate percentage to the total)

4.2.4 Average value of different assets of *kokum* growers

The investment information on different fixed assets possessed by the *kokum* growers including land, residential building, farm building, livestock, machinery and implements is given in the Table 4.5.

The average value of assets of sample *kokum* grower at overall level was Rs.1262037.27, out of which maximum amount was invested in the land which amount to 77.69 per cent of the total average asset value. While 16.36 per cent amount was invested on construction of building, where as 1.84 per cent amount of total asset value invested on cattle byre, followed by 1.66 per cent on livestock, 0.86 per cent on engine house, 0.84 per cent on store house, 0.49 per cent in machinery and 0.23 per cent on implement and hand tools.

In Sindhudurg district the average total value of assets owned by *kokum* sample grower was observed to be Rs.813127.55. The investment on land was the highest (72.62%) followed by construction of residential building (18.00%), cattle byre (2.94%), livestock (2.59%), store house (1.52%), machinery (0.76%) and implements and hand tools (0.33%).

Whereas in Ratnagiri district, the maximum share of total assets (Rs.3076055.30) was invested in land (88.77%), while 8.81 per cent, 6.74 per cent, 6.09 per cent, 3.42 per cent, 2.57 per cent, 1.81 per cent and 0.92 per cent share was invested on construction of building, cattle byre, livestock, engine house, store house, machinery and implements and hand tools respectively.

4.3 CROPPING PATTERN OF *KOKUM* GROWERS

The district wise and overall cropping pattern with average area under different crops for sample *kokum* growers is given in the Table 4.6.

The proportion of area under horticultural crop, *kharif* paddy, intercrop in perennial and cashew plantation were major determining activities to decide the cropping intensity. The overall average gross cropped area was 5.11 ha. and net cultivated area was 4.04 ha, while cropping intensity in the selected districts ranged from 104.00 per cent to 131.38 per cent, and it was 126.48 per cent at overall level.

It was observed that, in the overall average gross cropped area, the major area was utilized to grow horticultural crops (40.70%) and plantation crops (36.79%), followed by field crops in *kharif* season (17.41%), field crop in *rabi* season (7.63%), forestry plantation (6.85%) and intercrops in perennial under *kharif* season (4.30%). Among sample *kokum* growers, paddy (9.98%) and vegetables (3.91%) were more desired field crops to grow over other crops in *kharif* and *rabi* seasons respectively. Vegetables (3.91%) were preferred to grow as intercrops in perennial crops particularly during *kharif* season. In general, mango (29.35%) and cashew (11.74%) were indicated as the most idle major horticultural and plantation crops to cultivate by the sample *kokum* growers respectively.

In Sindhudurg district the gross cropped area was 3.6 ha. The area under horticultural crops accounted for 55.28 per cent, followed by plantation crops (19.72%), field crop in *kharif* season (18.06%) and *rabi* season (3.33%), forest plantation (2.78%) and intercrop in perennial during *kharif* season (0.56%).

In Ratnagiri district out of gross cropped area (7.69 ha.) horticultural crop, plantation crop and *kharif* field crops were observed to be the major crops, which contributed 35.89 per cent, 24.18 per cent and 17.81 per cent to the gross cropped area respectively. In the district under *kharif* season paddy was the major field crop and different types of vegetables were mainly grown in *rabi* season as inter crop in perennial.

In both the districts cashew and mango were major plantation and horticultural crops observed. *Kokum* accounted for 13.61 per cent and 4.29 per cent in Sindhudurg and Ratnagiri respectively and at overall level it was observed to be 7.6 per cent. The per cent area under vegetable was not substantial in Sindhudurg district.

4.3.1 Distribution of *kokum* orchards according to age groups.

The information on the distribution of seedling origin and grafted *kokum* orchards according to the age groups in Sindhudurg and Ratnagiri districts is given in Table 4.7.

Table 4.4. Average land use pattern of sample farmers in the study area

(Area in ha.)

Sl. No.	Particulars	Sindhudurg	Ratnagiri	Overall
I.	Cultivated land			
a.	Owned	2.74 (85.89)	7.38 (52.90)	4.02 (78.78)
b.	Leased in	0.02	0.05	0.02
	Total cultivated land	2.76 (85.98)	7.43 (53.32)	4.04 (79.13)
II.	Fallow land			
a.	Temporary fallow	0.42 (13.16)	6.02 (43.12)	0.96 (13.54)
b.	Non-agriculture			
i.	Rocks	0.01 (0.62)	0.40 (3.02)	0.09 (1.26)
ii.	Bunds	0.00	0.02 (0.071)	0.01 (0.07)
iii.	Gullies	0.01 (0.31)	0.02 (0.07)	0.01 (0.07)
iv.	Roads	0.01 (0.62)	0.02 (0.07)	0.12 (0.07)
	Total	0.03 (0.94)	0.46 (3.32)	0.105 (1.48)
III.	Total land	3.21 (100)	13.96 (100)	5.12 (100)

(Figures in the parentheses indicate percentage to the total)

Table 4.5. Average value of different assets of *kokum* sample growers in the study area

(Rs.)

Sl. No.	Particular	Sindhudurg	Ratnagiri	Overall
1	Land	590500.00 (72.62)	2730500.00 (88.77)	980500.00 (77.69)
2	Residential building	146416.67 (18.00)	271101.69 (8.81)	206500.00 (16.36)
3	Engine house	9983.33 (1.22)	11816.67 (0.38)	10900.00 (0.86)
4	Store house	12333.33 (1.52)	8883.33 (0.28)	10608.33 (0.84)
5	Cattle byre	23883.33 (2.94)	23305.08 (0.76)	23300.00 (1.84)
6	Livestock	21048.35 (2.59)	21048.35 (0.68)	21048.35 (1.66)
7	Machinery	6247.34 (0.76)	6247.34 (0.20)	6247.34 (0.49)
8	Implements and hand tools	2715.20 (0.33)	3152.84 (0.10)	2933.25 (0.23)
9	Total	813127.55 (100)	3076055.30 (100)	1262037.27 (100)

(Figures in the parentheses indicate percentage to the total)

Table.4.6. Cropping pattern of sample farmers in the study area (ha.)

(N = 120)

Sl No	Particulars	Sindhudurg		Ratnagiri		Overall average	
		Area	%	Area	%	Area	%
I	Land used for field crops						
a.	<i>Kharif</i> season						
	i. Paddy	0.47	13.06	0.72	9.36	0.51	9.98
	ii. Finger millet	0.13	3.61	0.25	3.25	0.15	2.93
	iii. Groundnut	0.02	0.56	0.15	1.95	0.08	1.56
	iv. Other crops	0.04	0.83	0.27	2.73	0.15	2.93
	Sub total	0.66	18.06	1.37	17.81	0.89	17.41
b.	<i>Rabi</i> season						
	i. Paddy	0.01	0.28	0.00	0.00	0.01	0.19
	ii. Groundnut	0.01	0.28	0.20	2.60	0.10	1.96
	iii. Pulses	0.05	1.39	0.14	1.82	0.08	1.56
	iv. Vegetables	0.05	1.39	0.35	4.55	0.20	3.91
	Sub total	0.12	3.33	0.69	8.97	0.39	7.63
II	Intercrop in perennial						
a.	<i>Kharif</i> season						
	i. Finger millet	0.00	0.00	0.01	0.93	0.01	0.19
	ii. Vegetables	0.01	0.28	0.30	3.90	0.20	3.91
	iii. Groundnut	0.01	0.28	0.00	0.00	0.01	0.19
	Sub total	0.02	0.56	0.31	4.00	0.22	4.30
III	Land used for plantation crops						
	i. Cashew	0.40	11.11	0.96	12.48	0.60	11.74
	ii. Coconut	0.17	4.72	0.46	5.98	0.30	5.87
	iii. Arecanut	0.06	1.67	0.40	5.20	0.20	3.91
	iv. Spices	0.08	2.22	0.04	0.52	0.08	1.56
	Sub total	0.71	19.72	1.86	24.18	1.18	36.79
IV	Land used for horticultural crop						
	i. Mango	1.20	33.33	1.95	25.35	1.50	29.35
	ii. Kokum	0.49	13.61	0.33	4.29	0.35	6.85
	iii. Sapota	0.00	0.00	0.10	1.30	0.02	0.39
	iv. Banana	0.30	8.33	0.18	2.34	0.20	3.91
	v. Other	0.00	0.00	0.20	2.60	0.01	0.19
	Sub total	1.99	55.28	2.76	35.89	2.08	40.70
V	Forestry plantation	0.10	2.78	0.70	9.10	0.35	6.85
VI	Gross cropped area (I+II+III+IV+V)	3.60	100.00	7.39	100.00	5.11	100.00
VII	Net cultivated area	2.76		7.38		4.04	
VIII	Cropping intensity (%)		131.38		104.00		126.48

(Figures in the parentheses indicate percentage to the total)

The results on the distribution of *kokum* orchards according to age groups indicated that in Sindhudurg district maximum (30.0%) number of *kokum* orchards were in the 16 to 20 year age group, followed by less than or equal to 10 years age group (23.33%), 26 to 30 years age group (20.0%), 21 to 25 year age group (16.67%), 11 to 15 year age group (6.67%) and 31 to 35 and above 35 year age group (1.67% each). In Sindhudurg district out of total area under *kokum* orchard, 44.72 ha was developed by using seed origin plant material and only 4.66 ha developed by using grafted planting material.

In Ratnagiri district (21.67%) the highest number of *kokum* orchards were in the category of 26 to 30 years and more than 35 years age groups which was followed by 21 to 25 years age group (20.00%), 31 to 35 years age group (15.00%), less than 10 years age group (20.00%), 16 to 20 years age group (6.67%) and only 5.00 per cent of the total number of orchards belonged to 11-15 years age group. In this district out of the total (23.28 ha.) *kokum* area 16.32 ha and 6.96 ha areas were developed by using seed origin and grafted planting material respectively.

It was also observed that at overall level farmers use seedling as planting material to establish *kokum* orchard on 61.04 ha of land and 11.72 ha of land was brought under *kokum* orchard by using grafted plant material.

The overall area distribution of *kokum* orchards according to the age groups indicated that (Table 4.7) the maximum area of 34.71 and 10.86 ha were developed by using seedling origin and grafted *kokum* planting material respectively and they fell under less than and equal to 10 years age group orchards. The distribution of area for seedling origin *kokum* orchards under other age group was observed to be 6.95 ha for 16 to 20 years followed by 5.02 ha for 21 to 25 years, 4.70 ha for 26 to 30 years, 4.10 ha for more than 35 years and 2.91 ha for 31 to 35 years. The minimum area of 2.65 ha and 0.86 ha area at overall level were noticed under 11-15 years age group in the sample farmers by using seed origin and grafted *kokum* planting material respectively.

4.4 ESTABLISHMENT COST OF *KOKUM* ORCHARD

The details on the year wise establishment cost incurred to develop *kokum* orchard by using grafted seedling and seed origin planting material till bearing period are presented in Table 4.8 and Table 4.9.

Grafted seedling

It was observed from the Table 4.8 that, Rs.69,205.67 per ha incurred as establishment cost by the sample farmers for the initial five years, which includes the total labour, and material cost. In this total establishment cost, the total labour cost amounted to 55.85 per cent and material 44.15 per cent material costs. The total establishment cost of *kokum* orchard in the first year amounted to Rs.21817.65 and formed 32.58 per cent of the total establishment cost. In the first year total establishment cost (Rs.21817.65), the labour cost constituted Rs.12494.00, and accounted 57.27 per cent of the first year total establishment cost. In the second, third, fourth and fifth years the labour cost and per cent to the total establishment cost of respective year amounted to Rs.9595.20 (55.61%), Rs.9000.50 (71.17%), Rs.5707.30 (49.37%) and Rs.1857.20 (31.64%) respectively. On the other hand the material cost from first to five year accounted Rs.9323.65 (42.73%), Rs.7658.47 (44.39%), Rs.3646.53 (28.83%), Rs.5851.81 (50.63%) and Rs.4071.01 (69.35%) respectively.

In the first year out of the total establishment cost, expenditure on irrigation accounted 19.68 per cent, while in second to fourth year, share of irrigation cost was 29.01, 51.27 and 22.98 per cents respectively.

Out of the total input cost in first year, the cost of manures accounted for the highest share of 18.91 per cent (Rs.4126.45) followed by *kokum* grafts 15.19 per cent (Rs.3314.70), chemical fertilizers 3.61 per cent (Rs.787.20), plant protection chemicals 2.93 per cent (Rs.639.97) and mulching material 2.09 per cent (Rs.455.33).

The trend given in Fig. 5 for grafted orchard revealed that, of the total cost of establishment (Rs. 69206) almost 60 per cent cost, though incurred in the first two year, it was declining more evenly for grafted orchard.

Table 4.7. Distribution of *Kokum* orchards according to age group

Sr. No	Age group (years)	Seed origin						Grafted					
		Sindhudurg		Ratnagiri		Overall		Sindhudurg		Ratnagiri		Overall	
		No.	Area (ha.)	No.	Area (ha.)	No.	Area (ha.)	No.	Area (ha.)	No.	Area (ha.)	No.	Area (ha.)
1	≤ 10	14 (23.33)	34.01 (76.05)	6 (10.00)	0.7 (4.29)	20 (16.67)	34.71 (62.99)	58 (96.97)	4.56 (97.85)	46 (76.67)	6.2 (89.08)	104 (86.67)	10.86 (92.66)
2	11 - 15	4 (6.67)	0.98 (2.19)	3 (5.00)	1.67 (10.23)	7 (5.83)	2.65 (3.73)	2 (3.33)	0.1 (2.14)	14 (23.33)	0.76 (10.92)	16 (13.33)	0.86 (7.34)
3	16 -20	18 (30.00)	4.2 (9.39)	4 (6.67)	2.75 (16.85)	22 (18.33)	6.95 (9.77)	--	--	--	--	--	--
4	21 -25	10 (16.67)	2.65 (5.93)	12 (20.00)	2.37 (14.52)	22 (16.67)	5.02 (7.06)	--	--	--	--	--	--
5	26- 30	12 (20.00)	2.61 (5.84)	13 (21.67)	2.09 (12.81)	25 (20.83)	4.70 (6.61)	--	--	--	--	--	--
6	31-35	1.00 (1.67)	0.25 (0.56)	9 (15.00)	2.66 (16.30)	10 (8.33)	2.91 (4.09)	--	--	--	--	--	--
7	≥35	1 (1.67)	0.02 (0.04)	13 (21.67)	4.08 (25.00)	14 (11.67)	4.10 (5.76)	--	--	--	--	--	--
	TOTAL	60 (100)	44.72 (100)	60 (100)	16.32 (100)	120 (100)	61.04 (100)	60 (100)	4.66 (100)	60 (100)	6.96 (100)	120 (100)	11.72 (100)

(Figures in the parentheses indicate percentage to the total)

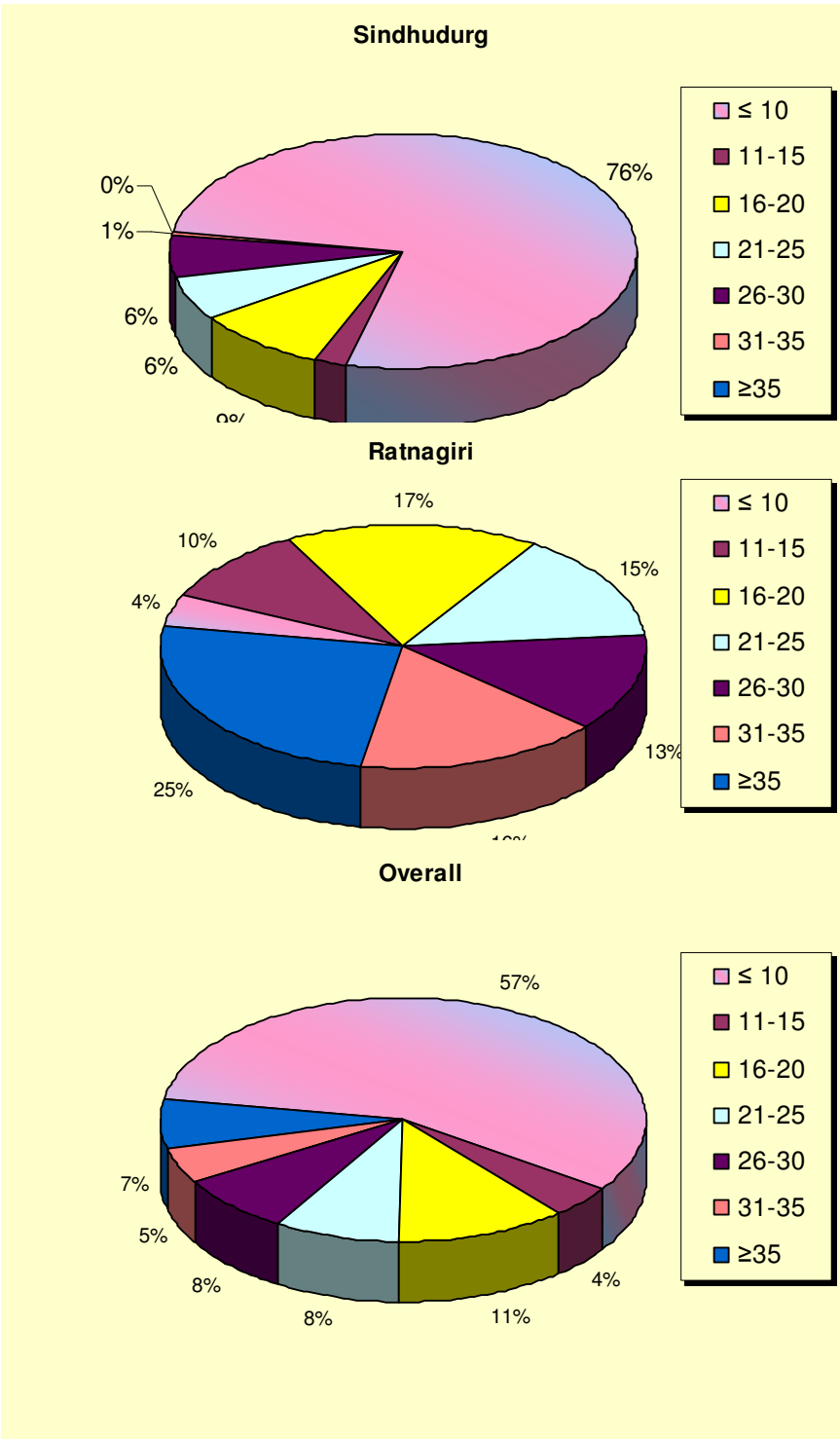


Fig.3. Age-wise distribution of seed origin kokum orchard in the study area

Table 4.8. Cost of establishment of grafted *Kokum* orchard

(Rs/ha.)

Sl. No.	Item of cost	Years					Total
		I.	II.	III.	IV.	V.	
I.	Labour cost						
a.	Cleaning and leveling of land	1447.79 (9.64)	666.21 (3.86)	580.33 (4.59)	972.63 (8.41)	315.5 (5.37)	3982.46 (5.75)
b.	Garden layout	263.72 (1.21)	--	--	--	--	263.72 (0.38)
c.	Digging of pits + Filling of pits	1990.52 (9.12)	--	--	--	--	1990.52 (2.88)
d.	Planting and staking	1190.72 (5.46)	750.00 (4.34)	--	--	--	1940.72 (2.80)
e.	Manuring	865.90 (3.97)	1620.29 (9.39)	1060.60 (8.39)	1179.05 (10.20)	1183.50 (20.16)	5909.34 (8.54)
f.	Irrigation	4294.40 (19.68)	5005.58 (29.01)	6483.62 (51.27)	2656.55 (22.98)	--	18440.15 (26.64)
g.	Mulching	539.27 (2.47)	248.96 (1.44)	169.33 (1.34)	266.75 (2.31)	117.20 (2.00)	1341.51 (1.94)
h.	Spraying of PP chemicals	280.25 (1.28)	187.20 (1.08)	150.40 (1.19)	139.90 (1.21)	42.50 (0.72)	800.25 (1.16)
i.	Cultural operation	1621.43 (7.43)	1116.96 (96.47)	556.22 (4.40)	492.42 (4.26)	198.5 (3.38)	3985.53 (5.76)
	Sub Total	12494.00 (57.27)	9595.20 (55.61)	9000.50 (71.17)	5707.30 (49.37)	1857.20 (31.64)	38654.20 (55.85)
II.	Material cost						
a.	<i>Kokum</i> Grafts	3314.70 (15.19)	828.67 (4.80)	--	--	--	4143.37 (5.99)
b.	Chemical fertilizers	787.20 (3.61)	3463.27 (20.07)	1388.14 (10.98)	3013.60 (26.07)	1835.68 (31.27)	10487.89 (15.15)
c.	Manures	4126.45 (18.91)	2444.94 (14.17)	1695.12 (13.40)	2425.14 (20.98)	2140.56 (36.47)	12832.21 (18.54)
d.	Plant protection chemicals	639.97 (2.93)	461.75 (2.68)	96.01 (0.76)	109.93 (0.95)	94.77 (1.61)	1402.43 (2.03)
e.	Mulching material	455.33 (2.09)	459.84 (2.67)	467.26 (3.69)	303.14 (2.62)	--	1685.57 (2.44)
	Sub Total	9323.65 (42.73)	7658.47 (44.39)	3646.53 (28.83)	5851.81 (50.63)	4071.01 (69.35)	30551.47 (44.15)
III	Grand Total(I+II)	21817.65 (100.00)	17253.67 (100.00)	12647.03 (100.00)	11559.11 (100.00)	5928.21 (100.00)	69205.67 (100.00)
IV	Yearwise total establishment cost	(32.58)	(25.76)	(18.88)	(17.26)	(8.76)	(100.00)

(Figures in the parentheses indicate percentage to the total)

Seed origin planting material

The establishment cost of *kokum* orchard by using seed origin planting material is presented in Table 4.9 Under this type of *kokum* orchards the total establishment cost was Rs.38883.96 per ha. Out of which the major cost incurred towards labour accounted for Rs.23732.72 (61.04%) and material cost accounted for Rs.15151.24 (38.96%). In the total breakup of cost, the first year establishment cost was observed to be Rs.16166.38, which accounted for 41.58 per cent of total establishment cost.

The establishment cost for succeeding second, third, fourth and fifth years amounted to Rs.7104.58 (18.28%), Rs.6484.76 (16.67%), Rs.5740.24 (14.76%) and Rs.3387.34 (8.71%) respectively. In the first year out of the total establishment cost (Rs.16166.38), the labour cost accounted for Rs.10356.36 (64.06%), while in second, third, fourth and fifth years, the labour cost accounted for Rs.4512.17 (63.51%), Rs.4525.56 (69.78%), Rs.3254.43 (56.70%) and Rs.1084.20 (32.01%) respectively. In the first year labour related establishment cost concerned to the establishment of *kokum* orchard by using seed origin planting material, the expenditure made on labour for digging and filling of pits accounted 19.65 per cent and cost on cultural operation of the orchard constituted 9.28 per cent. While in second to fourth year of establishment period, the labour cost incurred towards irrigation was 41.53 per cent, 48.06 per cent and 28.87 per cent, respectively.

The total material cost incurred during the establishment period revealed that the manure cost was observed to be the highest which amounted 12.02 per cent followed by expenditure made on seedlings observed to be 11.77 per cent, chemical fertilizers (9.69%), mulching (2.02%) and plant protection chemicals (0.45%).

In case of seed origin orchard, the cost of establishment was Rs. 38883.96, of which 41.58 per cent cost was incurred in first year itself. Hence, the trend given in the Fig. 5 for establishment cost of seed origin orchard was observed to be steep and declined in the period of subsequent years.

4.5 COST AND RETURN FROM *KOKUM* CULTIVATION

The information on the cost and returns for *kokum* orchards established by using grafted *kokum* seedling and seed origin planting material are presented under the following subheads for the year 2005.

Grafted *kokum* orchards

The itemwise per hectare cost incurred in the cultivation of *kokum* orchard established by using grafted seedlings for Sindhudurg and Ratnagiri districts are presented in Table 4.10.

The per hectare cost of cultivation (cost C) of *kokum* orchard in Sindhudurg district was worked out to be Rs.39462.56, of which the share of cost A was 50.74 per cent (Rs.20025.35). The per hectare gross return from the *kokum* orchard in Sindhudurg district was Rs.43425.90 and per hectare profit at cost C was Rs.3963.34 and per quintal, cost of production worked out to Rs.443.34. The profitability at different cost level were Rs.23400.55, Rs.7104.20 and Rs.3963.34 at cost A, cost B and cost C respectively with benefit cost ratio of 1:1.10.

The total cost of cultivation of *kokum* orchard in Ratnagiri district was Rs.51165.20 (cost C) and share of cost A accounted for Rs.28038.80 (54.80%) and cost B Rs.46638.16 (91.15%). The gross return per hectare obtained from the *kokum* orchard in Ratnagiri district was Rs.57414.00 and per quintal cost of production was estimated to be Rs.623.81. The profitability at cost A, cost B and cost C were Rs.29375.20, Rs.10775.84 and Rs.6248.80 respectively with benefit cost ratio of 1:1.12.

It was observed that, per hectare cost for cultivation of grafted *kokum* orchard at overall level accounted to Rs.42826.49 (cost C). Whereas, cost A and cost B accounted Rs.21847.95 and Rs.39,290.03. The share of cost A in cost C was observed to be 51.01 per cent, while with Cost B it was observed to be 91.74 per cent. The item wise cost of cultivation at overall level, indicated that the share of amortization value was maximum and accounted to 21.01 per cent followed by rental value of land (19.62%), chemical fertilizers (13.48%), total hired labour (10.64%), manures (8.67%), interest on working capital (5.73%), supervision

Table 4.9. Cost of establishment of seed origin *Kokum* orchard

(Rs/ha.)

Sl. no.	Item of cost	Years					Total
		I.	II.	III.	IV.	V.	
I.	Labour cost						
a.	Cleaning and leveling of land	713.15 (4.41)	402.31 (5.66)	338.58 (5.22)	574.84 (10.01)	431.21 (12.73)	2460.09 (6.63)
b.	Garden layout	2161.54 (13.37)	--	--	--	--	2161.54 (5.55)
c.	Digging of pits +Filling of pits	3176.90 (19.65)	--	--	--	--	3176.90 (8.17)
d.	Planting and staking	1212.97 (7.50)	115 (1.61)	--	--	--	1227.97 (3.11)
e.	Manuring	519.19 (3.21)	813.51 (11.45)	749.35 (11.56)	868.69 (15.13)	632.73 (18.67)	3583.47 (9.21)
f.	Irrigation	949.08 (5.87)	2951.93 (41.53)	3116.65 (48.06)	1657.00 (28.87)	--	8674.66 (22.60)
g.	Spraying of PP chemicals	123.37 (0.76)	10.33 (0.15)	20.23 (0.31)	10.22 (0.18)	20.26 (0.59)	184.41 (0.47)
h.	Cultural operation	1500.16 (9.28)	219.09 (3.08)	300.75 (4.64)	143.68 (2.50)	--	2163.88 (5.56)
	Sub Total	10356.36 (64.06)	4512.17 (63.51)	4525.56 (69.78)	3254.43 (56.70)	1084.20 (32.01)	23732.72 (61.04)
II	Material cost						
a.	<i>Kokum</i> seedlings	1902.50 (11.77)	250.00 (3.52)	--	--	--	2152.50 (5.53)
b.	Chemical fertilizers	1567.20 (9.69)	755.58 (10.64)	906.54 (8.23)	1186.70 (20.67)	1135.60 (33.52)	5551.70 (14.27)
c.	Manures	1942.49 (12.02)	1237.50 (17.42)	798.33 (7.25)	1204.17 (20.98)	1122.99 (33.15)	6305.49 (16.21)
d.	Plant protection	72.00 (0.45)	4.00 (0.06)	4.33 (0.03)	11.67 (0.20)	35.64 (1.05)	127.64 (0.32)
e.	Mulching material	325.83 (2.02)	345.33 (4.86)	250.00 (2.27)	83.33 (1.45)	8.91 (0.26)	1013.91 (2.60)
	Sub Total	5810.02 (35.94)	2592.41 (36.49)	1959.20 (30.22)	2485.81 (43.30)	2303.14 (67.99)	15151.24 (38.96)
III	Grand Total(I+II)	16166.38 (100.00)	7104.58 (100.00)	6484.76 (100.00)	5740.24 (100.00)	3387.34 (100.00)	38883.96 (100.00)
IV	Yearwise total establishment cost	(41.58)	(18.28)	(16.67)	(14.76)	(8.71)	(100.00)

(Figures in the parentheses indicate percentage to the total)

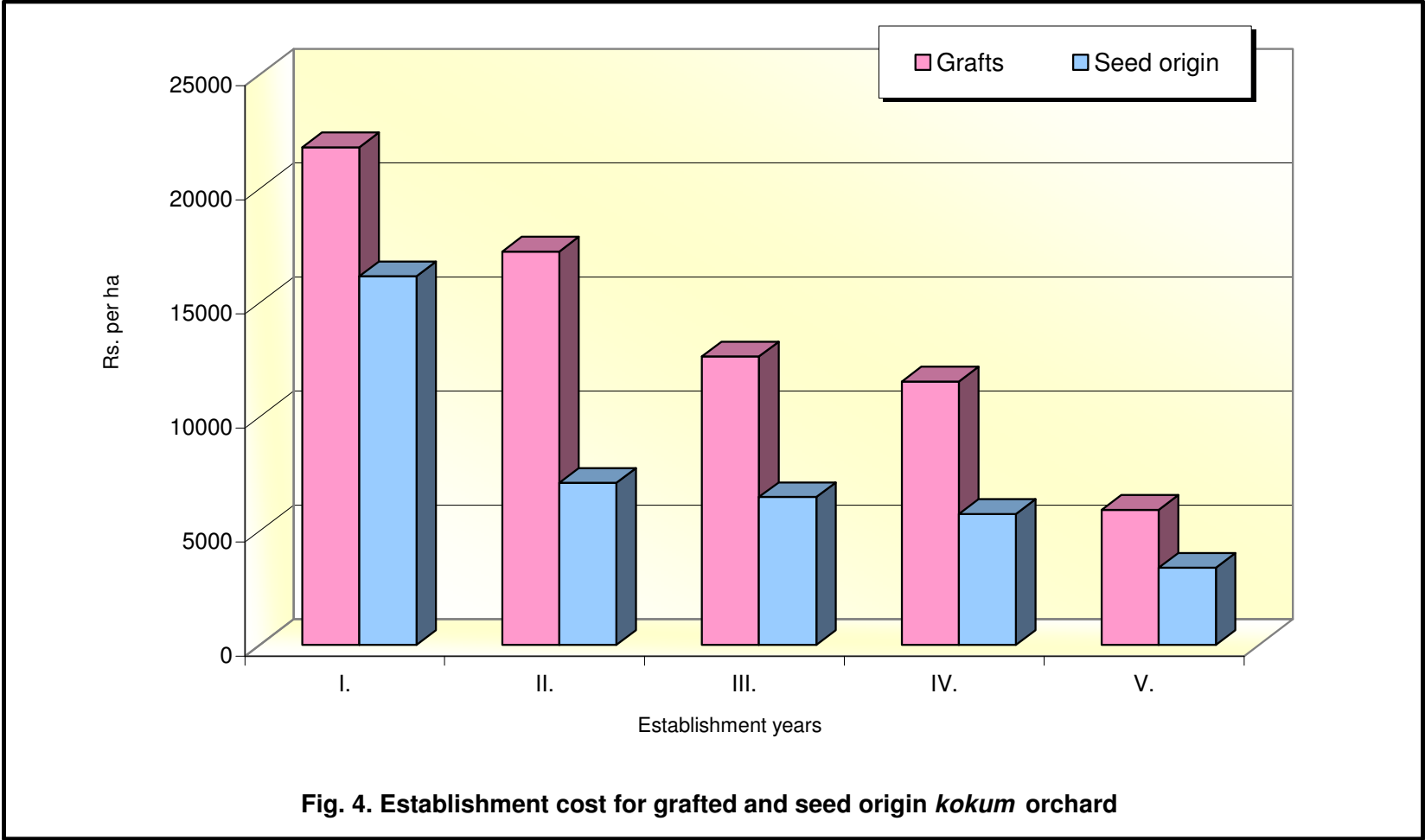
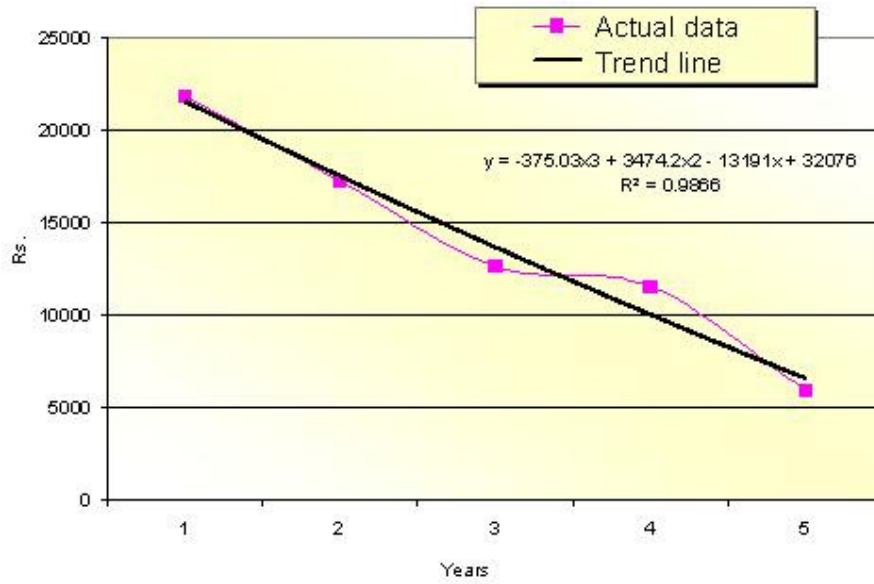
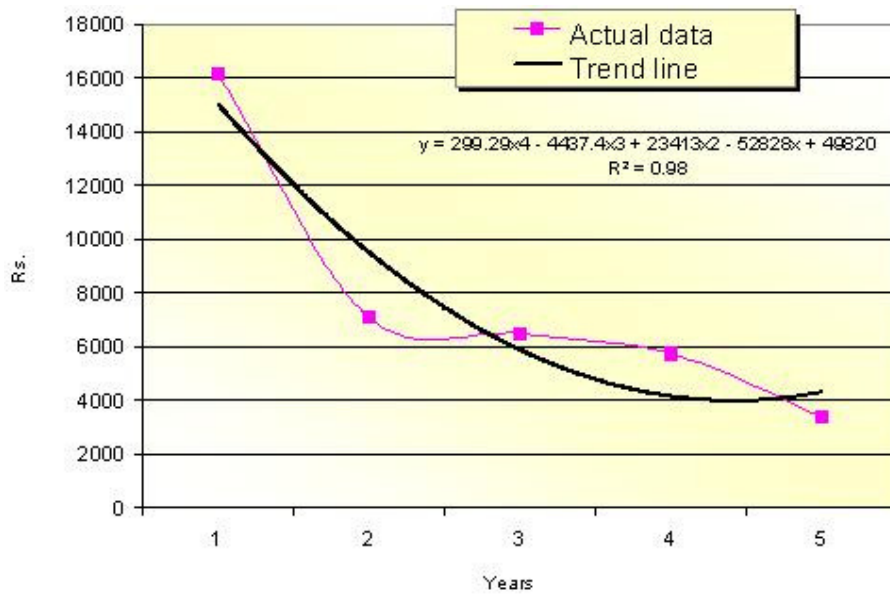


Fig.4. Establishment cost for grafted and seed origin kokum orchard



Grafted kokum orchard



Seed origin kokum orchard

Fig.5. Trends in establishment cost of grated kokum orchard and seed origin kokum orchard

Table 4.10. Item wise per hectare cost of production and returns of kokum grafted orchard (2005)

(Rs./ha.)

Sl. No	Item of cost	Sindhudurg	Ratnagiri	Overall
1	Hired labour			
a.	Male	1887.92 (7.48)	4194.35 (8.19)	3040.10 (7.09)
b.	Female	1322.23 (3.35)	3623.45 (7.08)	1518.03 (3.54)
	Total hired labour	3210.15 (8.13)	7817.80 (15.27)	4558.03 (10.64)
2	Manures	4378.34 (11.09)	3240.10 (6.33)	3711.79 (8.67)
3	Chemical fertilizers	6081.70 (15.40)	5203.31 (10.16)	5774.52 (13.48)
4	Plant protection chemicals	100.44 (0.25)	393.84 (0.76)	272.29 (0.63)
	Total input cost	16980.78 (43.03)	24472.28 (47.82)	18874.68 (44.07)
5	Land revenue and other costs	23.53 (0.05)	27.23 (0.05)	25.75 (0.06)
6	Depreciation and repairing charges	813.54 (2.06)	357.93 (0.70)	493.82 (1.15)
7	Interest on working capital (@ 13%)	2207.50 (5.59)	3181.36 (6.21)	2453.70 (5.73)
I	Cost – A	20025.35 (50.74)	28038.80 (54.80)	21847.95 (51.01)
8	Interest on fixed capital (@ 10%)	57.67 (0.14)	29.33 (0.06)	37.76 (0.09)
9	Rental value of land (1/6 th of the gross returns)	7237.65 (18.34)	9569.00 (18.70)	8403.29 (19.62)
10	Amortization value.	9001.03 (22.80)	9001.03 (17.59)	9001.03 (21.01)
II	Cost – B	36321.70 (92.04)	46638.16 (91.15)	39290.03 (91.74)
11	Family labour			
	a) Male	834.59 (2.11)	668.48 (1.30)	751.71 (1.75)
	b) Female	608.20 (1.54)	1411.34 (2.75)	897.95 (2.09)
	Total family labour	1442.79 (3.65)	2079.82 (4.06)	1649.66 (3.85)
12	Supervision charges (@ 10% on input cost)	1698.07 (4.30)	2447.22 (4.78)	1887.46 (4.40)
III	Cost – C	39462.56 (100)	51165.20 (100)	42826.49 (100)
13	Yield (quintal)	60.32	62.02	61.34
14	Gross returns	43425.90	57414.00	50419.50
15	Per quintal cost of production	443.34	623.81	568.44
16	Profit at cost A	23400.55	29375.20	21571.55
17	Profit at cost B	7104.20	10775.84	11129.47
18	Profit at cost C	3963.34	6248.80	7593.01
19	Benefit cost ratio	1.10	1.12	1.11

(Figures in the parentheses indicate percentage to the total)

charges (4.40%), total family labour (3.85%), depreciation and repairing charges (1.15%), plant protection chemicals (0.63%), interest on fixed capital (0.09%) and land revenue and other costs (0.06%). At overall level per quintal cost of production was Rs.568.44 and per hectare gross return was worked out to be Rs.50419.50. With this costs and returns from grafted *kokum* orchards, the profit at cost A, cost B and cost C were observed as Rs.21571.55, Rs.11129.47 and Rs.7593.01, respectively. The benefit cost ratio was worked out to be 1:1.11.

Seed origin *kokum* orchard

The cost of cultivation of seed origin *kokum* orchard was worked out and the results are presented in Table 4.11.

The per hectare cost of cultivation of seed origin *kokum* orchard at overall level accounted for Rs.26424.20 (cost C) and cost A, cost B were accounted to Rs.11342.47 (42.92%) and Rs.23985.80 (90.77%) respectively. Among the different items of cost of cultivation the share of rental value of land was the highest and observed to be 26.97 per cent followed by amortization value 20.73 per cent, total hired labour cost 15.54 per cent, total family labour cost 5.60 per cent, interest on working capital 4.71 per cent, supervision charges 3.62 per cent, chemical fertilizers 2.01 per cent, depreciation and repair charges 1.87 per cent, manures 1.86 per cent, plant protection chemical 1.28 per cent and land revenue and other costs 0.09 per cent. The per quintal cost of production of seed origin *kokum* orchard was Rs.422.04. While, the profit realized at cost A, cost B and cost C accounted to Rs.31421.03, Rs.18777.70 and Rs.16339.30 per ha. respectively.

Further, at overall level the benefit cost ratio for seed origin *kokum* orchard was observed to be 1:1.70. It could be inferred from the table that the per hectare total cost of cultivation (cost C) in the case of seed origin *kokum* orchard of Sindhudurg and Ratnagiri district was Rs.22270.99 and Rs.33683.51 respectively.

On the other hand, the per hectare gross return from the seed origin *kokum* orchard was estimated to Rs.47100.00, Rs. 42763.50 and Rs. 44931.50 in Sindhudurg district, Ratnagiri district and at overall level respectively. Similarly, in this type of *kokum* orchards of Sindhudurg, Ratnagiri districts and at overall level, the per quintal cost of production were worked out to be Rs.339.96, Rs.555.46 and Rs.422.04 respectively. The profitability from per hectare *kokum* orchard in Sindhudurg and Ratnagiri districts were found to be Rs. 24,829.01 and Rs.9079.99 with benefit cost ratio 1:2.11 and 1:1.26 respectively.

4.5 PRODUCTION AND RETURN FROM *KOKUM* ORCHARDS

The *kokum* fruit production and returns pattern for different types of *kokum* orchards established in Sindhudurg and Ratnagiri district were studied. Under the given condition the *kokum* orchards were categorized into grafted and seed origin orchards. In the case of seed origin orchards based on the nature of fruit bearing the orchards were sub grouped and the results are presented in Table 4.12.

The average per farm *kokum* fruit bearing plant for Sindhudurg and Ratnagiri districts were observed to be 60 and 56 in number. From these bearing *kokum* plants, the per farm average *kokum* fruit production was 38.86 quintals and 34.47 quintals for Sindhudurg and Ratnagiri districts respectively. With this per farm production levels sample farmer had realized Rs.21,776.20 and Rs.22,807.06 returns in the respective districts through sale of *kokum* fruits.

In the case of Sindhudurg and Ratnagiri districts of the total *kokum* fruits bearing plants, 73.33 per cent and 50.00 per cent were of seed origin *kokum* plants and remaining 26.67 per cent and 50.0 per cent were of grafted *kokum* plants.

With the grafted types of *kokum* orchard in Sindhudurg district the per farm yield and returns found to be 4.32 quintals and Rs.2779.20. On the other hand seed origin *kokum* plants orchard yielded 34.54 quintals of fruits which generated returns of Rs.18,997.00, while, in Ratnagiri district per farm grafted *kokum* orchards produced was 9.24 quintals of *kokum* fruits which had generated returns of Rs.6,430.20 and under this condition the seed origin *kokum* orchards produced 25.23 quintals of *kokum* fruits with return of Rs.16,377.66.

Table 4.11. Item wise per hectare cost of cultivation of seed origin *Kokum* orchard (2005)
(Rs./ha.)

Sl. No	Item of cost	Sindhudurg	Ratnagiri	Overall
1	Hired labour			
a.	Male	1593.15 (7.15)	3445.81 (10.22)	2671.16 (10.10)
b.	Female	765.00 (3.43)	1667.90 (4.95)	1435.32 (5.43)
	Total hired labour	2358.15 (10.59)	5113.71 (15.18)	4106.48 (15.54)
2	Manures	351.47 (1.58)	911.80 (2.70)	492.90 (1.86)
3	Chemical fertilizers	197.00 (0.88)	923.52 (2.74)	533.04 (2.01)
4	Plant protection chemicals	18.18 (0.08)	1620.98 (4.80)	338.89 (1.28)
	Total input cost	5282.95 (23.72)	13683.72 (40.62)	9577.79 (36.24)
5	Land revenue and other costs	23.53 (0.10)	27.23 (0.08)	25.75 (0.09)
6	Depreciation and repairing charges	813.54 (3.65)	357.93 (1.06)	493.82 (1.87)
7	Interest on working capital (@ 13%)	686.78 (3.08)	1778.88 (5.28)	1245.11 (4.71)
I	Cost – A	6806.80 (30.56)	15847.76 (47.04)	11342.47 (42.92)
8	Interest on fixed capital (@ 10%)	57.67 (0.26)	29.33 (0.08)	37.76 (0.14)
9	Rental value of land (1/6 th of the gross returns)	7850.00 (35.25)	7618.33 (22.61)	7127.25 (26.97)
10	Amortization value.	5478.32 (24.60)	5478.32 (16.26)	5478.32 (20.73)
II	Cost – B	20192.79 (90.67)	28973.74 (86.01)	23985.80 (90.77)
11	Family labour			
a)	Male	830.00 (3.73)	1287.10 (3.82)	812.58 (3.07)
b)	Female	720.00 (3.23)	1054.00 (3.12)	668.05 (2.52)
	Total family labour	1550.00 (6.96)	3341.10 (9.91)	1480.63 (5.60)
12	Supervision charges (@ 10% on input cost)	528.20 (2.37)	1368.37 (4.06)	957.77 (3.62)
III	Cost – C	22270.99 (100)	33683.51 (100)	26424.20 (100)
13	Yield (quintal)	65.51	60.64	62.61
14	Gross returns	47100.00	42763.50	44931.50
15	Per quintal cost of production	339.96	555.46	422.04
16	Profit at cost A	40293.20	26915.74	33589.03
17	Profit at cost B	26907.21	13789.76	20945.70
18	Profit at cost C	24829.01	9079.99	18507.30
19	Benefit cost ratio	2.11	1.26	1.70

(Figures in the parentheses indicate percentage to the total)

Table 4.12. Per farm *Kokum* fruit production and returns obtained from different types of *kokum* orchards (2005)

Sl. No.	Type of <i>kokum</i> orchard	Sindhudurg			Ratnagiri			Overall		
		Bearing plants (No)	Total yield (qt.)	Total Return (Rs.)	Bearing plants (No)	Total yield (qt.)	Total Return (Rs.)	Bearing plants (No)	Total yield (qt.)	Total Return (Rs.)
I	Grafted	16	4.32	2779.20	28	9.24	6430.20	22	6.60	4436.74
	Sub Total	16 (26.67)	4.32 (11.12)	2779.20 (12.76)	28 (50.00)	9.24 (26.81)	6430.20 (28.19)	22 (37.93)	6.60 (17.30)	4436.74 (17.34)
II	Seed origin									
i.	Profuse	7 (11.67)	9.94 (25.58)	5467.00 (25.10)	4 (7.14)	4.44 (12.88)	2863.56 (12.55)	6 (10.34)	7.20 (18.87)	4824.00 (18.86)
ii.	Medium	27 (45.00)	21.60 (55.58)	11880.00 (54.55)	21 (37.50)	20.37 (59.09)	13240.50 (58.05)	24 (41.38)	23.04 (60.38)	15436.80 (60.34)
iii.	Spares	10 (16.67)	3.00 (7.72)	1650.00 (7.57)	3 (5.35)	0.42 (1.22)	273.00 (1.20)	6 (10.34)	1.32 (3.46)	884.40 (3.46)
	Sub Total	44 (73.33)	34.54 (88.88)	18997.00 (87.23)	28 (50.00)	25.23 (73.19)	16377.06 (71.81)	36 (62.07)	31.56 (82.70)	21145.20 (82.66)
III	Grand Total	60 (100)	38.86 (100)	21776.20 (100)	56 (100)	34.47 (100)	22807.06 (100)	58 (100)	38.16 (100)	25581.94 (100)

Figures in the parenthesis indicate percentage to total

- Note: 1) Profuse bearing : <2.5 quintal fruits per tree.
 2) Medium bearing : 1 to 2.5 quintal fruits per tree
 2) Spares bearing : >1 quintal fruits per tree

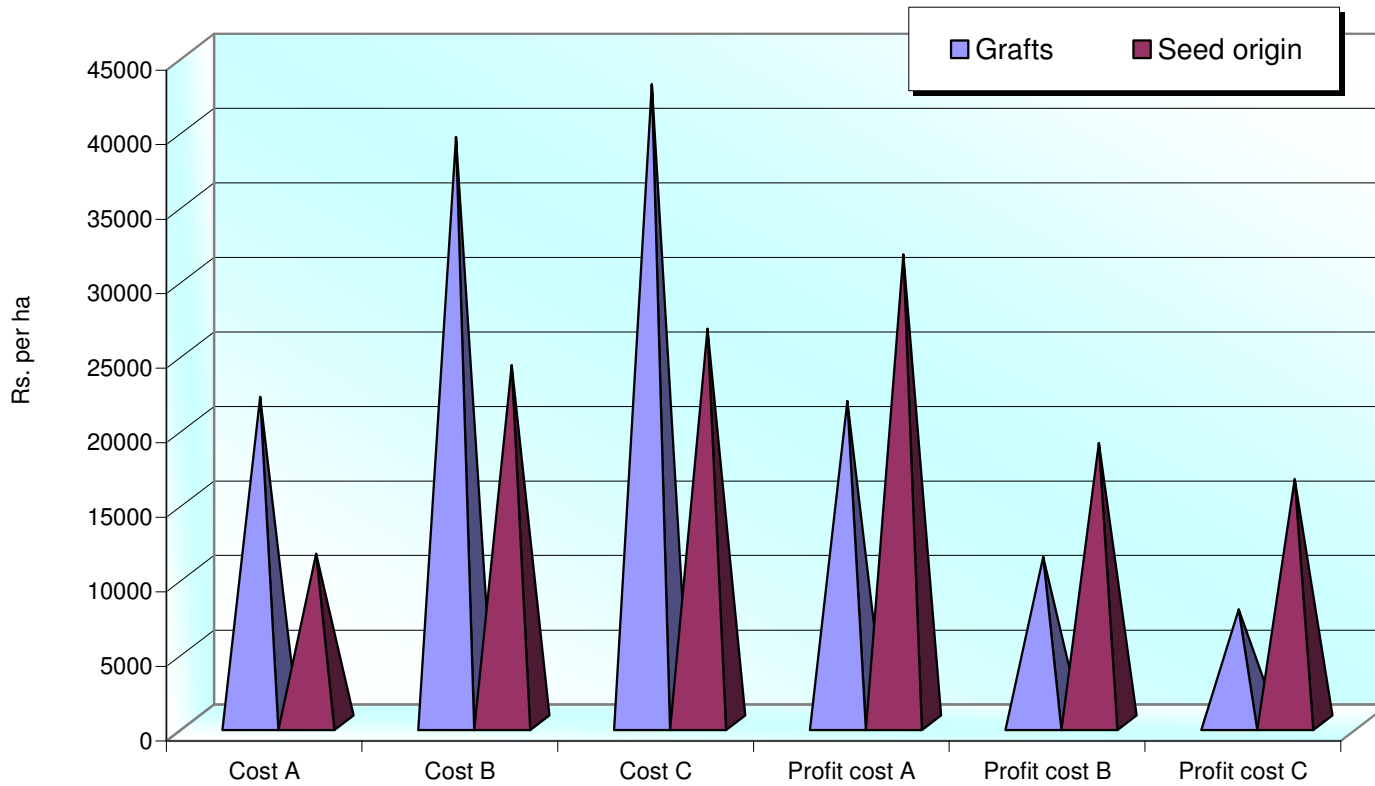


Fig. 6. Cost and net return at different cost level from *kokum* orchard

Fig.6. Cost and net return at different cost level from kokum oechard

The forgoing analysis revealed that at overall level per farm average number of total bearing *kokum* trees were observed to be 58 in number. Of this total bearing plants 22 plants were of grafted and 36 plants were of seed origin types. Under this situation the per farm average total *kokum* fruit production was observed to be 38.16 quintal. Of this, 17.30 per cent and 82.70 per cent of *kokum* fruits production were contributed by grafted and seed origin *kokum* orchards respectively. On the contrary, the per farm total returns from grafted and seed origin *kokum* orchards were amounted to Rs.4436.74 (17.34%) and Rs.21145.20. The total return from both types together generated the amount of Rs.25581.94 per farm.

4.7 ECONOMIC EVALUATION OF INVESTMENT IN *KOKUM* ORCHARD

The investment made in *kokum* orchard in terms of capital out flow and the in flow was spread over the period of 11 years (1995-2005) for both Sindhudurg and Ratnagiri districts. To study the economic feasibility the data were discounted at the rate of 8, 10 and 12 per cent. The results are presented in Table 4.13.

It was observed that, Net Present Value (NPV) for seed origin orchard at 8, 10 and 12 per cent discount rates in Sindhudurg district were Rs.278430.70, Rs.196076.70 and Rs.141348.70, respectively. While the respective figures for grafted *kokum* orchard were Rs.51846.86, Rs.42952.89 and Rs.35162.09 respectively. The NPV values at 8, 10 and 12 per cent discount rate for seed origin and grafted *kokum* orchards were found to be positive and the pay back period in these two types was observed to be 8 years. Further, the Internal Rate of Return (IRR) was 34 per cent for seed origin orchard and 27 per cent in grafted orchard and these IRR values were greater than prevailing rate of interest (12%) on borrowing.

The financial feasibility analysis of *kokum* cultivation in Ratnagiri district showed that all the NPVs were positive indicating viability of both types of *kokum* orchards. It was observed that the NPVs with respect to seed origin *kokum* orchard at 8, 10 and 12 per cent discount rates were Rs.511874.40, Rs.407514.90 and Rs.333006.90 respectively. The respective figure for grafted orchard were Rs.108476.80, Rs.95131.58 and Rs.83365.65 which were comparatively higher than Sindhudurg district. This indicated that *kokum* orchards in Ratnagiri district was more economically feasible than in Sindhudurg district. The IRR values for seed origin and grafted *kokum* orchards were 31 per cent and 46 per cent respectively and were greater than prevailing rate of interest on borrowing. Under this situation the pay back period in case of seed origin orchard was 8 years and in grafted orchard it was 7 years.

The benefit cost ratio analysis at different discount rates was more than unity in both the districts for grafted as well as seedling origin *kokum* orchards. The benefit cost ratios in Sindhudurg district for seed origin orchard at 8, 10 and 12 per cent discount rates were 7.83, 5.90 and 4.59, respectively, while the respective figures for grafted *kokum* orchard were 2.64, 2.29 and 2.06, on the contrary in case of Ratnagiri district, the benefit cost ratios for seed origin orchard 6.07, 4.51 and 3.49 and in the case of grafted orchard they were observed to be 2.51, 2.48 and 2.25 at the respective discount rates.

4.8 RESOURCE USE EFFICIENCY IN *KOKUM* CULTIVATION

The resource use efficiency was studied by fitting Cobb-Douglas type of production function to the data. The Marginal Value Product (MVP) of each explanatory variable was computed with its Marginal Factor Cost (MFC) to know the resource use efficiency of the farmers and the results are presented under the following sub heads.

4.8.1 Estimated Cobb-Douglas production function coefficients and MVP to MFC ratio

The regression coefficients and MVP to MFC ratios for various resources in grafted and seed origin *kokum* orchards established in Sindhudurg, Ratnagiri districts and at overall level were computed and results are presented in Table 4.14 and 4.15.

Table 4.13. Economic evaluation of investment in *Kokum* orchard (1995-2005)

Sl. No.	Parameters	Discount rate					
		Sindhudurg			Ratnagiri		
		8%	10%	12%	8%	10%	12%
I	Seed origin						
i.	Net present value (Rs.)	278430.70	196076.70	141348.70	511874.40	407514.90	333006.90
ii.	Benefit cost ratio	7.83	5.90	4.59	6.07	4.51	3.49
iii.	Internal rate of return (%)	34%			31%		
iv.	Pay back period (years)	8			8		
II	Grafted						
i.	Net present value (Rs.)	51846.86	42952.89	35162.09	108476.8	95131.58	83365.65
ii.	Benefit cost ratio	2.64	2.29	2.06	2.51	2.48	2.25
iii.	Internal rate of return (%)	27%			46%		
iv.	Pay back period (years)	8			7		

Grafted *kokum* orchard

The regression coefficients for identified resources of grafted *kokum* orchard are presented in Table 4.14. It was observed that, the regression coefficients of all the resources used in the *kokum* fruit production by the sample farmers were positive except for the area at overall level. On the other hand, under the grafted *kokum* cultivation the coefficient for number of tree per hectare (1.03) and age (1.01) were found to be positive and statistically significant at one per cent level in Sindhudurg district and for all other resources coefficients were found to be non-significant. In the case of Ratnagiri district the regression coefficients for age (0.36) and number of trees per hectare (0.89) and fertilizer (0.11) were observed to be positive and statistically significant at one per cent level and for labour, fertilizer it was also positive and significant at one per cent while, it was observed to be negative and non-significant for manures and insecticides. At overall level, the regression coefficients of age (0.52) and number of trees per hectare (0.93) were statistically significant at one per cent level and the others coefficients were non-significant. For the grafted *kokum* orchards the coefficient of multiple determination (R^2) were 0.68, 0.85 and 0.77 for Sindhudurg, Ratnagiri and overall level respectively. The values of sum of elasticities were 2.33, 1.28 and 1.55 for Sindhudurg, Ratnagiri and at an overall level respectively.

In Sindhudurg district, the ratios of MVP to MFC were greater than unity for labour (249.79), fertilizers (12.95) and insecticides (318.70) while, the ratios were less than unity for area (-36.83) and manures (0.56). Whereas, in Ratnagiri district the MVP to MFC ratio was less than unity for all resources except for labour (49.48) and fertilizers (64.19). At the overall level the MVP to MFC ratios greater than unity for labour, fertilizers and insecticides and they were observed to be 113.95, 60.98 and 22.81 respectively, while they were less than unity for area (-50.84) and manures (0.13).

Seed origin *kokum* orchard

The results of regression analysis of seed origin *kokum* orchard are presented in the Table 4.15.

It is observed from the Table 4.15 that, in Sindhudurg district the regression coefficients for all the resources used were positive and statistically significant at one per cent level, except for the area, manures and fertilizers.

In the case of Ratnagiri district the regression coefficient for area (-0.20) and manures (-0.05) were found to be negative and non-significant, while it was negative and statistically significant at 1 per cent level for insecticides (-0.14). On the contrary, the coefficients for age of trees (1.01), number of trees per ha (0.53) and labour (0.34) for the district were observed to be positive and statistically significant at one per cent level.

At an overall level the regression coefficients were observed to be positive for all resources used except for the area (-0.01). The coefficient for age (0.86), number of trees per ha. (0.60) and labour days (0.27) were found to be statistically significant at one per cent level and for other resources, the coefficients were non significant.

The coefficient of multiple determination (R^2) for seed origin *kokum* orchards established under Sindhudurg, Ratnagiri and at overall level were determined as 0.61, 0.57 and 0.50 respectively, while, the respective figures for sum of elasticities were calculated as 2.25, 1.42 and 1.68 for the respective districts and at overall level.

The ratios of MVP to MFC were greater than unity for all the resources such as area (88.24), labour (524.01), manure (7.60), fertilizers (782.49) and insecticides (6198.35) in the Sindhudurg district, while the MVP to MFC ratios indicated the negative values for all resources except for labour (353.97) in Ratnagiri district. At the overall level the MVP to MFC ratio were greater than unity in the case of labour (41.80) and fertilizers (2.40), and MVP to MFC ratios were negative for resource like area (-0.46) and insecticides (-0.144.73). The ratio of MVP to MFC was less than unity for manures (0.13) at the overall level.

Table 4.14. Estimated Cobb- Douglas production function co-efficient and MVP to MFC ratio for grafted *Kokum* orchard

Sl. No.	Particular	Parameter	Sindhudurg		Ratnagiri		Overall	
			Coefficient	MVP:MFC	Coefficient	MVP:MFC	Coefficient	MVP:MFC
1	Intercept	a	2.73	--	0.39	--	3.72	--
2	Area (ha.)	b ₁	-0.09 (0.30)	-36.83	-0.12 (0.12)	-45.28	-0.15 (0.12)	-50.84
3	Age (Year)	b ₂	1.01** (0.42)	--	0.36** (0.13)	--	0.52* (0.14)	--
4	Tree (No.) per ha	b ₃	1.03** (0.10)	--	0.89** (0.05)	--	0.93** (0.05)	--
5	Labour (days)	b ₄	0.15 (0.17)	249.79	0.06 (0.11)	12.49	0.09 (0.08)	475.62
6	Manures (qt.)	b ₅	0.09 (0.04)	0.56	-0.02 (0.03)	-42.37	0.03 (0.02)	8.24
7	Fertilizes (Rs.)	b ₆	0.01 (0.04)	12.95	0.11** (0.04)	1910.49	0.08** (0.03)	431.24
8	Insecticides (Rs.)	b ₇	0.13 (0.12)	318.70	-0.01 (0.05)	-19.37	0.05 (0.05)	1.45
9	Coefficient of multiple determination	R ²	0.68	--	0.85	--	0.77	--
10	Return to scale	$\sum b_i$	2.33	--	1.28	--	1.55	--

(Figures in the parentheses indicate standard error)

** :Significant at 1% level

MVP: Marginal value product, MFC: Marginal factor cost

Table 4.15. Estimated Cobb- Douglas production function co-efficient and MVP to MFC ratio for seed origin *Kokum* orchard

Sl. No.	Particular	Parameter	Sindhudurg		Ratnagiri		Overall	
			Coefficient	MVP:MFC	Coefficient	MVP:MFC	Coefficient	MVP:MFC
1	Intercept	a	3.24	--	3.72	--	3.64	--
2	Area (ha.)	b ₁	0.17 (0.11)	88.24	-0.20 (-0.21)	-77.04	-0.01 (0.11)	-0.46
3	Age (Year)	b ₂	0.64** (0.17)	--	1.01* (0.19)	--	0.86** (0.12)	--
4	Tree (No.) per ha	b ₃	0.69** (0.11)	--	0.53** (0.12)	--	0.60** (0.09)	--
5	Labour (days)	b ₄	0.29** (0.08)	524.01	0.34** (0.09)	353.97	0.27** (0.06)	41.80
6	Manures (qt.)	b ₅	0.0.09 (0.04)	7.60	-0.05 (0.07)	-1.34	0.02 (0.04)	0.13
7	Fertilizes (Rs.)	b ₆	0.14 (0.04)	782.49	0.07 (0.05)	-12.40	0.03 (0.03)	2.40
8	Insecticides(Rs.)	b ₇	0.21* (0.09)	6198.35	(-)0.14** 0.06	-1377.82	0.09 (0.04)	-144.73
9	Coefficient of multiple determination	R ²	0.61	--	0.57	--	0.50	--
10	Return to scale	$\sum b_i$	2.25	--	1.42	--	1.68	--

(Figures in the parentheses indicate standard error)

** : Significant at 1% level

MVP: Marginal value product

MFC: Marginal factor cost

4.9 PRODUCTION, DISPOSAL PATTERN AND MARKETING OF *KOKUM* FRUITS

Per farm production, disposal pattern and market expenses for fresh *kokum* fruits and processed products were analyzed for both districts and results are presented in the following subtitles.

4.9.1 Per farm fruit production, fruits losses and used for marketing and home scale processing

The information on per farm production, fruits losses at farm level, *kokum* fruits used for marketing and in home scale processing are presented in Table 4.16 which, revealed that, at an overall level average per farm *kokum* fruits production was arrived as 38.16 quintal. Of this average per farm production, 63.10 per cent of *kokum* fruits were marketed through different market intermediaries and 31.49 per cent of fruits were used for home scale processing. The remaining 4.83 per cent of fruits were lost in the form of losses at farm level and 0.58 per cent fruits were gifted to relatives and friends.

The districtwise information indicated that, in Sindhudurg district per farm average *kokum* production was 38.86 quintals, out of this 39.86 per cent of fruits were used in home scale processing and 52.11 per cent of fruits were sold through market intermediaries. In the average per farm production, the fruit losses at farm level and gifted to relatives and friends were observed to be 7.44 per cent and 0.59 per cent respectively.

Similarly, in Ratnagiri district the average per farm production of *kokum* was 34.47 quintals and a maximum of 72.27 per cent of the average per farm production was marketed through intermediaries. The remaining 24.80 per cent 2.33 per cent and 0.60 per cent of fruits were used for home scale processing, for gifting the relatives and friends and lost as wastage at farm level respectively.

It was observed that per farm 38.16 quintals of *kokum* fruits were produced at an overall level, out of this production 12.02 quintal *kokum* fruits were used for home scale processing, while in Sindhudurg and Ratnagiri districts, 15.49 quintal and 8.55 quintal of fruits were used for this purpose.

Out of the average quantity of per farm *kokum* fruits produced in Sindhudurg district, maximum quantity of (36.15%) *kokum* fruits was used for the preparation of *kokum ghul* followed by *kokum agal* (32.47%), *kokum rind* (22.60%) and *kokum* syrup (8.78%), whereas in Ratnagiri district, *Lonawala kokum* was prepared by using maximum (71.70%) quantity of fruits, followed by *kokum* syrup (12.87%), *kokum rind* (9.82%) and *kokum agal* (5.61%).

At an overall level the maximum quantity of *kokum* fruits (25.46%) was used for the preparation of *lonawala kokum* and 22.46 per cent, 21.64 per cent, 20.46 per cent and 9.98 per cent of *kokum* fruits were utilized for the preparation of *kokum ghul*, *kokum agal*, *kokum rind*, and *kokum* syrup respectively.

4.9.2 Per farm expenses involved in the marketing of raw *kokum* fruits and its processed products

Per farm expenses incurred in the marketing by the sale of fruits and processed products under the varied situations and purposes were analyzed and the results are presented in Table 4.17.

It was observed that in Sindhudurg district, per farm total marketing cost for raw fruits and its processed products was Rs.1373.74. In this maximum of 62.40 per cent cost was incurred on packaging, 17.52 per cent incurred on transport and 13.03 per cent on labour charges.

In Ratnagiri district out of per farm total marketing cost of Rs.685, maximum of 45.48 per cent marketing cost was incurred on packaging material, which was followed by 32.91 per cent on transport 16.25 per cent on other costs and 5.79 per cent on labour charges.

At an overall level, per farm total marketing cost was observed to be Rs.1030.89. In this total marketing cost the maximum share of 56.69 per cent was incurred on packing

Table 4.16. Per farm production and disposal of *Kokum* fruits and *Kokum* products
(Figures in qt.)

Sl. No.	Particulars	Sindhudurg	Ratnagiri	Overall
	Fruits			
I.	Fruit production	38.86 (100)	34.47 (100)	38.16 (100)
1.	Fruits utilization/losses			
	i) Home scale processing	15.49 (39.86)	8.55 (24.80)	12.02 (31.49)
	ii) Gift to relatives and friends	0.23 (0.59)	0.21 (0.60)	0.22 (0.58)
	iii) Losses at farm level	2.89 (7.44)	0.80 (2.33)	1.84 (4.83)
2.	Sales through intermediaries	20.25 (52.11)	24.91 (72.27)	24.08 (63.10)
II	Fruits used in home scale Processing			
1	<i>Kokum</i> syrup	1.36 (8.78)	1.10 (12.87)	1.20 (9.98)
2	<i>Kokum</i> Agal	5.03 (32.47)	0.48 (5.61)	2.60 (21.64)
3	<i>Kokum</i> rind	3.50 (22.60)	0.84 (9.82)	2.46 (20.46)
4	<i>Kokum</i> Ghul	5.60 (36.15)	0.00 (0.00)	2.70 (22.46)
5	<i>Lonawala kokum</i>	--	6.13 (71.70)	3.06 (25.46)
III	Total home scale processing (qt.)	15.49 (100)	8.55 (100)	12.02 (100)

(Figures in the parentheses indicate percentage to the total)

Table 4.17. Per farm marketing expenses involved in *Kokum* fruits and processed product transaction in the study area (2005)

(Rs.)

Sl. No.	<i>Kokum</i> Product	Sindhudurg		Ratnagiri		Overall	
		Per farm	Per quintal	Per farm	Per quintal	Per farm	Per quintal
I	Packing material						
	i.) Gunny bag	51.64 (3.76)	3.33	11.44 (1.67)	1.33	31.54 (3.06)	2.62
	ii.) Plastic bag	88.86 (6.47)	5.73	80.89 (11.81)	9.46	84.88 (8.23)	7.06
	iii.) Plastic can	716.72 (52.17)	46.26	219.23 (32.00)	25.64	467.97 (45.39)	38.93
	Total packing cost	857.22 (62.40)	55.32	311.56 (45.48)	36.43	584.39 (56.69)	48.61
II	Labour	178.98 (13.03)	11.55	39.69 (5.79)	4.64	109.33 (10.60)	9.09
III	Transport	240.66 (17.52)	15.53	225.46 (32.91)	26.36	233.06 (22.60)	19.38
IV	Other	96.88 (7.05)	6.25	111.33 (16.25)	13.02	104.11 (10.09)	8.66
	Total	1373.74 (100)	88.45	685.04 (100)	80.45	1030.89 (100)	85.74

(Figures in the parentheses indicate percentage to the total)

followed by 22.60 per cent on transport, 10.60 per cent on labour charges and 10.09 per cent on other costs.

4.10 PROCESSING OF *KOKUM*

In Konkan region of Maharashtra state the *kokum* fruit cultivation is gaining lot of popularity among the growers due to its processing activities. Hence, the information relating to the *kokum* processing units in the region was gathered and results are presented in the following sub-heads.

4.10.1 General information of sample *kokum* processing units

The general information pertaining to the *kokum* processing units operating in the study area and their other ancillary information viz., types of processing units, year of establishment, ownership pattern, distance from nearest bus stand and railway station etc. is presented in Table 4.18.

It was observed from the Table 4.18 that, out of the 20 sample *kokum* processing units working in the Sindhudurg and Ratnagiri districts, 12 units were classified as small scale, three of each was of home scale and large scale and two were of cottage scale. The *kokum* processing unit's average establishment period was observed to be 18.35 years in the study area. Further, it was also observed that most of the *kokum* processing units were managed by individual proprietorship. These selected sample processing units were located within a distance of 2.30 km from bus stand and 22 km away from the railway stations.

4.10.2 Capital investment made in *kokum* fruits processing unit

The capital investment made in *kokum* processing unit includes fixed capital and working capital. Information on these two cost items with other sub-items of costs incurred in the value addition activities viz., syrup, *agal*, rind, Ready To Serve (RTS) and overall is furnished in Table 4.19.

It was observed that, in the study area the total capital investment of Rs.2476950.53 was made to undertake the processing of *kokum* fruits. In this total capital investment the share of fixed capital was 13.65 per cent (Rs.337905.54) and the share of working capital was observed to be maximum which amounted to 86.35 per cent (Rs.2139044.96). The expenditure made towards chemicals and preservatives (39.86%) and raw material (18.08%) form an important items of the working capital whose aggregate share was worked out to be more than 57.00 per cent. On the other hand the productwise, establishment cost of processing units viz., *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS were found to be Rs.1962014.31, Rs.374814.95, Rs.62749.89 and Rs.77371.38 respectively. In these productwise capital investment, the fixed capital accounted for 12.54 per cent, 12.84 per cent, 26.23 per cent and 15.95 per cent respectively. Whereas, the working capital investment for *kokum* syrup, *agal*, rind and RTS was observed to be 86.70 per cent, 87.16 per cent, 73.77 per cent and 84.05 per cent respectively. In the total capital investment made for *kokum* syrup and RTS, the expenditure incurred towards chemicals and preservatives were found to be maximum and accounted for 43.03 per cent and 61.05 per cent respectively. On the contrary the expenditure share of raw material cost in total capital investment was found to be maximum in the case of *kokum agal* and *kokum* rind which amounted to 37.35 per cent and 52.81 per cent respectively.

4.10.3 Capacity utilization of processing unit

The activity wise viz., processing, packing and storage capacity utilization of processing units in the study area is presented in Table 4.20.

The annual overall installed capacity of different categories of the *kokum* processing units were observed to be 354.27 tonnes, out of this 202.80 tonnes capacity was utilized for *kokum* product processing with 125 working days and 61.65 tonnes capacity utilized for processing of non-*kokum* product with 109.81 working days. The factory was idle for 130.19 days in a year with an opportunity to process 89.82 tonnes of raw materials. The overall annual packaging and storage capacity of units was 314.26 tonnes and 115.45 tonnes respectively. Out of that created packaging and storage capacities 200.70 tonnes and 48.60 tonnes capacities were used by the *kokum* processed products respectively. It was also

Table 4.18. General information of sample *kokum* processing units in the study area (2005)

Sl. No.	Particulars	Number of units		
		Sindhudurg	Ratnagiri	Overall
I.	Type of processing unit			
i.	Home scale	2.0 (20.00)	1.0 (10.00)	3 (15.00)
ii.	Cottage scale	1.0 (10.00)	1.0 (10.00)	2 (10.00)
iii.	Small scale	6.0 (60.00)	6.0 (60.00)	12 (60.00)
iv.	Large scale	1.0 (10.00)	2.0 (20.00)	3 (15.00)
	Total	10.0 (100.00)	10.0 (100.00)	20 (100.00)
II.	Year of establishment	17.7	19.0	18.35 yr.
III.	Type of ownership			
	Individual	10.0	10.0	20 (100.00)
IV	Average Distance from nearest			
	i. Bus station (km)	2.0	2.6	2.30
	ii. Railway Station (km)	20.0	24.0	22.00

(Figures in parentheses indicate percentage)

Table 4.19. Activity wise capital investment made for *kokum* fruit processing in the study area (2005) (Rs./ unit)

Sl. No.	Item of cost	Syrup	Agal	Rind	RTS	Overall
I.	Fixed capital					
i.	Machinery and equipments	19884.61 (0.95)	3667.13 (0.97)	1254.28 (1.20)	1247.80 (1.61)	26053.82 (1.05)
ii.	Land	72260.01 (3.47)	13326.23 (3.55)	4558.01 (7.26)	4725.00 (6.10)	94869.25 (3.83)
iii.	Buildings	84767.43 (4.07)	15632.85 (4.17)	5346.95 (8.52)	4104.00 (5.30)	109851.23 (4.43)
iv.	Furniture and office equipments	14065.75 (0.67)	2594.01 (0.69)	887.24 (1.41)	421.44 (0.54)	17968.44 (0.72)
v.	Utensils	24301.05 (1.16)	4481.61 (1.19)	1532.86 (2.44)	492.75 (0.63)	30808.27 (1.24)
vi.	Vehicle	45695.08 (2.19)	8427.12 (2.24)	2882.35 (4.59)	1350.00 (1.74)	58354.54 (2.35)
	Sub Total	260973.93 (12.54)	48128.95 (12.84)	16461.69 (26.23)	12341.00 (15.95)	337905.46 (13.65)
II.	Working Capital					
i.	Raw material	260607.84 (12.52)	140019.12 (37.35)	33181.58 (52.81)	13947.00 (18.02)	447755.54 (18.08)
ii.	container	373005.07 (17.93)	66625.52 (17.77)	---	--	439630.59 (17.75)
iii.	Packing material	47597.15 (2.28)	51015.99 (13.61)	343.47 (0.54)	976.66 (1.26)	99933.27 (4.03)
iv.	Chemical & preservatives	895226.6 (43.03)	41456.57 (11.06)	3330.00 (5.30)	47241.63 (61.05)	987254.80 (39.86)
v.	Labour charges	116566.87 (5.60)	26086.84 (6.96)	8926.07 (14.22)	2645.31 (3.41)	154225.09 (6.22)
vi.	Other charges	8036.91 (3.86)	1481.96 (0.39)	507.08 (0.80)	219.78 (0.28)	10245.73 (0.41)
	Sub Total	1701040.38 (86.70)	326686.00 (87.16)	46288.20 (73.77)	65030.38 (84.05)	2139044.96 (86.35)
III.	Grand Total	1962014.31 (100)	374814.95 (100.00)	62749.89 (100.00)	77371.38 (100.00)	2476950.53 (100.00)

(Figures in the parentheses indicate percentage to the total)

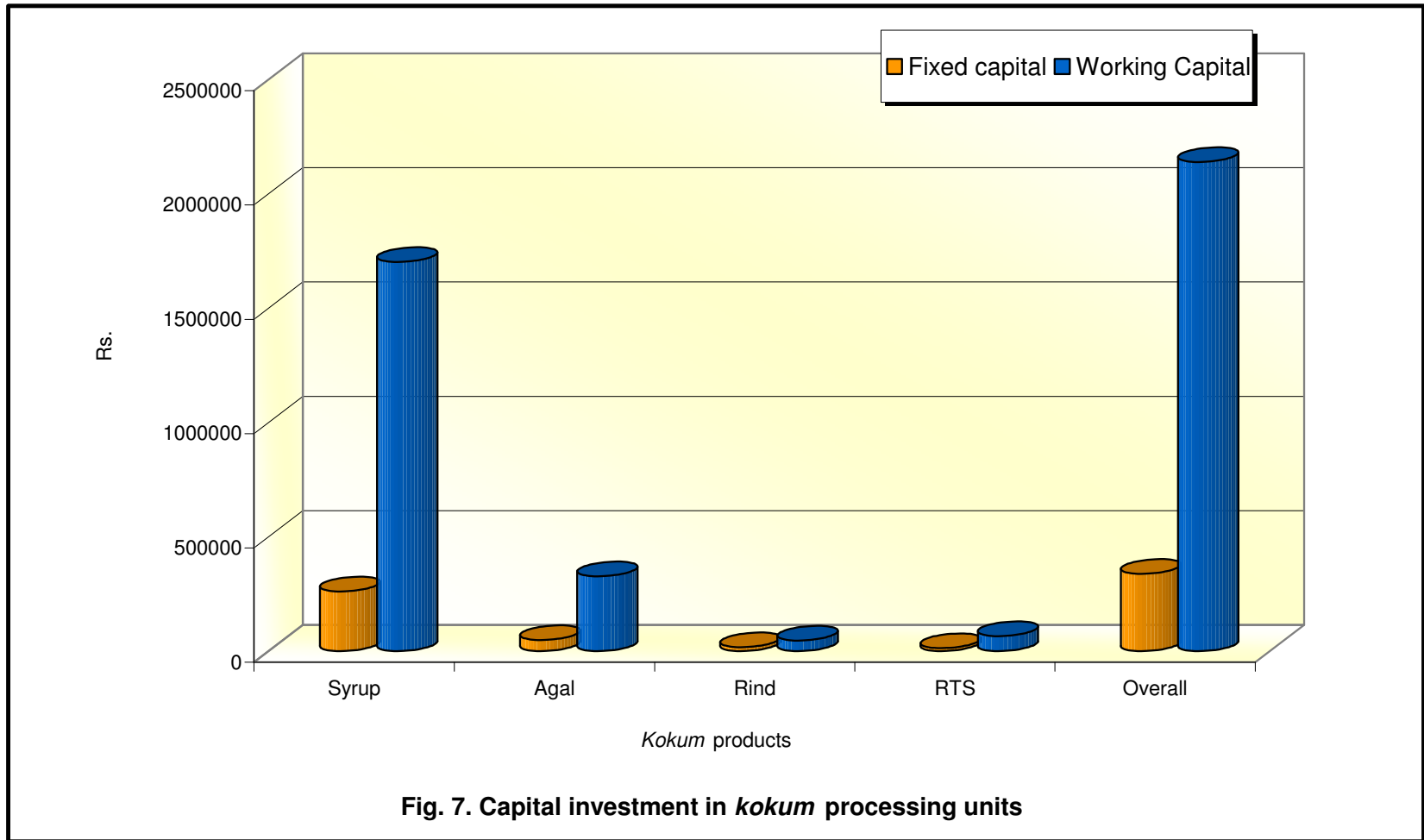


Fig. 7. Capital investment in *kokum* processing units

Fig.7. Capital investment in kokum processing units

Table 4.20. Activity wise capacity utilization pattern of the processing unit in the study area (2005)

Sl. No.	Particular	Home scale (N-3)		Cottage scale (N-2)		Small scale (N-12)		Large Scale (N-3)		Overall (N-20)	
		Days	Tonnage	Days	Tonnage	Days	Tonnage	Days	Tonnage	Days	Tonnage
I	processing										
a.	<i>Kokum</i>	84.33	24.00	73.00	50.25	137.60	64.00	150.00	673.00	125.00	202.80
b.	Non- <i>Kokum</i>	94.74	41.73	54.22	27.00	121.47	74.75	121.00	80.00	109.81	61.65
c.	Idle	185.93	49.16	237.78	112.80	105.93	28.88	94.00	116.70	130.19	89.82
	Total	365.00	114.89	365.00	190.05	365.00	167.63	365.00	869.70	365.00	354.27
II	Packing										
a.	<i>Kokum</i>	79.30	24.00	128.00	49.10	181.00	59.7	199.00	670.00	147.00	200.70
b.	Non- <i>Kokum</i>	118.20	41.00	97.00	27.00	126.50	73.33	109.67	79.07	121.40	59.14
c.	Idle	167.50	40.38	140.00	29.76	57.50	2.59	56.33	0.00	96.60	54.42
	Total	365.00	105.38	365.00	105.86	365.00	135.62	365.00	749.07	365.00	314.26
III	Storage										
a.	<i>Kokum</i>	311.66	12.00	326.33	32.50	327.33	50.50	326.33	88.33	357.30	48.60
b.	Non- <i>Kokum</i>	197.65	32.67	281.00	27.50	317.32	54.42	243.35	56.67	284.65	48.80
c.	Idle	53.33	11.33	39.00	12.00	38.00	8.64	0.00	0.00	36.10	18.05
	Total	562.64	56.00	646.33	72.00	682.65	113.56	569.68	145.00	678.05	115.45

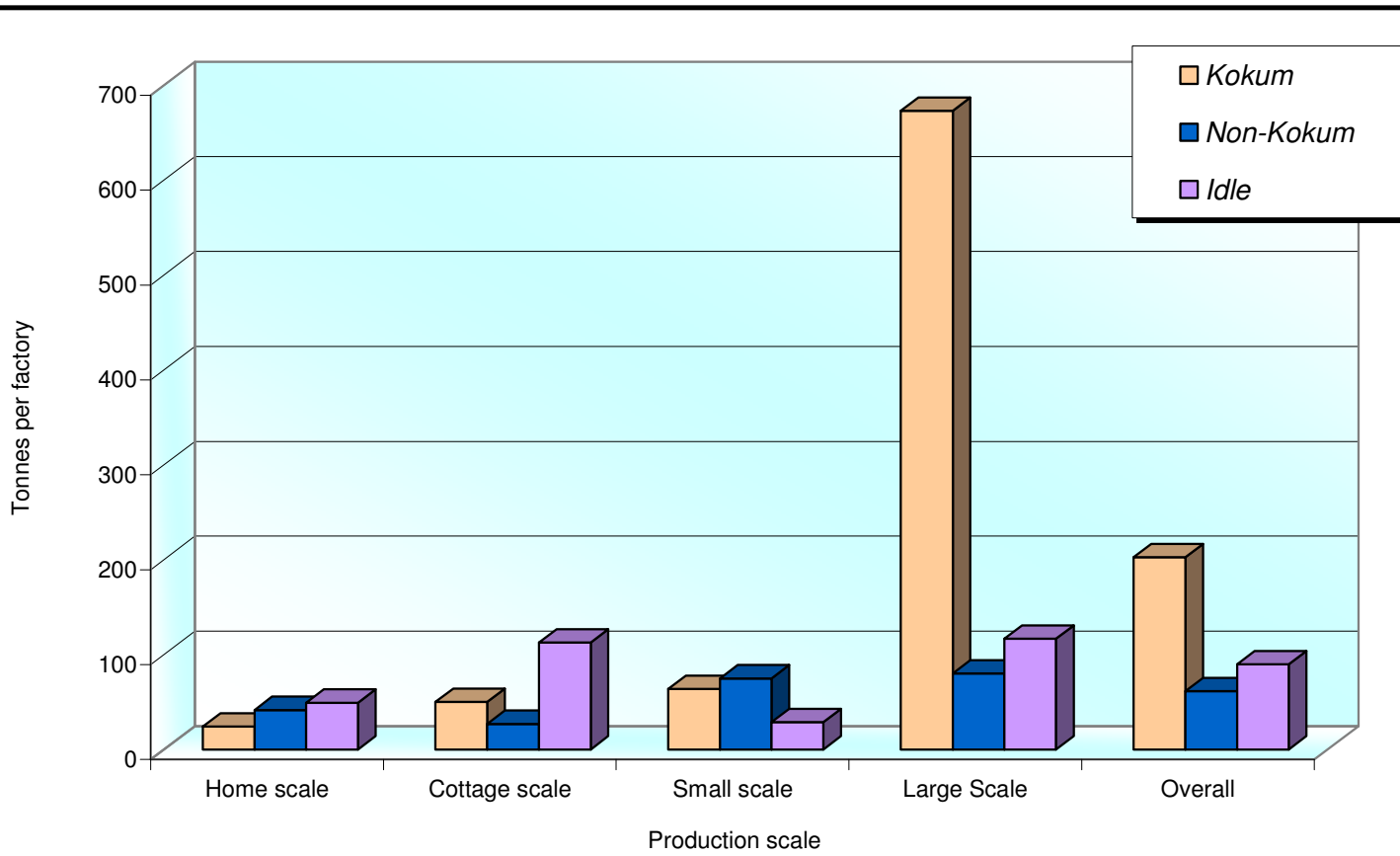


Fig. 8. Processing capacity utilization of the factory

Fig.8. Processing capacity utilization of the factory

observed that, the processing units at overall level remained idle for 96.60 day and 36.10 days in year with respect to usage of packing and storage facilities created for *kokum* and non *kokum* processed products, which resulted in the forgoing an opportunity to pack 54.42 tonnes and store 18.05 tonnes of processed products.

It was observed that in home scale, cottage scale, small scale and large scale processing units the total installed capacity of processing was 114.89 tonnes, 190.05 tonnes, 167.63 tonnes and 869.70 tonnes respectively. Out of which 24.00 tonnes, 50.25 tonnes, 64.00 tonnes and 673.00 tonnes capacity was utilized for the processing of *kokum* products and 41.73 tonnes, 27.00 tonnes 74.75 tonnes and 80.00 tonnes capacity used for the processing of non-*kokum* products. However, the respective *kokum* processing units were remained idle for 185.93 days, 237.78 days, 105.93 days and 94.00 days in a year. The total storage capacity created under the home scale unit was observed to be 56 tonnes and out of this only 12 tonne storage capacity was utilized to store the *kokum* processed product and in the case of non-*kokum* products out of 32.67 tonnes of its storage capacity, 11.33 tonne of storage capacity remained unused in a year. The packing capacity utilization for home scale indicated that 24 tonnes and 41 tonnes capacities were used to pack *kokum* and non-*kokum* products respectively and an idle capacity of 40.38 tonnes had remained unused.

In the case of cottage scale processing unit, the total packaging and storage capacities of 105.86 tonnes and 72.00 tonnes were created respectively. Out of this 49.10 tonnes capacity of packaging and 32.50 tonne capacity of storage was utilized by *kokum* processed products. On the other hand, about 27 tonnes of packaging and storage capacities each were utilized by non *kokum* products. Under this category of processing unit the packaging and storage capacities of 29.76 tonnes and 12.00 tonnes were remained unused in a year.

For the small scale and large scale processing units the total packaging capacity was observed to be 135.62 tonne and 749.07 tonnes, whereas the total storage capacities for these two groups was found to be 113.56 tonnes and 145.00 tonne respectively. Out of total packaging capacities created with respect to small and large scale processing units 59.70 tonnes and 670.00 tonnes capacity were used for packaging of *kokum* products under respective processing units. Further, these units packaged 73.33 tonnes and 79.07 tonnes of non-*kokum* products and were remained idle for 57.50 days and 56.83 days.

Similarly out of the total storage capacities created at small and large scale *kokum* processing units 50.50 tonnes and 88.33 tonnes capacities were used for storing the *kokum* processed products respectively, on the contrary, in these two units out of their created storage capacities, 54.42 tonnes and 56.67 tonnes capacities were utilized to store non-*kokum* products respectively. Only the small scale processing unit remained idle for 38.00 days in a year indicating under utilization of created storage capacity. The large scale processing unit fully utilized the created storage capacity in a year.

4.10.4 Input and labour utilization in processing units

The information regarding input and labour utilization in processing units is presented in Table 4.21 and 4.22.

4.10.4.1 Input utilization pattern of *Kokum* processing unit.

The raw material, additives, preservatives and packing material were the major inputs required for *kokum* processing. Therefore productwise input used and cost incurred are given in Table 4.21.

To process *kokum* fruit in to processed products viz., *kokum* syrup, *agal*, rind and RTS per processing unit, the overall total processing cost incurred towards various product was estimated and observed to be Rs.19,74,584.66. Out of the overall total processing cost, the maximum amount of Rs.15,76,436.66 (79.84%) was incurred in processing of *kokum* syrup followed by Rs. 2,99,116.21 in *kokum agal* (15.15%), Rs.62,165.20 in *kokum* RTS (3.14%) and Rs.36,855.05 in *kokum* rind (1.87%) were incurred as input costs.

In order to get *kokum* processed products the *kokum* fruits were used for the preparation of *kokum* syrup, *agal* and rind while, *kokum* raw *agal* was used to produce *kokum*

Table 4.21. Average Input utilization pattern for *Kokum* processing unit(per processing unit) (2005)

Sl. No.	Particulars	<i>Kokum</i> syrup		<i>Kokum</i> agal		<i>Kokum</i> rind		<i>Kokum</i> RTS		Total	
		Qty	Value (Rs.)	Qty	Value (Rs.)	Qty	Value(Rs.)	Qty	Value(Rs.)	Qty	Value (Rs.)
I.	Raw material.										
i	<i>Kokum</i> Fruits (tonnes)	5.89 (36.38)	40779.00 (36.41)	5.50 (33.97)	38036.25 (33.96)	4.80 (29.65)	33181.58 (29.63)	--	--	16.19 (100)	111996.86 (100)
ii	Raw <i>Agal</i> (ltr.)	24025.00 (65.47)	219828.84 (65.47)	11145.66 (30.37)	101982.87 (30.37)	--	--	1524.00 (4.15)	13947.00 (4.15)	36694.64 (100)	335758.71 (100)
	Sub Total	--	260607.84 (58.20)	--	140019.12 (31.27)	--	33181.58 (7.41)	--	13947.00 (3.12)	--	447755.5 (100)
II.	Additive										
i	Sugar (tonnes)	49.05 (94.71)	836605.94 (94.71)	--	--	--	--	2.74 (5.29)	46761.63 (5.29)	51.79 (100)	883367.57 (100)
ii	Salt (tonnes)	0.94 (16.43)	4543.66 (16.50)	4.09 (71.50)	19648.57 (71.36)	0.69 (12.06)	3330.00 (12.09)	--	--	5.72 (100)	27532.23 (100)
iii	<i>Jira</i> (kg.)	356.80 (100)	33459.00 (100)	--	--	--	--	--	--	356.80 (100)	33459.00 (100)
	Sub Total	--	874608.60 (92.62)	--	19648.57 (2.08)	--	3330.00 (0.35)	--	46761.63 (4.95)	--	944358.80 (100)
III.	Preservatives										
i	Citric acid (kg)	154.00 (45.16)	17248.00 (45.16)	187.00 (54.84)	20944.00 (54.84)	--	--	--	--	341.00 (100)	38192.00 (100)
ii	Sodium benzoate (kg)	42.00 (71.43)	3360.00 (71.43)	10.80 (18.37)	864.00 (18.37)	--	--	6.00 (10.20)	480.00 (10.20)	58.80 (100)	4714.00 (100)
	Sub Total	--	20618.00 (48.04)	--	21808.00 (50.84)	--	--	--	480.00 (1.12)	--	42906.00 (100)
IV.	Packing Material										
i	Plastic container (No)	58554.00 (85.16)	373005.07 (84.85)	10200.00 (14.83)	66625.52 (15.15)	--	--	--	--	68754 (100)	439630.59 (100)
ii	Other	--	47597.15 (47.63)	--	51015.00 (51.04)	--	343.47 (0.34)	--	976.66 (0.97)	--	99933.27 (100)
iii	Sub Total	--	420602.22 (77.95)	--	117640.52 (21.80)	--	343.47 (0.07)	--	976.66 (0.18)	--	539563.86 (100)
V.	Grand Total	--	1576436.66 (79.84)	--	299116.21 (15.15)	--	36855.05 (1.87)	--	62165.29 (3.14)	--	1974584.66 (100)

(Figures in parentheses indicate percentage)

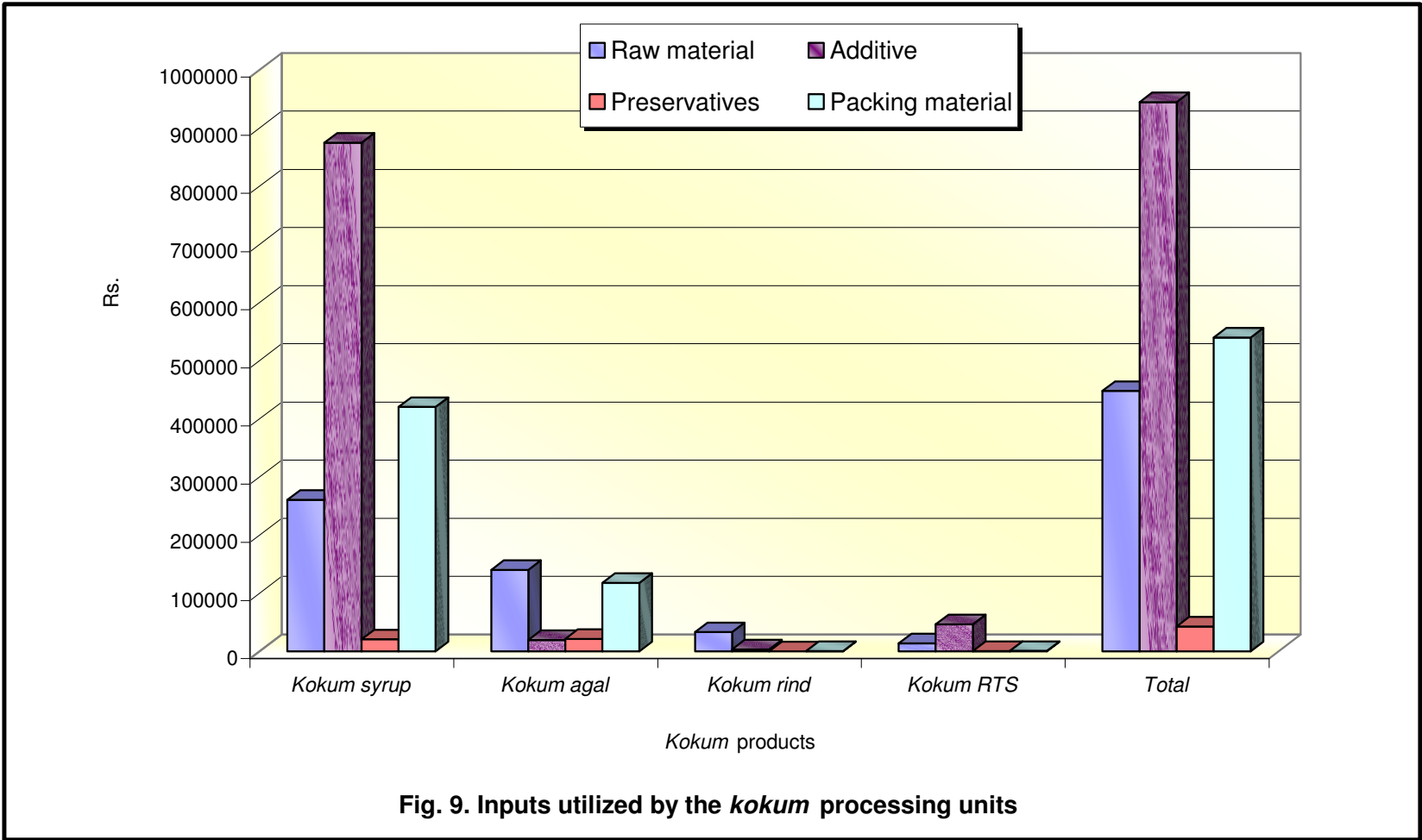


Fig.9. Inputs utilized by the kokum processing units

syrup, *agal* and RTS. Hence, *kokum* fruit and half processed *kokum agal* were used as raw materials by individual processing unit which was observed to be 16.19 tonne and 36694.64 litres respectively. Out of the total quantity of fruits used for processing, the maximum quantity of 5.89 tonnes (36.38%) used for syrup, followed by 5.50 tonnes for *agal* (33.96%) and 4.80 tonnes for rind (29.63%). Wherein, 65.47 per cent raw *agal* was utilized in the processing of *kokum* syrup while, 30.37 per cent and 4.15 per cent raw *agal* was used in the preparation of *kokum agal* and *kokum* RTS, respectively.

The *kokum* processing units used sugar as a additive and it was the second major input. The per processing unit average quantity of sugar utilization was worked out to be 51.79 tonne which was valued at Rs.883367.57. Out of that, total quantity of additives the maximum quantity of 49.05 tonnes was sugar (94.71%) which was valued at Rs.8,36,302.95 and it was used for syrup making. On the other hand salt and *jira* were also used as additives but little in quantities and the costs incurred on these additives were observed to be Rs.27,532.23 and Rs.33,459.00 respectively. Hence, the average per processing unit cost incurred towards additives was worked to be Rs.944358.80. Out of the total additives cost 92.62 per cent was incurred in processing of *kokum* syrup, 2.08 per cent for making *kokum agal*, 0.35 per cent for *kokum* rind and 4.95 per cent for *kokum* RTS.

The processing unit consumed inputs such as citric acid and sodium benzoate as preservatives. The per processing unit average total cost incurred on the purchase of preservatives was accounted to the sum of Rs.42906.00 of this, 48.04 per cent cost was incurred in *kokum* syrup making and 50.84 per cent cost incurred in *kokum agal* making. Only 1.12 per cent of the average total cost of the preservatives was incurred in making RTS.

The processing units utilize packing material, as a input for packing the *kokum* processed products. The per processing unit average total cost incurred on packaging material was observed to be Rs.539563.86. Out of the average total packaging cost the maximum proportion of 77.95 per cent of the cost was incurred in packing of *kokum* syrup followed by 21.80 per cent in *kokum agal*, 0.18 per cent in RTS and 0.07 per cent in *kokum* rind.

The plastic container listed the major item of packing cost for *kokum* syrup and *kokum agal* which, accounted to 84.85 per cent and 15.15 per cent of total container cost, respectively.

4.10.4.2 Labour utilization pattern by *kokum* processing units

The per season average labour utilization by *kokum* processing unit in the study area is presented in Table 4.22.

It was observed from table that, in the study area for processing, the sample *kokum* processing units had employed both permanent and temporary labour.

At an overall level per *kokum* processing unit, 21 labour were employed, out of that 76.19 per cent of labour were female and 23.81 per cent were of male labours. Out of total male labour, in this 40 per cent and 60 per cent were of permanent and temporary types respectively and out of total female labour 93.75 per cent were of temporary and only 6.25 per cent female labour were of permanent type. It could be observed that considering the aggregate labours of both types the maximum of 85.72 per cent labour force was of temporary and remaining 14.28 per cent was of permanent type.

Per processing unit, the average of 4770 days of employment was generated in a season and out of that maximum of 71.70 per cent (3420) of man days were occupied by female labourers and remaining 28.30 per cent (1350) of man days were occupied by the male labourers. It was also observed that out of total (1080 days) permanent labourers, 360 days and 720 days of labourers were employed as technical and ministerial staff respectively. Under the 3690 total temporary mandays, 120 mandays and 90 mandays were shared by administrative and technical staff and for the ministerial staff it was observed to be 3480 mandays.

4.10.5. Cost and return structure for *kokum* processing unit

The cost and return structure for *kokum* processing unit along with value addition activities is presented in Table 4.23 and 4.24, respectively.

Table 4.22. Per season average labour utilization by the sample *Kokum* processing units (2005)

(Man days.)

Sl. No.	Particulars	Labour No.		Days employed		Total	
		Male	Female	Male	Female	Labour	Days
I	Permanent	--	--	--	--	--	--
i	Administrative	--	--	--	--	--	--
ii	Technical	1 (20.00)	--	360 (26.67)	--	1 (4.76)	360 (7.55)
iii	Ministerial	1 (20.00)	1 (6.25)	360 (26.67)	360 (10.53)	2 (9.52)	720 (15.09)
	Sub Total	2 (40.00)	1 (6.25)	720 (53.34)	360 (10.53)	3 (14.28)	1080 (22.64)
II	Temporary						
i	Administrative	--	1 (6.25)	--	120 (3.51)	1 (4.76)	120 (2.51)
ii	Technical	1 (20.00)	--	90 (6.67)	--	1 (4.76)	90 (1.87)
iii	Ministerial	2 (40.00)	14 (87.50)	540 (40.00)	2940 (85.96)	16 (76.20)	3480 (72.95)
	Sub Total	3 (60.00)	15 (93.75)	630 (46.66)	3060 (89.47)	18 (85.72)	3690 (77.36)
III	Grand Total	5 (100)	16 (100)	1350 (100)	3420 (100)	21 (100)	4770 (100)
		(23.81)	(76.19)	(28.30)	(71.70)	(100)	(100)

(Figures in the parentheses indicate percentage to the total)

4.3.5.1 Per processing unit cost and return

The per processing unit, item wise costs incurred in the processing of different *kokum* products, total quantities processed and their ex-factory returns were analyzed and results are presented in Table 4.23.

The overall total processing cost per processing unit for the *kokum* processed products was worked out to be Rs.2462843.30. In this, the maximum cost of Rs.1957641.13 was incurred in the processing of *kokum* syrup followed by *kokum agal* (Rs.375617.89), *kokum* rind (Rs.54542.73) and *kokum* RTS (Rs.75031.72). At an overall level in total cost, the share of raw material cost was observed to be the maximum and it accounted for 86.55 per cent (Rs.2139044.80) while, the share of interest on working capital invested in business accounted to 11.29 per cent (Rs.278078.84).

Among the different *kokum* processed products, with respective total processing cost the share of raw material cost and interest on working capital were ranging from 86.97 per cent to 84.87 per cent and 11.31 per cent to 11.03 per cent.

In the total processing cost incurred in *kokum* syrup preparation, the maximum of 45.73 per cent cost was incurred towards additives and preservatives followed by container 19.05 per cent, 13.31 per cent towards the purchase of fruits and raw *agal*, 5.39 per cent towards labour charges, 11.29 per cent towards interest on working capital, 2.43 per cent towards packing material, 0.23 per cent towards depreciation on utensils and interest on fixed capital, 0.09 per cent and 0.08 per cent incurred as depreciation charges on machinery and buildings, respectively.

In the case of *kokum agal*, cost of fruits and raw *agal* was worked out to be maximum (37.28%) followed by plastic containers 17.74 per cent, packing material 13.58 per cent, interest on working capital 11.31 per cent, additives, chemicals and preservatives 11.04 per cent, labour charges 6.95 per cent, interest on fixed capital 1.28 per cent, depreciation on utensils, machinery, building and furniture 0.23 per cent, 0.09 per cent, 0.08 per cent, and 0.04 per cent respectively.

In the case of *kokum* rind preparation 60.84 per cent cost incurred for fruits, followed by labour charges 16.37 per cent and interest on working capital 11.03 per cent, while other cost accounted to very minor share of the total cost. The proportionate share of cost incurred for packing material, additives, other charges, depreciation on building, machinery, furniture, utensil, interest on fixed capital were 0.63 per cent, 6.11 per cent, 0.93 per cent, 0.23 per cent, 0.15 per cent, 0.53 per cent, and 3.02 per cent respectively.

In the case of *kokum* RTS, maximum of 62.96 per cent (Rs.47241.63) of total cost was incurred on purchase of additives, chemical and preservatives, followed by procurement of fruits and half processed raw *agal* (18.59%) and interest on working capital 11.27 per cent. On the other hand, the proportionate share of other costs like labour charges, interest on fixed capital, packing material, depreciation on utensils, machinery, building and furniture accounted to 3.53 per cent, 1.64 per cent, 1.30 per cent, 0.12, 0.15 per cent, 0.11 per cent and 0.03 per cent respectively.

The per processing unit, gross return obtained from the *kokum* syrup was Rs.26,41,076.00, from *kokum agal* Rs.4,86,998.00, from *kokum* rind Rs.1,66,635.00 and from *kokum* RTS Rs.2,00,000.00. Hence, per processing unit the overall total gross return received from different *kokum* processed products in a year was Rs.34,94,709.00. After deducting the total cost from gross return, the net return amounted to Rs.683434.87 in *kokum* syrup, Rs.111380.11 in *kokum agal* unit, Rs.112092.27 in *kokum* rind and Rs.124968.28 in *kokum* RTS. Hence, at the overall level total net return of Rs.1031875.53 was realized by the *kokum* processing unit.

It was observed from the Table 4.23 that, per season quantity processed by *kokum* processing unit was 69907.75 litres of *kokum* syrup, 18704.74 litre of *kokum agal*, 2914.50 kg of *kokum* rind and 50,000 packets of 200 ml capacity of *kokum* RTS. Where as per day quantity processed by *kokum* processing unit in a season was 559.20 litre of *kokum* syrup, 149.64 litre of *kokum agal*, 23.32 kg of *kokum* rind and 333.33 packets of 200 ml capacity of *kokum* RTS.

Table 4.23. Cost and returns for the processing unit

(Rs.)

Sl. no	Particular	<i>Kokum</i> syrup (ltr.)	<i>Kokum</i> <i>agal</i> (ltr.)	<i>Kokum</i> rind (kg.)	<i>Kokum</i> RTS (200ml)	Total
I.	Raw material					
i.	Fruits & raw <i>agal</i>	260607.84 (13.31)	140019.12 (37.28)	33181.58 (60.84)	13947.00 (18.59)	447755.54 (18.19)
ii.	Container	373005.07 (19.05)	66625.52 (17.74)	--	--	439630.59 (17.86)
iii.	Packing material	47597.15 (2.43)	51015.99 (13.58)	343.47 (0.63)	976.66 (1.30)	99933.27 (4.06)
iv.	Additive, chemical & preservatives	895226.60 (45.73)	41456.57 (11.04)	3330.00 (6.11)	47241.63 (62.96)	987254.80 (40.09)
v.	Labour charges	116566.87 (5.95)	26086.84 (6.95)	8926.07 (16.37)	2645.31 (3.53)	154225.09 (6.26)
vi.	Other charges	8036.91 (0.41)	1481.96 (0.39)	507.08 (0.93)	219.78 (0.29)	10245.73 (0.43)
	Sub Total	1701040.44 (86.89)	326686.00 (86.97)	46288.20 (84.87)	65030.38 (86.67)	2139044.80 (86.55)
II.	Depreciation on					
i.	Buildings	1695.34 (0.08)	312.65 (0.08)	106.93 (0.20)	82.08 (0.11)	2197.00 (0.09)
ii.	Machinery & equipments	1789.60 (0.09)	330.03 (0.09)	112.87 (0.21)	112.31 (0.15)	2344.81 (0.09)
iii.	Furniture and office equipments	1265.91 (0.06)	155.64 (0.04)	79.85 (0.15)	25.28 (0.03)	1526.68 (0.06)
iv.	Utensils	4617.19 (0.23)	851.50 (0.23)	291.24 (0.53)	93.62 (0.12)	5853.55 (0.23)
III.	Interest on					
i.	Working capital @ 13%	221135.25 (11.29)	42469.18 (11.31)	6017.46 (11.03)	8453.95 (11.27)	278075.84 (11.29)
ii.	Fixed capital @ 10 %	26097.39 (0.23)	4812.89 (1.28)	1646.17 (3.02)	1234.10 (1.64)	33790.55 (1.37)
IV.	Grand Total cost	1957641.13 (100)	375617.89 (100)	54542.73 (100)	75031.72 (100)	2462833.57 (100)
V.	Gross returns	2641076.00	486998.00	166635.00	200000.00	3494709.00
VI.	Net return	683434.87	111380.11	112092.27	124968.28	1031875.53
VII.	<i>Kokum</i> product processed during season					
i.	Per season	69907.75	18704.74	2914.50	50000.00	--
ii.	Per day	559.26	149.64	23.32	333.33	--

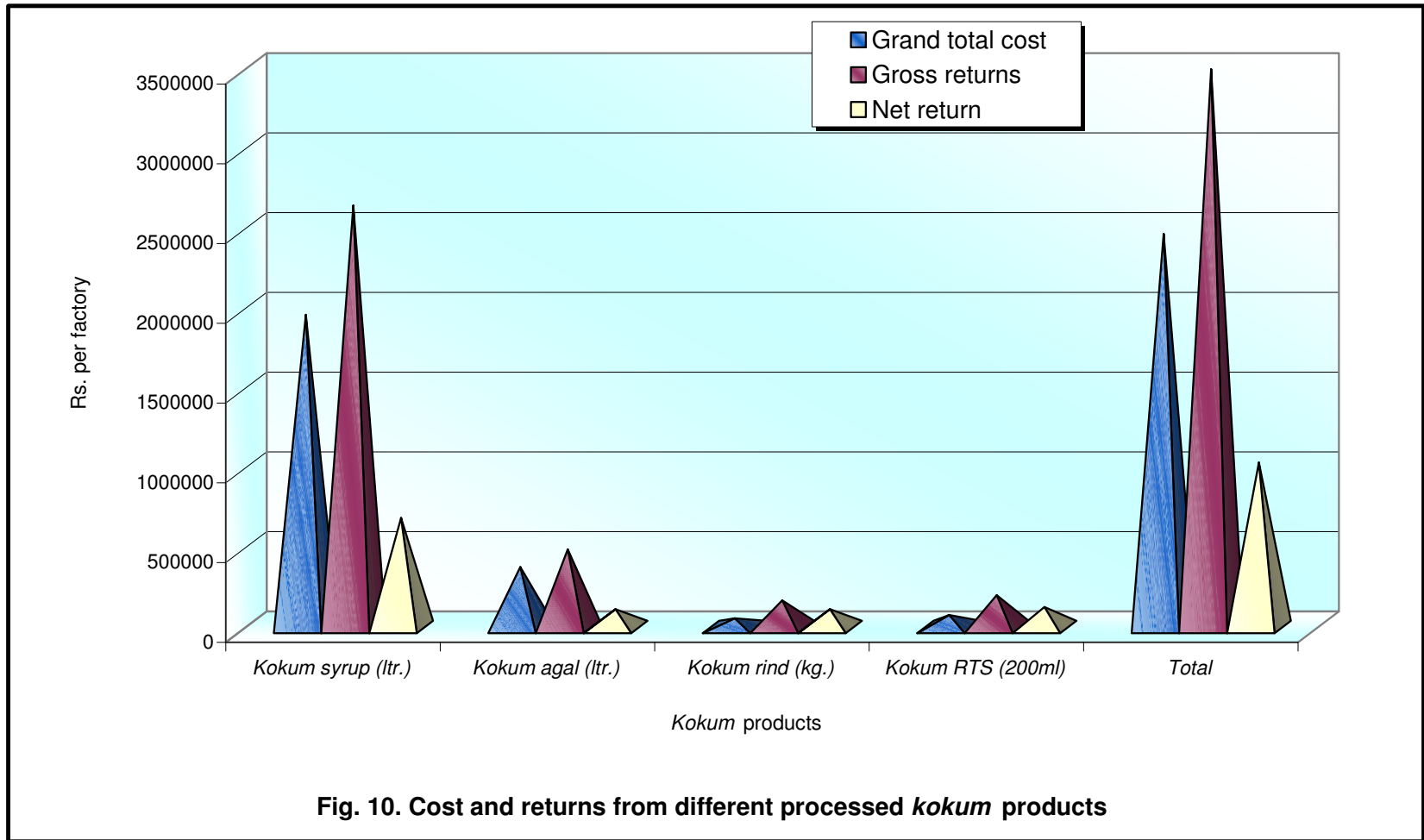


Fig.10. Cost and returns from different kokum products

4.10.5.2 Per unit cost and return for *kokum* product making

Per unit cost incurred and return realized from different *kokum* products were estimated and presented in Table 4.24.

The average total cost of processing of *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS were observed as Rs.29.91 per litre, Rs.20.08 per litre, Rs.18.71 per kg. and Rs.1.50 per 200 ml. pack of *kokum* RTS respectively. On the other hand the ex-factory prices realized for the *kokum* processed products were Rs.37.54 per litre, Rs.26.04 per litre and Rs.38.46 per kg and Rs.4 per 200 ml of packet of *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS respectively. Whereas, net return obtained from the processing *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS was Rs.7.63 per litre, Rs.5.96 per litre, Rs.19.75 per kg and Rs.2.50 per 200ml packet respectively.

The information on value addition to the *kokum* raw fruits/*agal* revealed that a sum of (Table 4.24) Rs.33.81 per litre in case of *kokum* syrup, Rs.18.55 per litre in case of *kokum agal*, Rs.27.00 per kg of *kokum* rind and Rs.3.72 per 200 ml packet of *kokum* RTS were obtained as added values. Hence, per unit the net processing cost after excluding expenditure towards fruits/raw *agal* was found to be Rs.26.18 per litre, Rs.12.59 per litre, Rs.7.33 per kg and Rs.1.22 per 200 ml packed of *kokum* syrup, *agal*, rind and RTS respectively.

4.10.6 Business ratio analysis

The capital efficiency, labour efficiency and profitability in *kokum* processing units were estimated and the results are presented under following subheads.

4.10.6.1 Measurement of capital efficiency

It is being observed from the Table 4.25 that, the rate of capital turn over was 134.91 per cent with *kokum* syrup, 129.65 per cent with *kokum agal*, 305.31 per cent with *kokum* rind making and 266.55 per cent in RTS. Thus, all processing activities put together at overall level the processing unit had attained the capital turnover of 141.89 per cent. Similarly with respect to the return on capital investment it was observed to be the highest in the case of *kokum* rind (216.54%) followed by *kokum* RTS packet (177.82%), *kokum* syrup (46.20%) and *kokum agal* (40.96%) preparation. At an overall level the return on capital investment made in the *kokum* processed products was 53.19 per cent. For different *kokum* processed products the capital per hundred rupee of gross income was worked out and observed as Rs.74.28, Rs.76.96, Rs.37.65, Rs.38.68 and Rs.70.84 for *kokum* syrup, *kokum agal*, *kokum* rind, *kokum* RTS and for overall level respectively. The capital investment per worker at overall level was Rs.1,27,935.61. Further, the per worker requirement of capital investment was observed to be maximum for *kokum* syrup (Rs.99,056.94) processing and minimum for making RTS (Rs.2424.67). The input-output ratio was 1.35 in *kokum* syrup, 1.29 in *kokum agal*, 3.05 in *kokum* rind and 2.66 in *kokum* RTS, where as it was 1.36 at the overall level.

4.10.6.2 Measurement of labour efficiency

Under the existing situation in *kokum* processing unit of the operations like peeling of fruits, filling of can, sun drying, loading and unloading, labeling *etc.* are being done by human labour. In this context to understand how labour was efficiently used in carrying out *kokum* processing work, data was analyzed and presented in Table 4.25.

It is seen from the table that the per worker gross return was observed to be maximum and amounted to Rs.1,25,765.52 in the case of *kokum* syrup and was minimum in the case of *kokum* RTS (Rs.6,267.62). Along with these two processed products the processing unit also generated an amount of Rs.24,695.63 and Rs.8450.00, as per worker gross returns for *kokum agal* and *kokum* rind making respectively. Hence the per worker net return was found to be the lowest and accounted to Rs.323.56 in case of RTS and was the highest in the case of *kokum* syrup (Rs.52895.71). Further, from the point of absolute quantities processed per worker were observed to be 3315.61 litres, 948.51 litres, 117.36 kg and 1566.90 packets of 200 ml of *kokum* syrup, *agal*, rind and RTS packets respectively.

4.10.6.3 Test of Profitability

The profitability of the *kokum* processing unit was analyzed and the results (Table 4.25) on the ratio of net profit to total assets indicated the net profit for each rupee of asset. In

Table 4.24. Per unit Cost and returns for *kokum* processed product in the study area

(Rs.)

Sl. No	Particular	<i>Kokum</i> syrup (/ltr)	<i>Kokum agal</i> (/ltr)	<i>Kokum</i> rind (/kg)	<i>Kokum</i> RTS (200ml packet)
I	Input cost				
i.	Fruits & raw <i>agal</i>	3.73	7.49	11.38	0.28
ii.	Container	5.34	3.56	0.00	0.00
iii.	Packing material	0.68	2.73	0.12	0.02
iv.	Additive,chemical & preservatives	12.81	2.22	1.14	0.94
v.	Labour charges	1.67	1.39	3.06	0.05
vi.	Other charges	0.11	0.08	0.17	0.00
	Sub Total	26.02	17.47	15.88	1.30
II	Depreciation charges				
i.	Buildings	0.02	0.02	0.04	0.00
ii.	Machinery and equipments	0.03	0.02	0.04	0.00
iii.	Furniture and office equipments	0.02	0.01	0.03	0.00
iv.	Utensils	0.07	0.05	0.10	0.00
III	Interest charges				
i.	Working capital @ 13%	3.38	2.27	2.06	0.17
ii.	Fixed capital @ 10 %	0.37	0.26	0.56	0.02
IV.	Total cost (I+II+III)	29.91	20.08	18.71	1.50
V.	Ex-factory price (Gross return)	37.54	26.04	38.46	4.00
VI.	Net Return	7.63	5.96	19.75	2.50
VII.	Added value over raw material	33.81	18.55	27.00	3.72
VIII.	Net cost of processing excluding fruit/ <i>agal</i>	26.18	12.59	7.33	1.22

Table 4.25. Measures of capital efficiency, labour efficiency and test of profitability for *kokum* processing unit (Aggregate level) (2005)

Sl. No.	Measures of efficiency	Kokum products				Overall
		<i>Kokum</i> syrup (ltr.)	<i>Kokum</i> Agal (ltr.)	<i>Kokum</i> Rind (kg.)	<i>Kokum</i> RTS (200ml packet)	
I.	Measures of capital efficiency					
i.	Rate of capital turnover (%)	134.91	129.65	305.31	266.55	141.89
ii.	Returns on capital investment (%)	46.20	40.96	216.54	177.82	53.19
iii.	Capital per hundred rupees of gross income (Rs.)	74.28	76.96	37.65	38.68	70.84
iv.	Capital per worker (Rs.)	99056.94	19006.84	3182.06	2424.67	127935.61
v.	Input: Output ratio	1.35	1.29	3.05	2.66	1.36
II.	Measures of Labour efficiency					
i.	Per worker gross return (Rs.)	125765.52	24695.63	8450.00	6267.62	159301.59
ii.	Per worker Net return (Rs.)	52895.71	6970.94	6136.83	323.56	50210.83
iii.	Quantity processed per worker	3315.61	948.51	117.36	1566.90	4435.44
III.	Test of profitability					
i.	Net profit to total asset ratio	0.28	0.24	1.68	1.51	0.27
ii.	Net profit to owned fund ratio	0.36	0.32	3.22	2.50	0.45
iii.	Net profit to fixed asset	2.21	0.18	6.40	9.47	1.16
iv.	Net profit to sale ratio	0.22	0.19	0.63	0.58	0.22
v.	BCR Ratio	1.35	1.30	3.06	2.66	1.41

this regard, at the overall level the average value of the ratio was 0.27. While the ratios for identified activities indicated the value of 1.68 as maximum in the case of *kokum* rind and 0.24 as a lowest in the case of *kokum agal*. On the other hand, the average value of this ratio for *kokum* RTS was 1.51 and for *kokum* syrup it was 0.28.

The ratio of net profit to owned funds at the overall level was 0.45, and for the *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS activities the ratios were found to be 0.36, 0.32, 3.22 and 2.50 respectively.

The ratio of net profit to fixed assets was the highest (9.47) in the case of *kokum* RTS and was the lowest (0.18) in the case of *kokum agal*, where it was 2.21 and 6.40 in *kokum* syrup and rind making unit.

Ratio of net profit to sale was 0.22 at an overall level, whereas it was the highest (0.63) in rind making and the lowest in (0.19) *agal* making. This ratio of net profit to sales was found to be 0.22 and 0.58 for syrup and RTS activities respectively.

4.10.7 Break even point for different *kokum* processed products

The break even points for various *kokum* products processed were analyzed and presented in Table 4.26. It could be observed from the table that the break even point for *kokum* syrup processing was found to be 22653.93 litres, which was about three times lower than the actual production (69907.75 litres). Similarly for *kokum agal*, the actual production (18704.74 litres) was three times higher than break even point (5596.38 litres). While, in the case of rind the achieved level (2914.50 kg) was two times higher than break even point level (1428.96 kg). Further, the break even point for 200 ml of RTS packets production was found to be 3335.40 units which was fifteen times lower than actual production level (50,000).

4.11 MARKETING PERFORMANCE OF *KOKUM* FRUITS AND *KOKUM* PROCESSED PRODUCTS

The marketing costs incurred by growers and various agencies at different levels in the marketing of *kokum* fruits and processed products were presented under following subheads.

4.11.1 Market cost incurred by sample *kokum* growers

In the marketing of processed product the *kokum* grower incurred considerable expenditure on various items *viz.*, packing, handling, transportation and labour. In this context the per kilogram average marketing cost incurred on fruits and different categories of *kokum* products were given Table 4.27.

In the marketing of *kokum* fruits the *kokum* growers incurred the equal proportion (33.33%) of marketing cost on handling, labour and transportation *i.e.* Rs.0.30/kg.

In the marketing of *kokum* seed the growers had incurred a cost of 40.00 per cent each on handling and transport charges and 20 per cent on labour charges.

Similarly in the case of *lonawala kokum* and *kokum ghul* the expenditure on handling charges was found to be the highest as compared to other items and ranked first in the marketing cost list. It accounted for 42.86 per cent of the total marketing cost followed by labour charges (28.57%). While in *kokum ghul* 14.28 per cent each on packing material and transport charges were incurred as the marketing costs. The transportation cost incurred in the marketing of *lonawala kokum* was accounted to 28.57 per cent of the total marketing cost.

4.11.2 Marketing cost incurred by sample *kokum* processors

The per unit average marketing costs incurred by sample processors towards different *kokum* processed products are furnished in Table 4.28.

The total marketing cost incurred by processors towards *kokum* syrup was observed to be Rs. 1.88/lit. In this total marketing cost, the share of packing material cost was highest (44.15%) and was followed by handling and transport costs (26.60%), insurance charges (13.30%), storage cost (10.64%) and other charges (5.32%). Similar, trend was also observed for *kokum agal*.

Table 4.26 Estimation of break even point of production in *kokum* processing

Sl. No.	Particular	<i>Kokum</i> products			
		<i>Kokum</i> syrup (ltr.)	<i>Kokum agal</i> (ltr.)	<i>Kokum</i> rind (kg.)	<i>Kokum</i> RTS (200ml pouch)
1	Total fixed cost (Rs.)	260973.00	48128.95	16461.69	12341.00
2	Total variable cost (Rs.)	1819222.00	326686.00	46288.20	65030.38
3	Per unit selling price (Rs.)	37.54	26.04	38.46	4.00
4	Per unit variable cost (Rs.)	26.02	17.47	15.88	1.3
5	Actual production (lit/kg/no)	69907.75	18704.74	2914.50	50000.00
6	Break even point (lit/kg/no)	22653.93	5596.38	1428.96	3335.40

Table 4.27 Marketing costs incurred in the sale of *kokum* fruits and half processed products by the sample growers

(Rs./kg.)

Sl. No.	Cost components	Products			
		Fruits	Seed	<i>Lonawala kokum</i>	<i>Kokum ghul</i>
1	Packing material	--	--	--	0.05 (14.28)
2	Handling charges	0.10 (33.33)	0.10 (40.00)	0.15 (42.86)	0.15 (42.86)
3	Labour	0.10 (33.33)	0.05 (20.00)	0.10 (28.57)	0.10 (28.57)
4	Transport charges	0.10 (33.33)	0.10 (40.00)	0.10 (28.57)	0.05 (14.28)
	Total	0.30 (100)	0.25 (100)	0.35 (100)	0.35 (100)

(Figures in the parentheses indicate percentage to the total)

Table 4.28. Average marketing costs incurred towards different processed *kokum* products by sample processors

Sl. No.	Cost items	Products			
		Syrup	<i>Agal</i>	Rind	RTS
		Rs./lit	Rs./lit	Rs./kg	Rs./pack
1	Packing material	0.83 (44.15)	0.83 (44.15)	0.10 (20.00)	0.25 (41.66)
2	Storage	0.20 (10.64)	0.20 (10.64)	0.10 (20.00)	--
3	Handling and Transport	0.50 (26.60)	0.50 (26.60)	0.20 (40.00)	0.10 (16.67)
4	Insurance	0.25 (13.30)	0.25 (13.30)	-	0.10 (16.67)
5	others	0.10 (5.32)	0.10 (5.32)	0.10 (20.00)	0.15 (25.00)
	Total	1.88 (100)	1.88 (100)	0.50 (100)	0.60 (100)

(Figures in the parentheses indicate percentage to the total)

In case of *kokum* rind, expenditure on handling and transport charges was found to be the highest (40.00%). The cost incurred on packing material, storage and other charges, accounted to 20.00 per cent each respectively.

For the *kokum* RTS the total marketing cost was worked out to be Rs.0.60 per 200 ml packet of which, 41.66 per cent and 25.00 per cent of the total marketing costs were incurred towards packing material and other charges respectively.

4.11.3 Marketing cost incurred by market intermediaries towards sale of fruits and half processed product

The per unit product and itemwise cost incurred and returns realized by various intermediaries involved in the marketing of *kokum* fruits and its half processed product are presented in Table 4.29.

It was observed that, *kokum* fruits were marketed only through village traders. Out of the different marketing cost items, the village trader incurred 87.72 per cent of their total marketing cost on the items *viz.*, telephone, electricity and transportation which was observed to be maximum.

In the case of *kokum* seed marketing itinerant merchants had incurred the highest expenditure (73.53%). Among the cost components labour charges was the major item followed by telephone, electricity and transport cost (22.06%). While, the village traders incurred the highest expenditure on telephone/electricity and transport which accounted to 88.24 per cent. The trader involved in *kokum* seed marketing had booked maximum cost on the items such as labour charges and interest on working capital, whose share in the total marketing cost was worked out to be 39.22 per cent and 19.61 per cent respectively. Further, 19.61 per cent of the total marketing cost was incurred on items like telephone, electricity and

transport charges. The other cost items incurred by the trader include salary (9.80%) other charges (9.80%) and license fee (0.98%).

In the case of *Lonawala kokum* marketing, in the total marketing cost, 71.43 per cent cost was incurred on labour charges by itinerant merchant. While, 79.50 per cent of total marketing cost was incurred towards salary payments by the village trader. In the case of traders 46.64 per cent of total marketing cost was incurred towards labour charges followed by 37.32 per cent towards telephone/ electricity /transport charges, 6.34 per cent towards interest on working capital, 5.60 per cent on salary payment and 3.73 per cent on other expenses.

In the case of *kokum ghul* marketing, it was observed that, itinerant merchant was not involved in this trading activity. It was also observed that the total marketing cost incurred a maximum share went on making payment towards labour charges by the market intermediaries viz., village traders and traders, which accounted to 58.31 per cent and 55.28 per cent for *kokum ghul*, respectively.

4.11.4 Marketing cost incurred by intermediaries towards sale of processed *kokum* product

In the study area, the processed *kokum* products sales was handled by two types of market intermediaries viz., dealer and retailer. Thus the product and item wise cost incurred by the market intermediaries were analyzed and results are depicted in Table 4.30.

It was observed from the table that, dealer was not engaged in the marketing of *kokum* syrup and RTS. These two products were directly marketed through retailer in the study area. The marketing cost structure for retailer indicated that, in the total marketing cost the expenditure on staff salary was found to be 32.92 per cent followed by telephone/ electricity/transport charges (28.81%), interest on working capital (24.69%) and other expenses (12.35%). The cost incurred on the items like license and labour charges were observed to be minimum and the corresponding share in total marketing cost was only 0.62 per cent.

As far as the total marketing cost of *agal* for the dealer was concerned it worked out to Rs. 0.10 per litre. Out of this 32.11 per cent of the cost was incurred as interest on working capital and 27.52 per cent expenses incurred towards salary. On the other hand, out of total marketing cost of retailer in *kokum agal*, the major cost was incurred on the payment of telephone/electricity /transport charges (28.10%) followed by payment of salary 26.45 per cent and 19.83 per cent each were incurred on the interest on working capital and other costs.

In the *kokum* rind marketing, out of total cost incurred by dealer, substantial amount of cost was incurred towards the payment of interest on working capital and salary of the employees (40% each), whereas for the retailer it was found to be 33.80 per cent on salary, 29.82 per cent towards payment of telephone/ electricity /transport charges and 23.86 per cent as interest on working capital.

In the case of RTS it was marketed only through the retailer and the total marketing cost for retailer worked out to be Rs.0.423 per 200 ml packet of RTS. In this total marketing cost, the share of cost incurred on the telephone/electricity/transport charges was observed to be maximum (33.10%). The costs incurred on other charges, interest on working capital and salary were also observed to be important item of the total marketing cost and their share were observed to be 30.73 per cent, 23.64 per cent and 11.82 per cent respectively. The labour charges incurred on this activity as marketing cost by the retailer was worked out to be only 0.71 per cent.

4.11.2 Price spread for *kokum* fruits and processed products marketing

The price spread is one of the tool used to measure the marketing efficiency. Hence, the price spread in the identified marketing channels, which would reveal the share of producers in the price paid by the market functionaries in the study area was analyzed. For this purpose following marketing channels for growers and processors were identified.

Table 4.29. Marketing cost incurred towards *kokum* fruit and different half processed products by the market intermediaries

(Rs./kg.)

Sl. No.	Cost item	<i>Kokum Fruits</i>	<i>Kokum seed</i>			<i>Lonawala kokum</i>			<i>Kokum Ghul</i>	
		Village Trader	Itine rant	Village Trader	Trader	Itine rant	Village Trader	Trader	Village Trader	Trader
1	Labour	0.050 (8.77)	0.500 (73.53)	0.002 (1.18)	0.040 (39.22)	0.25 (71.43)	0.020 (8.37)	0.250 (46.64)	0.200 (58.31)	0.220 (55.28)
2	License	--	--	0.001 (0.59)	0.001 (0.98)	--	0.001 (0.42)	0.001 (0.19)	0.001 (0.29)	0.001 (0.25)
3	Storage	--	0.010 (1.47)	0.001 (0.59)	0.001 (0.98)	--	0.001 (0.42)	0.001 (0.19)	0.001 (0.29)	0.001 (0.25)
4	Interest on working capital	0.010 (1.75)	0.010 (1.47)	0.001 (0.59)	0.020 (19.61)	0.010 (2.86)	0.015 (6.28)	0.034 (6.34)	0.016 (4.66)	0.003 (0.75)
5	Telephone/ Electricity/Transport	0.500 (87.72)	0.150 (22.06)	0.150 (88.24)	0.020 (19.61)	0.080 (22.86)	0.007 (2.93)	0.200 (37.31)	0.100 (29.15)	0.150 (37.69)
6	Salary	--	--	0.010 (5.88)	0.010 (9.80)	--	0.190 (79.50)	0.030 (5.60)	0.020 (5.83)	0.003 (0.75)
7	Others	0.010 (1.75)	0.010 (1.47)	0.005 (2.94)	0.010 (9.80)	0.010 (2.86)	0.005 (2.09)	0.020 (3.73)	0.005 (1.46)	0.020 (5.03)
	Total	0.570 (100)	0.680 (100)	0.170 (100)	0.100 (100)	0.350 (100)	0.230 (100)	0.530 (100)	0.340 (100)	0.390 (100)

(Figures in the parentheses indicate percentage to the total)

Table 4.30. Marketing cost incurred by intermediaries towards sale of *kokum* products (Processed)

(Rs./kg/lit./packet)

Sl. No.	Cost item	Syrup	<i>Agal</i>		Rind		RTS
		Retailer	Dealer	Retailer	Dealer	Retailer	Retailer
1	Labour	0.003 (0.62)	0.001 (0.92)	0.005 (0.83)	0.001 (1.33)	0.003 (0.60)	0.003 (0.71)
2	Rent	--	0.002 (1.83)	0.030 (4.96)	0.003 (4.00)	--	--
3	License	0.003 (0.62)	0.003 (2.75)	--	0.003 (4.00)	--	--
5	Interest on working capital	0.120 (24.69)	0.035 (32.11)	0.120 (19.83)	0.030 (40.00)	0.120 (23.86)	0.100 (23.64)
6	Telephone/ Electricity/Transport	0.140 (28.81)	0.008 (7.34)	0.170 (28.10)	0.008 (10.67)	0.150 (29.82)	0.140 (33.10)
7	Salary	0.160 (32.92)	0.03 (27.52)	0.160 (26.45)	0.030 (40.00)	0.170 (33.80)	0.050 (11.82)
8	Other	0.060 (12.35)	0.030 (27.52)	0.120 (19.83)	--	0.060 (11.93)	0.130 (30.73)
	Total	0.480 (100)	0.109 (100)	0.605 (100)	0.075 (100)	0.503 (100)	0.423 (100)

(Figures in the parentheses indicate percentage to the total)

A. Channels for growers

Channel-I: Grower – Trader – Processor

Channel-II: Growers – Itinerant merchant– Trader – processors

Channel-III: Growers – Village trader – Processor

B. Channels for processor

Channel-I: Processor – Retailer – Consumers

Channel-II: Processor – Dealer - Retailer - Consumers

4.11.1 Price spread in marketing of *kokum* fruits and half processed product

The sample farmers in the study area resorted to different marketing channels for the sale of *kokum* fruits, seed, *lonawala kokum* and *kokum ghul*. For these channels the average price spreads were analyzed and results (Table 4.31) are presented in following subheads.

Kokum fruits

To market the *kokum* fruits, the sample *kokum* growers had resorted to channel - III in which village trader involved as market intermediary to sell *kokum* fruits to the processors. In channel - III the growers had realized Rs.4.45 as net price per kilogram of *kokum* fruits which brought 59.33 per cent as his share in the processor's rupee. Thus the remaining 40.67 per cent was shared by the village trader who had facilitated *kokum* fruit marketing under this channel.

Kokum seed

After peeling out of fruits' rind, the remained *kokum* seeds were sold to the processor with the involvement of the trader as market intermediaries (Channel-I). In this channel the grower had realized net price of Rs.26.75 per kilogram and retained 71.58 per cent as his share in the processor's rupee. Further, the trader as a market functionary had received Rs. 10.27 per kg as profit margin.

On the other hand, in channel-II and channel-III the *kokum* fruit growers had marketed the seeds through itinerant merchant to the trader then to the processor, and to village trader then to processor respectively. As a result of this the grower could retain only 15.92 per cent and 49.88 per cent as share in processor's rupee in the respective channels which were relatively less as compared to the channel-I. Thus, the marketing margins worked to be Rs.31.42 per kg and Rs.17.54 per kg of *kokum* seeds under channel-II and channel-III, respectively.

Half processed *kokum* products

Under this category the *kokum* fruit will be used to process half processed *kokum* products viz., *lonawala kokum* and *kokum ghul*. The marketing channels followed to sell half processed *kokum* products by the growers are presented as below.

Lonawala kokum

It is observed from the Table 4.31 that the growers had realized a maximum net price of Rs.16.55 followed by Rs.10.65 and Rs.8.65 from per kg of *lonawala kokum* when marketed in channel-I, channel-III and channel-II respectively. As a result of this the producer's share in the processor's rupee was observed to be maximum (66.69%) in channel I followed by channel-III (46.30%) and in channel-II (34.60%). For this *kokum* half processed product the total market margin was worked out to Rs.8.35 in channel-I, Rs.16.35 in channel-II and Rs.12.35 in channel-III. Thus the highest market margin was observed in channel-II.

Kokum ghul

The channel-I and channel-III were generally followed by sample growers to sell their *kokum ghul* (Table 4.31) and it was observed that the growers had received Rs.4.70 and Rs.4.20 per kg of *kokum ghul* sold through channel-I and channel-II respectively. Hence, the producer's share in processor's rupee was maximum in channel-I (78.33%) as compared to channel-III (70.00%). It was also observed that, no grower in the study area followed channel-II to sell *kokum ghul*.

Table 4.31. Producers share in consumer rupee in *Kokum* fruit/product marketing

(Rs./kg.)

Sl. No	Particular	<i>Kokum</i> Fruit	<i>Kokum</i> seed			<i>Lonawala Kokum</i>			<i>Kokum Ghul</i>	
		Channel -III	Channel- I	Channel -II	Channel-III	Channel- I	Channel-II	Channel-III	Channel- I	Channel-III
I	Net price received by producer	4.45	26.75	5.95	17.46	16.65	8.65	10.65	4.70	4.20
1	Cost incurred by producer	0.30	0.25	0.25	0.25	0.35	0.35	0.35	0.30	0.30
2	Purchase price of Itinerant	--	--	6.20	--	--	9.00	--	--	--
3	Cost incurred by Itinerant	--	--	0.68	--	--	0.35	--	--	--
4	Profit margin of Itinerant	--	--	20.63	--	--	7.65	--	--	--
5	Purchase price of Village trader	4.75	--	--	17.71	--	--	11.00	--	4.50
6	Cost incurred by Village trader	0.57	--	--	0.17	--	--	0.23	--	0.34
7	Profit margin of Village trader	2.18	--	--	17.71	--	--	11.77	--	1.16
8	Purchase price of Trader	--	27.00	27.00	--	17.00	17.00	--	5.00	--
9	Cost incurred by Trader	--	0.10	0.10	--	0.53	0.53	--	0.31	--
10	Profit margin of Trader	--	10.27	10.27	--	7.47	7.47	--	0.69	--
11	Processor/consumer purchase price	7.50	37.37	37.37	35.00	25.00	25.00	23.00	6.00	6.00
II	Total marketing margin	3.05	10.26	31.42	17.54	8.35	16.35	12.35	1.30	1.80
III	Producer share in processors rupee (%)	59.33	71.58	15.92	49.88	66.60	34.60	46.30	78.33	70.00

4.11.2 Price spread for processed *kokum* product

The sample processors in the study area, marketed their processed *kokum* products viz., *kokum* syrup, *kokum agal*, *kokum* rind and RTS through different channels. For these different channels the average price spread were analyzed and presented in Table 4.32.

Kokum syrup

It was observed from Table 4.32 that to market the *kokum* syrup processors have resorted to channel-I in which retailer involved as market intermediary in the sale of *kokum* syrup to consumer. In channel I the processor had realized Rs.43.12 as net price per litre of *kokum* syrup and the consumers share of 75.64 per cent was realized as share and remaining 24.36 per cent was retained by retailer who had earned net profit of Rs.11.52 per litre of *kokum* syrup in the channel.

Kokum agal

The channel-I and channel-II were generally followed by sample processor to sell the *kokum agal* in the study area.

It was observed that the processors had realized a maximum of Rs.32.12 as net price per litre of *kokum agal* in both channel-I and channel-II. The processor's share in consumer's rupee was 73.60 per cent and 70.46 per cent in channel-I and channel II respectively and hence market margin was the highest in channel-II (Rs.13.88 per litre) as compared to the channel-I (Rs.11.88 per litre).

Kokum rind

It is observed that the processors had realized maximum net price of Rs.30.66 followed by Rs.23.15 per kg of *kokum* rind when marketed through channel-I and channel-II, respectively. Hence, processor's share in consumer's rupee was observed to be maximum (61.32%) in channel-I followed by channel-II (42.09%). For this *kokum* rind, market margin was worked out to be Rs.19.34 per kg. in channel-I and Rs.31.85 per kg in channel-II, thus the highest market margin was observed in channel-II.

Kokum RTS

It was observed that, to market *kokum* RTS processor had restricted to only channel-I in which retailer was involved as market intermediary to sell the *kokum* RTS to consumer. In channel I the processor had realized Rs.3.40 as net price per packet of 200 ml RTS and 68.00 per cent of consumer's rupee was received as share and remaining 32.00 per cent was retained with retailer who had earned a net profit of Rs.0.58 per packet of 200 ml RTS in the channel.

4.12 EXPORT PERFORMANCE OF *KOKUM*

Under existing scenario, the *kokum* products are being marketed in the domestic as well as in the international market. Hence, to understand the export performance of Indian *kokum*, the growth and variability in *kokum* export was analyzed and results are presented under the following sub-titles.

4.12.1 The growth rate of Indian *kokum* products export

The compound growth rates for the export of processed *kokum* products are given in Table 4.33. The compound growth rates with respect to quantity and value of *kokum* products exported from India were observed to be negative. Further, it was also observed that, in terms of quantity and value, the growth rates were negative and non-significant for all major *kokum* products importing countries. But the other importing countries showed positive and non-significant growth rates for quantity (1.08%) and value (0.36%). The countrywise import of processed *kokum* products over a period of time from India to U.S.A., U.K., U.A.E., Australia and Oman had decreased at the rate of 0.80, 0.58, 0.38, 0.89 and 0.54 per cent respectively. As a result of this the total exports of processed *kokum* products from India had declined by 0.07 per cent. Similarly the country-wise import value of processed *kokum* products revealed the negative path of growth. The corresponding growth rates of value were -0.75 per cent, -0.48 per cent, -0.03 per cent, -0.27 per cent and -0.81 per cent for U.S.A., U.K., U.A.E., Australia and Oman respectively. Though the growth rate for overall total export of *kokum*

Table 4.32. Producers share in consumer rupee in *Kokum* processed product marketing

(Rs./lit./kg./packet)

Sl. No.	Particular	<i>Kokum Syrup</i>	<i>Kokum Agal</i>		<i>Kokum Rind</i>		<i>Kokum RTS</i>
		Rs./lit	Rs./lit		Rs./kg.		Rs./packet
		Channel- I	Channel- I	Channel -II	Channel- I	Channel -II	Channel- I
I	Net price received by producer	43.12	33.12	33.12	30.66	23.15	3.70
1	Cost incurred by producer	1.88	1.88	1.88	0.50	0.50	0.30
2	Purchase price of Dealer	--	--	35.00	--	23.65	--
3	Cost incurred by Dealer	--	--	0.10	--	0.07	--
4	Profit margin of Dealer	--	--	1.90	--	9.63	--
5	Purchase price of Retailer	45.00	35.00	37.00	31.16	33.35	4.00
6	Cost incurred by Retailer	0.48	0.60	0.60	0.49	0.49	0.42
7	Profit margin of Retailer	11.52	9.40	9.40	18.35	21.16	0.58
8	consumer purchase price	57.00	45.00	47.00	50.00	55.00	5.00
II	Total marketing margin	13.88	11.88	13.88	19.34	31.85	1.60
III	Producer share in consumer rupee (%)	75.64	73.60	70.46	61.32	42.09	68.00

Table 4.33 Compound growth rates and instability of export of processed *kokum* products (quantity & value) during 1993-2003

(in per cent)

Sl. No.	Country	Quantity		Value	
		Compound Growth Rate	Coefficient of variation (%)	Compound Growth Rate	Coefficient of variation (%)
1	U.S.A.	-0.80	166.37	-0.75	209.10
2	U.K	-0.58	181.07	-0.48	194.98
3	U.A.E	-0.38	66.57	-0.03	124.95
4	Australia	-0.89	75.20	-0.27	181.18
5	Oman	-0.54	77.58	-0.81	75.14
6	Others	1.08	107.88	0.36	135.57
7	Total	-0.07	59.16	0.52	98.03

processed products observed negative (-0.07%) and the corresponding growth rate for value was observed to be positive (0.52%) they were not-significant.

4.12.2 Instability analysis on export of *kokum* products

In order to study the variability in the export of processed *kokum* products an attempt was made to analyze the instability by calculating the co-efficient of variation and results are presented in Table 4.33. It was observed that, from India, the export of *kokum* product in term of quantity and value were relatively unstable with respect to major importing countries. The instability in *kokum* export was varied between 166.37 to 66.57 per cent within the major *kokum* product importing countries. The instability in the export value for *kokum* products was the highest in U.S.A. (209.10%) and it was the lowest in Oman (75.14%) and in term of quantity the CV was observed to be highest in UK and lowest in UAE (66.57%).

4.12.3 Trend in *kokum* export

The trend in *kokum* export over a period of time was studied by using Orthogonal Polynomial Regression Analysis and results are indicated in Fig. 11. It could be seen from the figure that the change in export of *kokum* quantity and value varied over a period of time. In the case of quantity exported, upward and downward swing were observed during study period. Up to 1995-96 downward swing was observed (106.7 tonnes to 18.30 tonnes). Then the increasing trend was observed during 1996-97 to 1998-99 (53.8 tonnes to 102.84 tonnes). Thereafter, export of *kokum* decreased and reached to a minimum during 2001-02 (22.17 tonnes). In 2002-03 increasing trend was noticed (108.74 tonnes). Similarly high fluctuation was noticed in export value during the study period. It is observed from the figure that, in terms of export value the increasing trend was noticed over a period from 1993-94 to 2002-03.

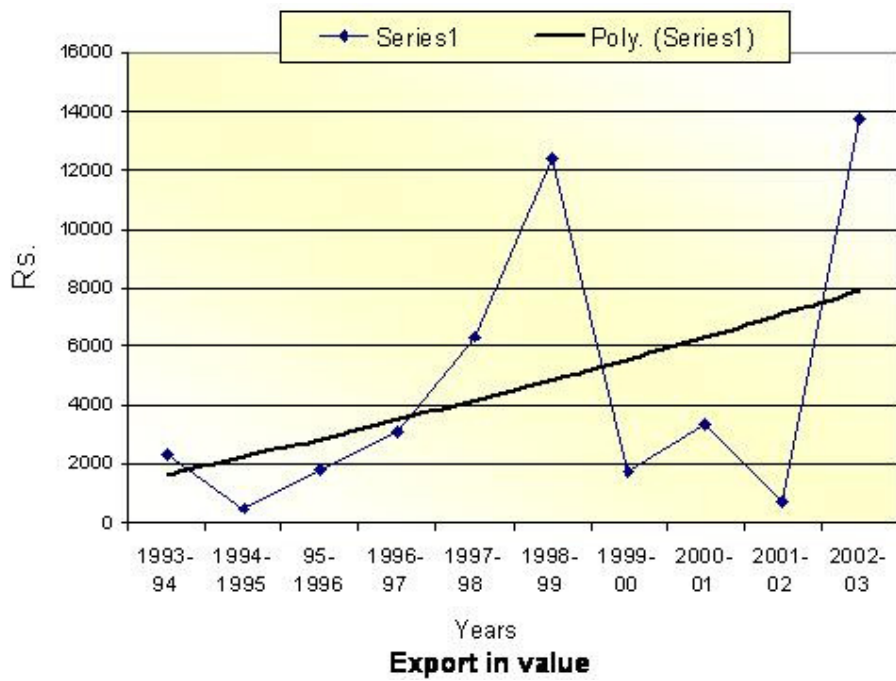
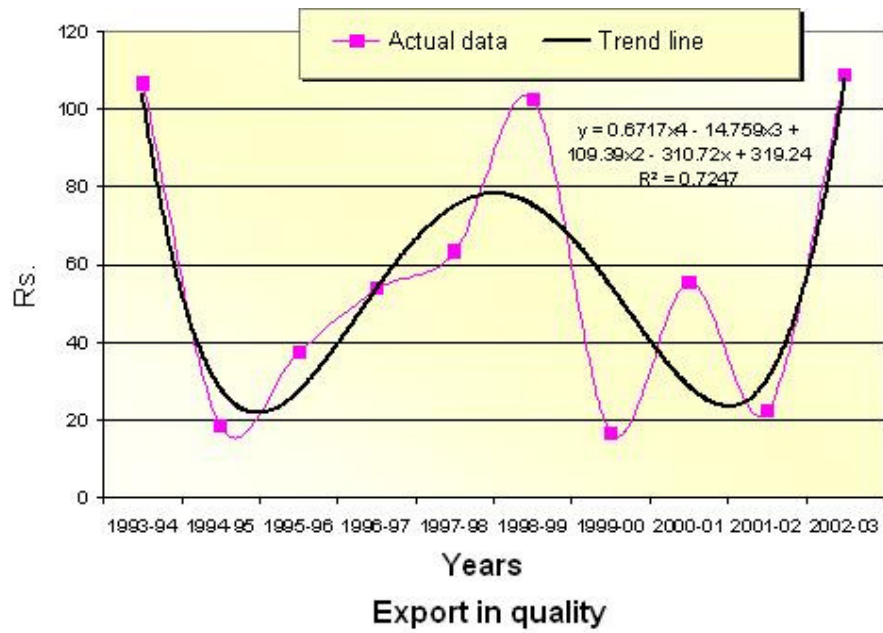


Fig.11. Trend in quality and value of kokum export from India

Table 4.34. *Kokum* growers production processing and marketing constraints

(percentage)

Sl. No.	Constraints	Sindhudurg	Ratnagiri	Overall
I.	Constraints in <i>Kokum</i> production			
1	Late bearing	66.67	44.44	55.56
2	Irrigation	13.33	20.00	16.67
3	Stray cattle	17.78	26.67	22.22
4	Labour shortage	73.33	48.89	61.11
5	Fruit wastage	44.44	24.44	34.44
6	Non availability of graft	13.33	11.11	12.22
7	Higher mortality of graft	11.11	17.78	14.44
8	Transport	--	4.44	2.22
9	No technical guidance	--	13.33	6.67
10	Fruit drying	2.22	0.00	1.11
11	Laborious processing procedure	44.44	2.22	23.33
II.	Constraints in <i>Kokum</i> marketing			
1	Less demand for fruit	55.56	22.22	38.89
2	Lower prices	75.56	35.56	55.56
3	No standard grades	17.78	4.44	11.11
4	Malpractices	4.44	6.67	5.56

4.13 CONSTRAINTS IN PRODUCTION, PROCESSING AND MARKETING OF *KOKUM*

The constraints encountered in the production, processing and marketing of *kokum* in the study area were studied and presented under the following subheads.

4.13.1 Production constraints

The information on the major constraints experienced in the production of *kokum* by the growers in the study area are presented in Table 4.34. It was observed that, majority of the *kokum* growers (61.11%) from both the districts expressed labour shortage as major constraint. In Sindhudurg and Ratnagiri district about 73.33 per cent and 48.89 per cent of the growers expressed the constraints of labour shortage. The other constraints experienced in *kokum* production at overall level were late bearing (55.56%), wastage of fruits (34.44%), laborious processing procedure (23.33%), problem of stray cattle (22.22%), irrigation (16.67%), higher mortality of grafts (14.44%), non availability of *kokum* grafts (12.12%), lack of technical guidance (6.67%), transport (2.22%) and drying of fruits (1.11%).

In the case of fruits marketing, growers from Sindhudurg and Ratnagiri district expressed low prices for the *kokum* fruits and half processed products as major constraint. At an overall level lower prices (55.56%), less demand for fruits (38.89%), no specific standard grades for *kokum* fruits and processed products (11.11%) and malpractices in market (5.56%) were expressed as major marketing constraints by the sample growers.

4.13.2 Processing constraints

The major constraints experienced in the processing of *kokum* in the study area are presented in table 4.35. It was observed that, irregular supply of electricity and water were the major constraints as expressed by 90.00 per cent of the sample processors. The other important constraints experienced in *kokum* processing were no incentive from Government (80.00%) followed by high taxes and duties and poor infrastructure like road (75.00% each), high marketing expenses (70.00%), shortage of labour during peak period of processing (65.00%) shortage of fruits and late bearing (60.00%) and fluctuating demand for products (35.00%).

4.13.3 Constraints of market intermediaries

The major constraint expressed by market intermediaries *viz.*, retailer, itinerant, village trader and traders in the study are presented in Table 4.36. The major constraints expressed by the retailer for *kokum* product marketing were high transportation cost (80.00%), followed by non-availability of packing material (66.67%), price fluctuation (63.33%) and improper market information (48.33%). However, in the case of itinerant, it was observed that the price fluctuation was the major constraint as expressed by 93.33 per cent of the respondents and followed by improper market information (90.00%), higher transport cost (83.33%), non-availability of packing material and delay in payment of sale proceeds (6.67% each).

The major constraint indicated by the village trader in *kokum* product marketing was delay in payment of sale proceeds (94.12%). While the other constraints experienced by village traders were price fluctuation (88.24%), improper market information (73.53%), high transport cost (44.12%) and non availability of packing material (35.29%). Whereas, traders in the study area expressed price fluctuation (95.45%) was the major constraints for them. However, the other important constraints experienced by the traders were higher transportation cost (90.91%) followed by delay in payment of sale proceeds (63.64%), improper market information (9.09%) and non-availability of packing material (4.55%).

Table 4.35 Processing constraints experienced by processors

Sl. No.	Particulars	Factories (N-20)
1	Irregular supply of electricity, water etc	18 (90.00)
2	NO incentives from Government	16 (80.00)
3	Taxes and duties are high	15 (75.00)
4	Poor infrastructure like road	15 (75.00)
5	Marketing expenses are high	14 (70.00)
6	Shortage of labour during peak period of processing	13 (65.00)
7	Shortage of fruits and late bearing	12 (60.00)
8	Inadequate transport facility	9 (45.00)
9	Demand is fluctuating	7 (35.00)

Figures in the parenthesis indicate percentage to total

Table 4.36. Marketing constraints expressed by market intermediaries

Sl. No.	Problem	Intermediaries			
		Retailer (N=60)	Itinerant (N=30)	Village trader (N=34)	Trader (N=22)
1	Non availability of packing material	40 (66.67)	2 (6.67)	12 (35.290)	1 (4.55)
2	Higher transportation cost	48 (80.00)	25 (83.33)	15 (44.12)	20 (90.91)
3	Price fluctuations	38 (63.33)	28 (93.33)	30 (88.24)	21 (95.45)
4	Improper market information	29 (48.33)	27 (90.00)	25 (73.53)	2 (9.09)
5	Delay in payment of sale proceeds	5 (8.33)	2 (6.67)	32 (94.12)	14 (63.64)

Figures in the parenthesis indicate percentage to total

5. DISCUSSION

The results of the investigation presented in previous chapter are discussed in the present chapter keeping the objectives of the study in view under the following heads.

- 5.1 Growth rate and instability in area, production and productivity of *kokum*
- 5.2 Demographic and socio-economic features
- 5.3 Cropping pattern of sample *kokum* growers
- 5.4 Per hectare establishment, maintenance cost and returns from *kokum*
- 5.5 Cost and return from *kokum* cultivation
- 5.6 Economic evaluation of investment in *kokum* orchard
- 5.7 Resource use efficiency in *kokum* cultivation
- 5.8 Production disposal pattern and marketing of *kokum* fruits
- 5.9 Processing performance in *kokum*
- 5.10 Marketing performance of *kokum* fruits and *kokum* processed products
- 5.11 Export performance of *kokum*
- 5.12 Constraints in production, processing and marketing of *kokum*

5.1 GROWTH RATE AND INSTABILITY IN AREA, PRODUCTION AND PRODUCTIVITY OF *KOKUM*

Kokum being prime spice crop of Konkan region play an important role in generating employment opportunities in rural hinter land since, processing is pre-requisite for creating utility to *kokum* products usage in day to day life.

5.1.1 Growth rate for area, production and productivity of *kokum*

The growth rate for *kokum* area, production and productivity for Sindhudurg and Ratnagiri district of Konkan region under the period 1990 to 2004 has been furnished in Table 4.1 revealed that in general, a significant growth in area (0.74 and 3.40%) and production (0.53 and 3.71%) of *kokum* was observed during the study period both in Sindhudurg and Ratnagiri district. In case of the districts each had 0.04 per cent positive productivity growth but non- significant, this clearly indicated that due to area expansion production has increased. The effect of productivity and demand for *kokum* and *kokum* based products had very negligible effect on production. However, the *kokum* producers in long term can be benefited due to the better price realization by the growers for *kokum* fruits, existence of higher employment opportunities due to the processing, providing raw material for processing of diverse *kokum* products and some of the *kokum* derivatives are being preferred in the domestic and international markets. Pawar (1996) also found similar observations. In addition to realizing the importance of *kokum* fruit as raw material, the Government of Maharashtra continued to include *kokum* crop under employment guarantee scheme since 1994. From this period onwards the scheme had restricted the growers in the traditional areas viz., Sindhudurg and Ratnagiri district to take up *kokum* cultivation in systematic way. Though the growth in productivity was positive it was observed to be non-significant due to the existence of young age *kokum* plantations where average age was observed to be less than 10 years.

5.1.2 Instability analysis in area, production and productivity of *kokum*

Inherently agriculture is unstable in the country. Therefore *kokum* is not an exceptional case; in spite of this, *kokum* productivity was observed to be relatively stable in the study area due to the systematic approach followed right from planting of good quality grafts produced from the identified plus trees to the development of *kokum* orchards with the implementation of critical interventions contributing directly to the *kokum* productivity levels. The instability in *kokum* area and production in Ratnagiri and Sindhudurg districts were 81.90 per cent, 83.75 per cent and 53.57 per cent and 49.26 per cent respectively. While the productivity was more or less stable around 16 per cent. The reason behind was that the

kokum growers have not paid due attention to this crop on commercial scale. Further, the instability was higher in Ratnagiri district than in Sindhudurg district and it was mainly due to more scattered plantation spread over a large uneven topography. (Karnik; 2001).

5.2 DEMOGRAPHIC AND SOCIO-ECONOMIC FEATURES

5.2.1 Socio-economic characteristics of *kokum* growers

The social characteristic of the sample *kokum* growers in the study area presented in Table 4.2. depicted that, majority of farmers belonged to middle age group in both Sindhudurg and Ratnagiri district. A large population of sample growers had education up to secondary level in both the district, which indicated that the growers were fairly capable of absorbing the technical knowledge pertaining to the *kokum* cultivation. The average family size of the growers was observed as medium type, this had influenced the growers to take suitable decision to combine the crop enterprises along with *kokum* which was less labour intensive and more processing intensive by which more employment opportunities were created at farm level for all farming members. However, agriculture had remained the main occupation for these growers. Further, growers in the vicinity of township like Kudal, Ratnagiri, Chiplun, and Vengurle stated service and dairy as their main occupations, while in the case of rural setting these were turned to be artisan and agricultural labour. Thus the sample growers were predominantly agrarian in character and having receptive capacity for the adoption of the new technology for better production of *kokum* fruits with processing activities in suitable for achieving vertical integration (Pawar, 2005).

5.2.2 Operational land holding of sample growers

The size of holding was higher for the Ratnagiri district (Table 4.3) and was considerably greater than the overall level because those growers in the district had sufficient land holding capacity which would have facilitated them to go for *kokum* and other horticultural crop cultivation. In both the districts higher proportion of unirrigated area in the total holding was observed and very small proportion of irrigated land was possessed by the *kokum* growers. Thus under the given crop production situations, in the study area an opportunity was made use by the *kokum* growers to include diverse seasonal field crops and perennial horticultural crops together under irrigated and unirrigated situations.

5.2.3 Land use pattern of sample growers

The analysis of average land use pattern of sample *kokum* growers (Table 4.4) revealed that 79.13 per cent of total land belonged to cultivated land while, 1.48 per cent and 13.54 per cent were of non-agriculture and temporary fallow. Further, it revealed that the proportion of fallow land was higher in Ratnagiri district as compared to Sindhudurg district, with the existence of these comparative advantages in the respective districts the sample *kokum* growers planned to allocate the owned fallow land for the cultivation of horticultural *kokum* plants in particular. On the other hand the small quantity of leased in land in both districts was used to grow crops other than horticultural crops.

5.2.4 Average value of different assets of *kokum* growers

The maximum share of the total assets was invested on land and then construction of residential building by the *kokum* growers (Table 4.5) in both Sindhudurg and Ratnagiri districts and the minimum share of total assets were invested in livestock, machinery and implements. The Konkan region itself received very high rainfall and dominated by uneven topography and the farmers were having well built residential houses. The holdings of farmers are dominated by large proportion of plantation crops grown and the investment towards irrigation structure, machinery is negligible. Therefore whatever investment observed in livestock, machineries and implements showed lower proportion. Amongst seasonal crops, rice and nagali had more share, which need less investment in specific assets.

5.3 CROPPING PATTERN OF SAMPLE *KOKUM* GROWER

Table 4.6 revealed that the proportion of area under horticultural and plantation crops dominated the cropping pattern of *kokum* growers in both Sindhudurg and Ratnagiri districts. This is because of the fact that agro climatic and land terrain conditions in Konkan region are congenial for the cultivation of horticultural crops like mango, cashew, coconut, *kokum* etc.

(Talathi *et al.* 2001). However seasonal field crops in the study area had not been entirely displaced because domestic family consumption of staple food crop encourages the *kokum* grower for cultivating it to some extent. Hence, paddy and vegetables dominated the field crops. As a result of this, in the study area *Kharif* paddy and *kharif* vegetable are cultivated as inter crop in perennial, ensuring the food and income security to the *kokum* growers, since, a perennial crop takes minimum five years to generate income from the year of establishment. The cropping intensity in Ratnagiri district was quite less (104.00%) as compared to Sindhudurg district (131.38%) because in the Sindhudurg district, mainly irrigated crops are grown in horticulture plantation as intercrops and hence cropping intensity is on higher side. Thus the total cultivated area utilization by the *kokum* growers in Ratnagiri district was observed to be relatively less. The main reason for the restrictive use of land in Ratnagiri district could be attributed to the reasons *viz.*, sloppy terrain of land and climatic features which are forcing the *kokum* growers to cultivate the *kharif* paddy on terrain land. In addition to this, non-availability of labour and irrigation facilities during the critical stage of crop production acts like constraints in land utilization under this situation. On the other hand, in spite of land terrain problems the cropping intensity in Sindhudurg district was significantly higher (131.38%). This could be attributed to the availability of irrigation facilities for raising the field crops in the other seasons also. In both districts, among the horticultural and plantation crops, *kokum* was less preferred over mango and cashewnut, hence the *kokum* growers cultivated this crop to the extent of 13.61 per cent in Sindhudurg and 4.47 per cent in Ratnagiri district. The preference of *kokum* cultivation between the two districts was more observed in Sindhudurg compared to the Ratnagiri district. This phenomenon clearly indicated that in Sindhudurg district, better linkages between production and value addition activities were observed.

5.3.1 Distribution of *kokum* orchards according to age groups

In the study area, grafted *kokum* and *kokum* seed origin planting material were used by the sample *kokum* growers for developing *kokum* orchards (Table 4.7). The results revealed that in the Ratnagiri district cultivation of *kokum* orchards attracted the attention of sample farmers much earlier than Sindhudurg district. Hence in Ratnagiri district the highest numbers of *kokum* orchards (21.61%) were observed to be older (26 to 35 years). Further in Sindhudurg and Ratnagiri districts the highest proportion of the total area of the *kokum* orchard was developed by using seed origin planting material as compared to grafted planting material. The main reason attributed towards this type of preference was use of seed origin planting material could be delay in standardizing the grafting technique procedure for *kokum* propagation and non-availability of grafted *kokum* planting material, which was made available only after the introduction of employment guarantee scheme since 1994.

5.4 PER HECTARE ESTABLISHMENT, MAINTENANCE COST AND RETURNS FROM *KOKUM*

5.4.1 Cost of establishment of *kokum*

It could be seen from the Table 4.8 and Table 4.9 that at overall level in the total cost of establishment of *kokum* orchards the share of labour cost was observed to be lower (55.85%) in case of *kokum* orchard established by using grafted planting material than that of *kokum* orchard (61.04%) established by using seed origin planting material. While, with respect to material cost incurred, observed to be higher (44.15%) in case of grafted orchard when compared to seed origin (38.96%) planting material. Further, over period of time in the total establishment cost of both types of *kokum* orchards indicated declining labour cost and increasing material cost. Under first year in the total establishment cost for the grafted *kokum* orchard, the labour cost was 57.27 per cent and was increased to 71.17 per cent in third year and finally it reduced to 31.64 per cent in fifth year, whereas in case of seed origin *kokum* orchard the labour cost had marginally increased (69.76%) over the first year cost (64.06%). From fourth year onwards this cost declined and observed to be 32.01 per cent in fifth year. In the development stage of any orchard, in the initial years major expenditure is incurred on labour and at latter stage, the expenditure on critical inputs goes on increasing and expenditure on labour goes on decreasing, this has relevance with concentration of many labour operations in the early years.

On the contrary in the total establishment cost, the material cost under grafted *kokum* orchard had declined from 42.73 per cent to 28.33 per cent in third establishment year, this was due to reduction in the cost of *kokum* grafts used for planting and gap filling and chemical fertilizers. This cost had increased to 69.25 per cent in the fifth establishment year. Similar trend was also observed in case of seed origin *kokum* orchard. For both types of orchards, the total labour cost towards irrigating the orchards formed as a major cost item for first three establishment years of *kokum* orchard, wherein manure, chemical fertilizers and planting material were observed to be important cost items of the total material cost.

The main reasons for observing lower share of labour cost in the total establishment cost for the *kokum* orchard established by using grafted planting material could be attributed to the development of such orchards on the lands specifically developed for *kokum* plantation. While labour cost was observed to be more in case of seed origin planting material orchards which were prepared by the sample growers in the sloppy and undulated terrain land. As a result of this, these gardens were established by using more labourer when compared to the orchards developed by using grafted planting material in a less undulated land terrain.

With the introduction of improved grafted material for establishing *kokum* orchards the expenditure incurred for procurement of planting material was observed to be relatively higher compared to the seed origin planting material. Hence, the planting material forms an important item in deciding the total establishment cost of the orchard. Moreover due to the higher use of manures, plant protection, irrigation charges and higher cost of *kokum* grafts, the establishment cost for grafted *kokum* orchard was higher as compared to seed origin *kokum* orchard. In the study area *kokum* growers were willing to invest higher amount during the establishment period because the gestation period of *kokum* grafts are less than five years and the growers could get early fruits production. Besides this the grafted *kokum* plants remain dwarf during its life span, so that intercultural operations become very easy and fruit losses can be minimized which was difficult in seed origin taller plants in future span of production. In addition to this in case of both type of *kokum* orchards material costs revealed an increasing trends over period of time. This was due to the more use of inputs like manure and chemical fertilizer, as it was directly related to the age of orchard (Talathi *et al.* 2001).

The trend in *kokum* orchard establishment cost for initial five years (Fig. 5) declined evenly in grafted orchard, whereas it was observed to be a steep decline in seed origin *kokum* orchard. This was due to the more care that had been taken during the initial period of establishment of *kokum* grafts *i.e.* the regular irrigation, proper fertigation, desuckering after every month of interval, plant protection and gap filling at regular interval if necessary etc. such operations were carried out during initial period. But in case of seed origin orchard, not much more care is required because seed origin plant become sturdy and once planted in the field, it established early if little care has been taken, and it required less amount of irrigation and other intercultural operations.

5.4.2 Cost and return from *kokum* cultivation

The share of input cost was maximum in the total cost for maintaining both grafted and seedling orchard (Table 4.10 and Table 4.11) but it was relatively higher in grafted orchard, Talathi *et al.* (2001) observed that in production stage the number of labour unit and quantities of material input increased as tree grows older. The grafted orchard was very young and responding well to manuring and fertilization, the cultural operations like desuckering, preparation of trenches, application of comparatively higher doses of manure and chemical fertilizer to the fast growing grafts added to the labour and input costs. Farmyard manures to the tune of 3.71 tones per hectare, nitrogen, phosphorus and potash at the rate of 30 kilogram per ha. were found to be applied for grafted orchard. The powdery mildew and black sooty mould diseases and mealy bug and jassid insects were reported as major pests in the study area. Nearly 90 per cent of the powdery mildew and 80 per cent of the mealy bug and jassids were controlled through sprays. Incidence of pest and disease were slightly ignored by the farmers in seedling orchard due to hardness of the seed origin plants.

The maintenance cost of seed origin orchards was (Table 4.11) accounted to 61.70 per cent of the total maintenance cost of grafted orchard at overall level. The seed origin orchard did not require special care and farmers were not paid proper attention even though this type of orchard could give economical yield. In the total cost 26.97 per cent cost was



Plate.1. Seed origin kokum orchard and fruit bearing seedling

accounted for rental value of land and it was calculated by considering 1/6 of the gross return as imputed rental value which is the prevailing rental value for the leased in land. This rent was higher in seed origin *kokum* since the proportionate return from seed origin *kokum* orchard was higher than that of grafted orchard due to the prior establishment of these orchards which were in fully grown fruit bearing stage. This confirms the observation of Talathi (2001), *i.e.* fruit production stage in *kokum* started when seed origin plants complete their vegetative growth phase. In the initial part of the production stage, orchards indicated lesser production of *kokum* fruits and gradually increased as the age of the orchards advanced upto 15 year. Finally attained full level of production at that stage, when tree become more matured and adult. Then there was stabilization of *kokum* fruit production up to 40 years. The low level of input use had kept cost of maintenance at the lower level in seed origin orchards. In Ratnagiri district the maintenance cost was slightly higher than Sindhudurg district. The situation in the Ratnagiri district demanded higher levels of labour, plant protection and chemical fertilizer which lead to slightly rise in the maintenance cost.

The per hectare return from grafted orchard was comparatively higher but profitability at different cost was less than the seedling orchard. The benefit cost ratio in both the orchards was higher than unity, which indicated that *kokum* cultivation was observed to be profitable. On one hectare, 244 grafts were accommodated as compared to 90 to 100 seed origin *kokum* plants, and the grafted plants were plagiotropy in nature and dwarf in habit, which provided an easy way for intercultural operation and for harvesting of fruits. Therefore, losses were minimized in harvest whereas in case of seed origin plants material types, grown up *kokum* plant resembled the pyramid shape and grew in big structure. As a result of this the harvest loss was more observed than grafted orchards. The yield level in seed origin orchard also depended on male and female plant ratio maintained in the garden. Hence, Karnik *et al.* (2001) suggested to maintain at 1:10 male female ratio. This had direct influence on production performance of the garden. The per quintal cost of production was comparatively higher in grafted *kokum* orchard. Wadkar *et al.* (2001) reported per kg cost of producing *kokum* fruits was Rs. 2.58 with net profit of Rs.3.42 to the grower at present price of Rs.6 per kg of *kokum* fruits. From the above forgoing analysis, it is seen that the results are sufficient to accept the hypothesis that *kokum* is profitable horticultural enterprise.

5.5 PRODUCTION AND RETURN FROM *KOKUM* ORCHARDS

The Table 4.12 revealed that at overall level per farm *kokum* production was the highest in seed origin orchards which accounted to 82.70 per cent of total yield. Similar trend was also observed in Sindhudurg and Ratnagiri districts *i.e.* production of fruits was higher in seed origin orchards compared to grafted orchards. This clearly indicated that, the seed origin *kokum* orchards were established much earlier than that of grafted orchards because, the seed origin *kokum* orchard were at fully matured stage and age of the plant directly influenced the production levels. While, the grafted *kokum* orchards were established recently and not fully matured, yielding less *kokum* fruits as compared to seed origin orchards. However, the grafted *kokum* orchards started yielding the *kokum* fruits much earlier than that of seed origin orchards indicating the advantage of vegetative method of propagation by which the fruit bearing period was preponed. Thus, yield stage of the *kokum* plant becomes an important factor in deciding the production and return level of *kokum* orchards.

5.6 ECONOMIC EVALUATION OF INVESTMENT IN *KOKUM* ORCHARD

The table 4.13 revealed that, economic feasibility with discount rate of 8, 10 and 12 per cent in the both the districts, the NPV values for seed origin and grafted origin were found to be positive. However, the seed origin orchards indicated around four to five times higher NPV compared to grafted orchards for the respective discount rates. The payback period for both districts with respect to seed origin *kokum* orchard, it was observed to be same (8 years) and for grafted *kokum* orchards it was 8 years in Sindhudurg district and 7 years in Ratnagiri district. Further Internal Rate of Return (IRR) values were greater than prevailing rate of interest on borrowing in both districts and both type of orchards. Similar types of result in case of mango were also observed by Borude (1990). Similarly the benefit cost ratio at different discount rate was more than unity in both districts for seed origin and grafted *kokum* orchard.

From the above results, it is inferred that, the cultivation of *kokum* by using both type of planting material in the study area observed to be economically feasible. However, seed origin took up more years to recover invested amount, while the grafted *kokum* orchards relatively observed to be earlier in recovering the invested amount. This could be attributed to the advantage of vegetative propagation method which preponed the pay back period by one year particularly in Ratnagiri district. Looking to the financial feasibility indicators, it was also observed that, *kokum* orchard of both type in Ratnagiri district were economically more feasible than in Sindhudurg district. The *kokum* orchards of seed origin planting material type in Ratnagiri district were established before 20 years which have attained full maturity stage and performing well with good yield that was reflected in better economic feasibility.

5.7 RESOURCE USE EFFICIENCY IN *KOKUM* CULTIVATION

The Cobb-Douglas production function was used to measure the resource use efficiency and allocative efficiency of resources under grafted and seedling plantation in both Sindhudurg and Ratnagiri district.

5.7.1 Estimated Cobb- Douglas Production function co-efficient and MVP to MFC ratios in grafted *kokum* orchard

Table 4.14 revealed that elasticity coefficient of number of trees were statistically significant in Sindhudurg district. Kshirsagar (1994) worked out that elasticity coefficient for planting material was statistically significant at one per cent level in Lal Velchi variety of banana. The age and trees numbers and fertilizers were statistically significant for Ratnagiri district and at overall level, while those of other resources in all the groups were non significant. Hence, the gross income from the grafted *kokum* orchard in Ratnagiri district and at overall level the number of grafted tree per unit area and age of the orchard were significant and positively influenced the *kokum* fruit production level. One per cent increase of graft density would increase the gross income by 0.89 per cent and 1.03 per cent in Ratnagiri and Sindhudurg district respectively. The coefficient of multiple determination indicated that 76.90 per cent of the variation in gross income was explained by these seven variables included in production function. The sum of elasticities was found to be more than unity, which indicated, increasing return to scale in both the districts.

The variable area had a negative influence on return and was found over utilized in the production process in both the districts and at overall level. While the input, insecticides in Ratnagiri district had negative influence indicating over utilization of insecticides, which did not contribute to the improvement of returns from the grafted orchard. Hence, rational decision has to be made in minimizing the usage of insecticides and reduction of land resource with the high density planting geometry, which had helped in improving the returns.

5.7.2 Estimated Cobb-Douglas production function co-efficient and MVP to MFC ratios in seed origin *kokum* orchard

Table 4.15 reflected that about 50 per cent of variations in gross return was explained by the variables included in the production function. Where as it was observed to be more in Sindhudurg district (61%) compared to Ratnagiri district (57%).

For the seed origin *kokum* orchard, the elasticity of coefficients for age, number of trees, and labour were positive and statistically significant at one per cent level for overall and for the individual districts. Thus, here the gross income was significant and positively influenced by age, number of trees per unit area and labour used, indicating under utilization of these inputs in general and labour in particular.

At overall level it was observed that, the one per cent increase in tree number per ha would increase gross returns by 0.59 per cent. Further, the elasticity of coefficient for area at overall level was observed to be negative which directed to reduce the area and the coefficient of plant number indicated to increase the number per ha in order to derive better performance of the seed origin *kokum* orchard. The sum of elasticities of co-efficient was 2.25, 1.41 and 1.68 at Sindhudurg, Ratnagiri and at overall level respectively which showed increasing return to scale. In Ratnagiri district elasticity of co-efficient for age, manures and insecticides have negative value which indicated decrease in returns if any of these resource use increased. Whereas in Sindhudurg district it was observed that, elasticity co-efficient for



Plate.2. Grafted kokum orchard and fruit bearing grafted plants

all variables were positive. Hence, in Ratnagiri district, the seed origin *kokum* orchard were over aged producing lesser *kokum* fruits production as compared to Sindhudurg which was reflected in lesser returns to scale (1.41).

The MVP : MFC ratio for the resources *viz.*, labour and fertilizer at overall level were more than unity which showed the under utilization of these resources. In Sindhudurg district MVP : MFC ratio for all the resources employed in *kokum* cultivation had more than unity showed under utilization. Hence it could be concluded that there is a scope for increasing the returns with the more use of such resources. The MVP : MFC ratios for resources *viz.*, manure, insecticides and area in Ratnagiri and at overall level was less than unity which indicated over utilization of these resources. The ratio suggested that by curtailment of manure, insecticides and area to some extent there is a possibility of getting increased income with suitable modification in planting geometry.

5.8 PRODUCTION, DISPOSAL PATTERN AND MARKETING OF *KOKUM* FRUITS

5.8.1 Fruit production and fruit losses during marketing and home scale processing

Table 4.16 revealed that fresh *kokum* fruits production in Sindhudurg district was higher than that of overall level. The information on fruit utilization pattern also indicated the higher proportion in home scale processing. Whereas in Ratnagiri district, higher proportion of the fruits production was marketed through intermediaries to the other *kokum* processing units. Among the home scale processing activities in Sindhudurg district, *kokum* growers were observed to use higher quantity (36.15%) for processing *kokum ghul*, while in Ratnagiri district higher quantity (71.70%) was used for preparation of *lonawala kokum* by the *kokum* growers.

From the above information it was clearly observed that, the concentrations of home scale *kokum* processing was more observed with the higher per farm production level and handiness with capital available with individual farmer. In addition to this the growers in Sindhudurg district observed to be more enterprising than that of Ratnagiri district, that is more than 50 per cent of the per farm production of *kokum* fruits was utilized in the home scale processing instead of selling to the other *kokum* processing units, which was commonly observed in case of Ratnagiri district. Hence, this has led to higher concentration of *kokum* processing activities in Sindhudurg district. The *kokum* fruits comes for harvest much early in Sindhudurg district due to soil and agro climatic conditions, as a result of this sample growers in this district indicated greater preference to process *kokum* fruits into less labour intensive home scale *kokum* product i.e. *kokum ghul* which in tern used as a raw material for the extraction of *kokum agal*. During the same period, the other two important major crops *viz.* mango and cashew required more labour for harvesting and marketing. On other hand in Ratnagiri district sample *kokum* growers were forced to process *kokum* fruits into *lonawala kokum* since *kokum* fruits delay in attaining maturity. These processed products were not consumed locally but marketed in the adjoining distant markets of the Gujarat state (Karnik et al. 2001). Looking to the comparative advantage exist with these two products, the processing activities are concentrated in the respective districts.

5.8.2 Per farm expenses involved in marketing *kokum* fruits and processed products

The per farm expenses incurred in the marketing of *kokum* fruits and processed products by the sample growers at overall level indicated that the highest proportion of the total marketing expenses was incurred (56.69%) on packing material followed by transport and other expenses. Similar trend was also observed in Sindhudurg and Ratnagiri district. However the total marketing expenses incurred in Ratnagiri district was comparatively observed to be less due to large scale processing activities developed at household level in Sindhudurg district.

The main reason for the higher expenses involved in marketing of fruits and processed products with respect to Sindhudurg district and at overall level could be attributed to higher proportion of fruits processing and packing material used to pack the *kokum*

processed product *i.e.* *kokum agal* and *kokum* syrup and *kokum* rind. Whereas in case Ratnagiri district sample growers incurred higher proportion of expenditure on transport next to the expenditure on packing material. This was due to the reason that the sample farmers mainly resorted to process, late mature *kokum* fruits into *lonawala kokum* and transported the processed products to the distant market of the Gujarat state.

5.9 PROCESSING PERFORMANCE IN *KOKUM*

With the due consideration of gaining popularity of the *kokum* cultivation, the *kokum* processing activities had emerged with important link in integrating *kokum* based activities. Hence, the *kokum* processing activities in the region is discussed under the following sub-heads.

5.9.1 General information of *kokum* processing units

In the study area, the *kokum* processing units belong to different types (Table 4.18) *viz.*, home scale, cottage scale, small scale and large scale. Of the total number of processing units, the share of the small scale processing unit's number was observed to be maximum and home scale processing unit's number was at minimum level. This processing unit's average establishment periods was observed to be 18.35 years and were managed by individual proprietorship. Further, they have been well connected by road and rail.

Hence, in the study area, small scale processing units play an important role in *kokum* processing compared to other types of existing processing units. Further, these processing units were established much early with individual proprietorship. This enabled the development of processing units to look into the needs of the growers and market. Moreover the small scale processors were well experienced and well known about technical, administrative, managerial and business skill. As a result of better performance of processing units, the taste, preferences and market for their product was well established.

5.9.2 Capital investment in *kokum* processing unit

The study revealed (Table 4.19) that fixed and working capitals were used to setup *kokum* processing units to get varied kinds of *kokum* processed products. Hence, the use of *kokum* raw material had direct relationship with the quantity of different *kokum* products processed and inverse relationship with fixed capital. This was similar to the theoretical concept that larger the quantity of raw material processed, the apportioned fixed capital requirement to produce the processed products would fall. Therefore, during the study period Rs.3,37,905.46 was invested as fixed capital to procure machineries and durables to take up *kokum* processing activities.

The Table 4.19 revealed that in the total fixed capital invested to establish *kokum* processing units, the share of *kokum* syrup processing was observed to be maximum. This was due to the higher expenditure made in the acquisition of infrastructural facilities *viz.*, buildings land, vehicle and machineries.

It was also observed that, out of total capital investment in *kokum* syrup unit, 86.70 per cent investment was incurred as working capital and it had direct relationship with quantity of *kokum* syrup processed by the units. Similar type of results in case of mango was observed by Naik (2005). That is higher working capital was required for the purchase of raw material, containers, packing material, additives and chemicals and payments of labour charges. As a result *kokum* syrup processing level also varied accordingly. Similarly, the part of the working capital involved on containers, packing material, additives and labour charges which had direct relationship with the quantity of raw material processed. Hence, in the study area the processing units were completely depending upon the growers *kokum* fruits production levels. Therefore, the working capital investment in *kokum* processing units had direct relationship between production levels of *kokum* fruits and availability of *kokum* fruits in the market.

In the case of *kokum agal* processing units, similar trend was observed regarding fixed and working capital investment. The quantities of working capital required by the processing units were totally depending on the availability of *kokum* fruits. The major items constituting the working capital, in case of *kokum* syrup processing were additives and chemicals.

In case of *kokum* rind and *kokum* RTS processing units the fixed capital investment was observed to be minimum. The possible reason was that the equipments required for the processing of these two products demand less fixed capital. Therefore, risk involved in the processing of the two products was observed to be lower than that of *kokum* syrup and *agal*.

Table 4.19 revealed that, for all the *kokum* processing products, the requirement of working capital ranged from 73.77 per cent to 87.16 per cent of the total capital investment. Thus the *kokum* processing units in the study area were more working capital intensive whose share in the total investment was 86 per cent and the remaining 14 per cent was the fixed capital. The overall investment pattern in *kokum* processing units indicated the direct relationship between extent of capital invested and quantities of the processed products produced.

5.9.3 Capacity utilization pattern of processing units

The annual overall installed capacity of *kokum* processing units (Table 4.20) indicated a direct relationship between the total capacity utilized and the category of the *kokum* processing unit. Therefore, the total capacity utilized in large scale unit for processing the raw material was 673 tones, in small scale 64.00 tones, in cottage scale 50.25 tones and in home scale 24.00 tones. It was also observed that, in all categories of the processing units out of the total created capacities for processing, maximum share was spared for processing of *kokum* based raw material than compared to non-*kokum* products. Hence, it was confirmed that, the selected processing units in the study area were *kokum* raw material based processing units. The possible reason for this may be that in the study area *kokum* cultivation had better comparative advantages and the investment pattern followed in the establishment of the processing units also observed to be less fixed capital intensive. Further the processing units had clearly developed their product brand name, known for their characters. As a result, the market demand guided *kokum* processing units devoted more time and capacities to process *kokum* based raw material than that of non-*kokum* type.

The similar trend was found in the packing and storage capacity utilization of all the categories processing units in the study area. The packing and storage capacities were directly influenced by quantity of raw material processed and dispatching of consignments. Hence, the packaging and storage capacity used for *kokum* products were higher than other non-*kokum* products.

Processing units belonged to different categories remained idle for want of raw material was found to be higher in cottage scale (237.88 days), followed by home scale (185.93 days), small scale (105.93 days) and large scale (94.00 days). The reasons for this might be the to non availability of raw material for processing and working capital to the cottage and home scale processing units. However, the packing and storage capacity were observed to be fully utilized by the processing units except the home scale category. It was also observed that the packing capacity utilization of all categories of processing units was directly influenced by the storage capacities, which was a prerequisite for processing units.

5.9.4 Input utilization pattern of *kokum* processing plant

The average procurement cost of raw material at the processing unit level was found to be Rs.447755 out of that 58.20 per cent cost was incurred on *kokum* syrup processing unit, this revealed that large share of the total raw material cost was incurred towards the production of *kokum* syrup, which was followed by *kokum agal* (31.27%) cost, *kokum* rind (7.41%) and *kokum* RTS (3.12%). On the other hand, half processed raw *agal* was also used by the processors as raw material to process into *kokum* syrup and *kokum agal*. This helped the processors to enhance the capacity utilization of the processing units whenever fresh *kokum* fruits were not available in the market.

Hence, farmers in the study area were inclined to extract half processed raw *agal* which could be stored for longer time and sold to the trader and processors according to their requirements and formed another important *kokum* fruit based processing activities.

The purchase of inputs other than raw material *viz.*, additives, preservatives and packing material indicated the direct relationship with the procurement of raw material and quantities of different products processed by the processing units. The usage of preservatives in *kokum* processing products was observed to be most essential in order to enhance the

shelf life of the products to avoid spoilage and bulging of the plastic containers stored under the post-harvest period.

In the case of *kokum* rind making no preservatives was used except salt as additives though it was stored for long period. The possible reason for this could be *kokum* rind itself which had a sour taste and high percentage of citric acid content (3 %) which does not allow the product to spoil.

Table 4.21 also revealed that, processing units had incurred Rs.19,74,584 as average overall input cost, in this 79.84 per cent was contributed by *kokum* syrup alone. This had clearly indicated that, *kokum* syrup was more preferred by the retail centers than that of other products. Hence, the processing units put relatively more efforts to process the raw materials in to *kokum* syrup and then traded through the outlets situated in the states like Gujarat, Madhya Pradesh, West Bengal, Uttar Pradesh, Bihar, Delhi and in the metropolitan cities of Maharashtra state.

5.9.5 Labour utilization pattern of *kokum* processing unit

It was observed (Table 4.22) that the per season average labour utilization pattern of the *kokum* processing unit indicated the creation of employment opportunities to the permanent and temporary labours. At an overall level when all 21 labours were employed it accounted to 4770 mandays. In this total mandays, temporary labours mandays share was comparatively higher (77.36%) than that of permanent labour mandays (22.64%). Further in the permanent labour mandays (1080 mandays), the share of male mandays was two time higher than that of female mandays. Similarly in the total temporary mandays, the share of female mandays was five times higher than that of male mandays, as most of the operations in the processing industry are female dominated and convenient. The proportion of female labour was drastically on higher side which adds to economic efficiency in terms of labour cost.

This clearly indicated that higher proportions of temporary labours were engaged by the processing units compared to permanent labourers. Hence in *kokum* processing units, the peak season engaged more temporary labours in accordance with the availability of the raw material for the processing. While less amount of permanent labours were engaged during peak and slack seasons whose number did not influence the processing activities. Under temporary labours, the engagement of higher female labour by the processors indicated that, in *kokum* processing, female labour greatly influenced the performance of processing unit. Since this section of labour technically specialized in the preparation of recipe with desired composition, which enabled effective management of processing, packing and labeling activities at processing unit level, with the lower labour cost per unit as against other section of labourers.

5.9.6 Cost and return structure for *kokum* processing unit

The cost and return per processing unit and for different *kokum* products has been discussed as under.

5.9.6.1 Cost and return of processing of *kokum* into different *kokum* products

At an overall level, the per processing unit the cost incurred (Table 4.23) to process different *kokum* products was Rs.24.62 lakh. From this total processing cost, maximum amount of Rs.19.57 lakh was incurred in the processing of raw material to 69907.75 litres of *kokum* syrup. On the other hand, the minimum cost of Rs.0.54 lakh was incurred to process raw material into 2914.50 kg of *kokum* rind. Therefore, for the per processing unit the highest net return (Rs.6.83 lakh) was realized from the processed *kokum* syrup and minimum from *kokum agal*. However, per unit net return was observed to be maximum (Rs.19.75 per kg) for the processed *kokum* rind as against this for *kokum* syrup (7.63 per liter) and *kokum agal* (Rs.5.96 per litre), the net return were observed to be relatively lower (Table 4.24). Pawar (1996) found similar observation in *kokum* processing unit at home scale level.

The main reason for this was due to the higher cost incurred on the purchase of raw material and additives used to get processed *kokum* syrup (Pawar B.P. 1996). Further, to pack the processed *kokum* syrup and *kokum agal*, containers were also used as packing material, which amounted to 19.05 per cent and 17.74 per cent of the total *kokum* syrup and *kokum agal* processing cost respectively. While to get processed *kokum* rind only raw



Plate.3. Processing of kokum products

material was the major item of the cost. However, it was revealed from the Table 4.24 that the value addition in *kokum* fruit by preparing *kokum* syrup was Rs.33.81 per liter, which was observed to be maximum when compared with *kokum* rind (Rs.27.00 per kg), *kokum agal* (Rs.18.55 per liter) and *kokum* RTS (Rs.3.72 per 200 ml of packet). Therefore in *kokum* raw material based processing activities, the value addition need to be encouraged to process raw material into *kokum* syrup.

5.9.7 Business ratio analysis

To understand the performance of *kokum* processing units, various parameters were considered for taking appropriate decisions and are discussed below.

5.9.7.1 Measurement of capital efficiency

As indicated in Table 4.25 the capital turnover and returns to capital investment ratios were observed to be more than unity for all *kokum* processed products, indicating processing of *kokum* fruit into different processed products was economically profitable. However the rate of capital turnover and returns on capital investment ratios were observed to be maximum in case of *kokum* rind processing activity as compared to other products, which indicated higher efficiency of capital turn over and returns to capital investment. This was mainly due to the lower cost of processing associated with minimum quantities of inputs required to process *kokum* fruit into *kokum* rind. In case of other *kokum* processed products viz., *kokum* syrup, *kokum agal* and RTS, more fixed as well as working capital were required for the purchase of machineries and inputs, whose services will be made use over period of time. Further, these *kokum* processed products activities last for very short period in a year leaving behind the machineries larger part of the year remained idle, hence the rate of capital turnover and return to capital investment were observed less for these products.

The capital per hundred rupee of gross income for the *kokum agal* and *kokum* syrup were observed to be higher than that of overall level indicating these two products have capital intensive activities, this could be attributed to the higher investment made to procure machineries and inputs. Similarly the input : output ratio was significantly higher in *kokum* rind, which also further confirmed the above discussed information.

From this it could be inferred that *kokum* rind processing forms a protective cushion for taking up highly risky *kokum* processing activities having greater market demand. By which the sustainability of the processor can be enhanced, due to its higher rate of capital turn over and returns to capital investment.

5.9.7.2 Measurement of labour efficiency

For overall, aggregate processed product, it was observed that (Table 4.25) per worker net return was Rs.50,210.83 which was lesser than that of *kokum* syrup (Rs.52,895.71). Hence, the engaged quantity of labour in the processing of *kokum* syrup had efficiently worked and contributed higher net return. On the other hand, it was observed to be minimum in case of *kokum* RTS. This showed that care need to be taken in allocating the labour force among different *kokum* processing activities.

5.9.7.3 Profitability ratio

The profitability ratio in *kokum* processing unit was assessed by using net profit to asset ratio, net profit to own fund ratio, net profit to fixed asset ratio and net profit to sale ratio.

The net profit to total asset ratio indicated the net profit for each rupee invested on all asset. At an overall level, the average value of the ratio was 0.27 and ranging from 0.28 to 1.68 for *kokum* syrup and *kokum* rind. This ratio indicated the direct relation with fixed and working capital investment. That is the fixed capital had an inverse relation with net profit to total asset ratio. Hence, higher ratio for *kokum* rind was due to lower fixed capital investment share in the total investment made in this processing activity.

Net profit to own fund ratio was found to be higher in *kokum* rind (3.22%) and lower in *kokum agal* (0.32%). This indicated the owned fund invested by the processor had brought profits from all *kokum* processed products. Net profit to owned fund ratio also had the direct relation with profitability of the venture. Wadkar (2001) observed a similar trend in the net profit to fixed asset for cashew processing.

Net profit to fixed asset ratio was used to examine the extent of net profit of each rupee invested on fixed asset. It was found to be higher in *kokum* RTS, due to its lower level of investment made in the fixed assets. Similar trend was observed in the net profit to sale ratio of *kokum* rind. Hence, processing of *kokum* fruit in to *kokum* rind was observed to be more economically feasible.

5.9.7.4 Break even analysis

Break-even level of out put is the minimum out put that has to be produced by the firm in order to remain in the production process without sustaining losses. The Table 4.26 revealed that the quantity of output required to reach break-even point was 22653.93 liter of *kokum* syrup, where as it was 5596.38 liter of out put in case of *kokum agal*, 142.96 kg. out put of *kokum* rind and 3335.40 packets of 200ml in case of *kokum* RTS. However, all the *kokum* processing activities had produced more than the break-even value of output indicating all activities were generating higher profits at processing unit level. Similar result was observed by Naik (2005) in case of mango pulp processing factory in the Konkan region of Maharashtra. Further, the variation in break-even point output of these *kokum* processing units was due to the variation in the fixed cost and the quantity of output produced.

5.10 MARKETING PERFORMANCE OF *KOKUM* FRUITS AND *KOKUM* PROCESSED PRODUCTS

A systematic analysis of cost and returns of various market functionaries involved in marketing of *kokum* would help to know the various services rendered and charges added by the intermediaries in the process of marketing *kokum* fruits and its processed products. Apart from this; market conduct was studied to understand the performance of marketing of *kokum* and its products. The findings are discussed as under.

5.10.1 Marketing costs incurred by sample *kokum* growers

The marketing cost incurred by the growers was found to be the highest in *lonawala kokum* and *kokum ghul* in the selected markets (Rs.35.00per quintal) followed by *kokum* fruits (Rs.30.00per quintal) and *kokum* seed (Rs.25.00per quintal). The higher magnitude of total marketing cost with respect to *lonawala kokum* and *kokum ghul* incurred by growers was mainly due to higher handling and labour charges. This is in line with the results obtained by Koujalgi *et al.* (1992) in marketing of pomegranate. It was also observed that the transportation costs formed another major component of total marketing cost incurred by the growers in marketing of *kokum* fruits and seeds. The reason being that the sample growers preferred to sell their produce in distant markets having processing facilities. This clearly indicated that growers share was affected due to the non availability of commercial processing units in local area. Therefore it is necessary to establish the *kokum* processing unit in the production hinterlands of *kokum* in order to cut down the total marketing cost and transport charges in particular to increase the growers share.

5.10.2 Marketing cost incurred by the sample processors

The marketing cost incurred by the processors for different *kokum* processed products in the study area was found to be the highest in *kokum* syrup and *kokum agal* (Table 4.28) followed by *kokum* RTS, and *kokum* rind. This was mainly due to the expenditure incurred on packing material, handling charges, telephone, electricity and transportation charges which significantly influenced the overall total marketing costs. As a result of this the processed *kokum* products were efficiently handled in the storage and released to the markets according to the market demand. On the other hand, in case of *kokum* rind, handling and transport cost formed an important item of total marketing costs, since this activity demands more working hands for packing and repacking of *kokum* rind in order to reach the consumer located in the distinct markets.

5.10.3 Marketing cost incurred by market intermediaries towards *kokum* fruits and half processed products

In the study area the village trader was observed to be the only intermediary for marketing of *kokum* fruits. This intermediary procured *kokum* fruits at village level and supplied as a raw material to the processing unit located at distance places. Thus, the

transportation cost was the major item of total marketing cost associated with the *kokum* fruits sale. Further, *kokum* growers mainly resorted to the village trader for marketing of *kokum* fruit, since an individual grower with the small available quantity of *kokum* fruits marketable surplus was not in a position to organize the entire logistic requirement required to reach the destiny.

In case of *kokum* seed marketing itinerant, village traders and traders saved as three important marketing intermediaries. The marketing cost incurred in *kokum* seed marketing was observed to be the highest at itinerant merchant level. This was mainly due to the reason that the itinerant merchant at village level does the *kokum* seed collection from the individual growers located at different places. Then the assembled *kokum* seed were sold to the processing units located at distant markets through the traders. To perform this job the itinerant incurred higher cost on labour and transport which formed the major item of the total marketing cost.

To reach the consumer, *Lonawala kokum* was routed through itinerant, village trader and trader in the study area. The magnitude of marketing cost incurred by the trader was the highest (Rs.53.00 per quintal) in *lonawala kokum*. In *lonawala kokum* the total marketing cost was significantly influenced by the labour, telephone, electricity and transportation costs. Since, the trader required to store material in order to attain sizable quantity to carry it in the bulk carrier. Hence, this marketing cost was observed to be higher than that of itinerant and village trader.

The village trader and main trader (dealer) were observed to be engaged in *kokum ghul* transaction in the study area. At trader level the *kokum ghul* was assembled from the village traders. For this purpose, the trader did exercise in contacting village traders for pooling the *kokum ghul*, also used the logistic services for dispatching the assembled *kokum ghul* to distant markets. Hence, the trader's marketing cost was more than that of village traders. Due to the higher handling frequency of *kokum ghul*, the village trader incurred higher expenditure on labour as compared to other costs items.

5.10.4 Marketing cost incurred by intermediaries towards sale of processed *kokum* products

Retailer was the only intermediary involved in the *kokum* syrup marketing (Table 4.30) who incurred marketing cost to the tune of Rs.480 per 100 liter of *kokum* syrup. The salary of staff, telephone, electricity and transportation and interest on working capital were the major constituents of costs, which, significantly influenced the *kokum* syrup total marketing cost. This was due to the processors' preference to sell the *kokum* syrup through retailer in the domestic market to minimize his marketing costs.

The dealer and retailer were engaged in case of *kokum agal* and *kokum* rind marketing. The total marketing costs for these two products were observed to be higher at retailer level. The cost was fairly distributed among at the cost items viz., transportation, electricity, telephone, salary payment, interest on working capital, miscellaneous expenses, shop rent, labour charges etc. This indicated that the per unit marketing cost has direct relation with the quantity sold by dealer and retailer; and therefore per unit marketing cost incurred by retailers was on higher side as they were selling very less quantity.

In the study area, *kokum* RTS was marketed through retailer only. Thus recently launched product was tried to reach the hands of consumers whose performance was not much known to the other market players. Hence, only retailer trying to promote the sale of *kokum* RTS by procuring the material from the processing units located at distant places. Hence, the retailer had incurred more expenditure on the transportation of this material whose shelf life was observed to be very much less compared to other *kokum* processed products.

5.10.5 Price spread for *kokum* fruits and processed products

For the *kokum* products under the different marketing channels, the marketing margin measures gap between the net price received by producer/processors and the price paid by the processors/consumer. This provided the information for selecting the suitable marketing channel in order to increase the margin in the end user's price.

It was worth nothing that, the percentage of margins realized by the different intermediaries was higher than their cost incurred in the marketing of *kokum* products.



Plate.4. Packaging and marketing of kokum products

5.10.5.1 Price spread in marketing of *kokum* fruit and *kokum* seed

Kokum fruit

Table 4.31 revealed that, the average producer's share in processor's rupee was 59.33 per cent in channel-III. This was the only one option provided to the *kokum* fruit grower in which the village trader provided bondage between the growers and the processors for which the village trader had retained more than 40.00 per cent as his share in the processor's rupee.

Kokum seed

In the marketing of *kokum* seed the marketing margin was the highest in case of channel-II and channel-III as compared to channel-I. This indicated that, with the absence of itinerant and village trader of channel-II and channel-III, the grower had realized maximum share of 71.58 per cent in processor's rupee under channel-I. When, the *kokum* seeds were sold to processor through the trader, where the trader had collected the net profit margin of Rs.10.27 per kg as against Rs.17.71 per kg and Rs.20.63 per kg by village trader and itinerant respectively. Hence, itinerant were observed to be more profit oriented market intermediary as far as *kokum* seed was concerned. Though producers in channel-II were realizing minimum share in consumer's rupee, nearly 21 per cent of the *kokum* growers, who did not have bulk quantity of seed for direct selling to traders, were selling their seed through itinerant merchants only.

5.10.5.2 Half processed *kokum* products

Under this category of *kokum* fruit processing the *lonawala kokum* and *kokum ghul* were processed and sold to different market intermediaries. The price spread among the different channels for marketing of these two half processed produce are discussed below.

Lonawala kokum

With respect to marketing of *lonawala kokum* as half processed product, the producer's share in the processors rupee was observed to be maximum in case of channel-I as compared to channel-III and channel-II. This indicated that whenever producers sold the *lonawala kokum* to the processors keeping a trader as a intermediary was successful in realizing maximum share (66.60%) in the processor's rupee. On the other hand with the addition of itinerant as an additional intermediary in channel-II, the producer's share was sharply reduced to 34.60 per cent. This suggested to reduce the intermediaries in order to increase the producer's, share in processor's rupee. The processors offered less price (Rs.23.00 per kg), whenever the producer sold the *lonawala kokum* through village trader. This clearly indicated that the processors discouraged the trading activities of village trader dealing with the *lonawala kokum*.

Kokum Ghul

To sell *kokum ghul*, sample growers followed the marketing channels, that is channel-I and channel-III (Table 4.31). In these two channels the absence of itinerant's role in the sale of *kokum ghul* was consequently observed. However, in channel-III village trader did operate to trade *kokum ghul* by collecting the processed material from the grower and directly sold to the processors. During this process he had retained higher profit margin which had brought down the producer's share from 78.33 per cent (channel-I) to 70.00 per cent (channel-II). This clearly indicated that channel-I was more preferred over channel-III, since the producer directly sold the *kokum ghul* to the processor with the trader as market intermediary working in between growers and the processors. It was also observed that, the trader in channel I kept his profit margin at Rs.0.69 per kg as compared to the village traders profit margin of Rs.1.16 per kg in channel-III. Hence, the village traders were observed to be more exploitative market intermediary as compared to traders. As a result of this in the study area the growers had expressed greater preference to channel-I as compared to channel-III for the sale of *kokum ghul*.

5.10.5.3 Price spread in processed *kokum* products

In the study area, it was observed that (table 4.32) to sell processed *kokum* products like *kokum* syrup and *kokum* RTS, the processors mainly resorted to one and the only market channel i.e. channel-I. Further in channel-I the processor's share in consumer rupee was

observed to be maximum (75.64%) with respect to *kokum* syrup as compared to *kokum* RTS (68.00%). The main reason for this was attributed to the maximum net price received for *kokum* syrup (Rs.43.12 per litre) as compared to the *kokum* RTS (Rs.3.70 per packet). Hence, the processor would be greatly benefited by processing *kokum* fruits into *kokum* syrup rather than *kokum* RTS.

On the other hand in case of other *kokum* processed products such as *kokum agal* and *kokum* rind, the processors resorted to channel-I and channel-II for the sale of these two products. The processors sold *kokum agal* directly to the consumer under channel-I, while, in channel-II this was marketed through dealer. With the addition of dealer's margin to the processing price of *kokum agal* in channel-II, the processors share in consumer's rupee was reduced from 73.60 per cent (channel-I) to 70.46 per cent (channel-II). Similar trend was observed for *kokum* rind. Hence, it is revealed that the involvement of dealer in these marketing of two products viz., *kokum agal* and *kokum* rind, influenced the processor's share in consumer's rupee and net price received by the processor particularly in *kokum* rind marketing.

5.11 EXPORT PERFORMANCE OF *KOKUM*

In this section an attempt was made to discuss the findings on growth rate in export, its trend and instability in export of *kokum*. *Kokum* products are exported to U.S.A., Australian, European, and Gulf countries. The quantity of *kokum* products exported along with its value for the period 1993 to 2003 are presented as below.

5.11.1 Growth rate of Indian *kokum* products export

The compound growth rate with respect to quantity and value of *kokum* exported from India to major counties like U.S.A., U.K., U.A.E., Australia and Oman was negative over a period from 1993-1994 to 2003-2004. But, it was found to be positive but non-significant to other importing countries. The decreasing pattern of growth trend in export of *kokum* may be attributed to the decrease in production of processed product like *kokum* butter, instability in availability of *kokum* seeds, and increased domestic consumption of *kokum* products. Perhaps the production of *kokum* was concentrated in Konkan region only and demand for *kokum* products increased in other countries, was the reason for this positive growth rate (Table 4.33) in export to other countries. Further, *kokum* butter was mainly exported to U.S.A., Australia and European countries, which fetches higher prices in international market, while along with *kokum* butter other products like *kokum* syrup, rind and *Lonawala kokum* were exported to Gulf countries. As a result of this the growth for overall export with respect to value of *kokum* was positive but in terms of quantity it was negative. Therefore it is necessary to develop and produce exportable quality *kokum* products, improve the production and processing, packing technology and standardize the processing methods. This would help to increase the export for gaining wide market for *kokum* and will provide boost to the economic upliftment of farming community.

5.11.2 Instability analysis on export of *kokum* products

In order to study the variability in the *kokum* export an attempt has been made to analyze the extent of instability in the export of *kokum* product from India, during 1993-94 to 2003-04.

The coefficient of variation indicated the extent of instability with respect to quantity and value of *kokum* products (Table 4.33). It was observed that a higher instability was noticed in U.K. followed by U.S.A., other countries, Oman, Australia and a least instability was noticed with respect to U.A.E. in terms of quantity exported to these customary importers. Further, the higher instability of recorded especially in countries like U.K. and U.S.A. which could be attributed to the fact that, in these countries strict phyto-sanitary and quarantine measures were implemented during the interim, which varied the quantity of imports depending upon the acceptance or rejection of the lots. In case of U.A.E and Oman demand was found to be relatively stable than other countries due to various religious factors as well as increasing migrant population. Lancieri (1979) observed that, in general, smaller the value of export in value terms, higher will be the degree of instability and *vice versa*.

In terms of instability of value in export, it was observed that higher degree of instability was seen relating to U.S.A. followed by U.K., Australia, other countries, U.A.E. and

least was in the case of Oman. The possible reason for this phenomena could be attributed to type of *kokum* product, and quantity of supply were associated with lower prices and vice versa. The price fluctuation also played an important role for inducing instability in value terms. However in case of Oman, the instability coefficient in value terms remained at the lower level along with least instability in quantity terms. Similar observation was made by MamaleDesai (2002) in mango export to U.A.E. This implied that, prices prevailed over the years were found to be stable and the inflationary pressure was negligible.

5.11.3 Trend in *kokum* export

In terms of quantity exported, cyclical pattern of trend in export of *kokum* product was observed. Initially quantity export trend exhibited downward movement and then upward movement during the period 1995-96, again decreasing trend was observed over the period from 1998-99 to 2001-2002 and then upward growth later on. The gradually increasing pattern of trend in value of export was observed. It was initially decreasing then steadily increasing upto 1997-98, then movement to upward was very rapid from 1997-98 to 1999-2000 and similar trend was again observed up to 2002-2003 (Fig. 11). The same pattern trend was observed by Pal (1992) in spices. It was observed that difference in trend of quantity and value exhibited due to different kinds of *kokum* product exported. During the boom when upward movement of trend in term of value, the export of *kokum* butter might be exported at higher magnitude.

The *kokum* butter fetches international prices from \$ 14 to \$ 23 per pound mainly exported to European and American countries but it was very meager compared to other products like rind and *lonawala kokum* which are mainly exported to Gulf countries. It is worth noting that the value realization of export of *kokum* had greater variation than the corresponding quantity of export, this might be due to exchange rate fluctuation and fluctuation in quantity of export. Therefore in order to stabilize the value of export and to increase the unit value realization, it is necessary to develop the processing technology and improved packing for highly valuable pharmaceutical product like *kokum* butter. This would help for earning foreign exchange by increasing export.

5.12 *Kokum* growers production processing and marketing constraints

5.12.1 Production constraints

Constraints in the cultivation of *kokum* (Table 4.34) revealed that the growers were clearly aware of the shortcomings in the cultivation techniques. The iteration of labour shortage, late harvesting, wastage of fruits, non availability and high degree of mortality of *kokum* graft, laborious home processing were the crux of the cultivation problems of grower. This may be partly due to the reason that *kokum* cultivation was subsidiary enterprise of the sample farmers and being perennial crop found last preference for the allotment of these resources even though earning from it were considerable. Patil *et al.* (2001) observed similar problems in *kokum* cultivation in Maharashtra. The *kokum* growers who were willing to expand their plantation and those who want to replace their grafts mainly complained regarding non availability of sufficient number of grafts and incidence of high mortality in the initial year of planting.

Regarding the problem relating to fruit marketing the sample farmers expressed lower price and no demand to fruits, no standard grade to their produce and malpractices in the market place as their problems. The farmers expressed dissatisfaction with the current set up of *kokum* marketing and those reflected the grower's awareness and desire to expand his *kokum* cultivation.

5.12.2. Processing constraints

Kokum processors faced many problems in the factory. However, nine major problems faced by the processors were identified and the results are presented in Table 4.35 which revealed that the irregular supply of electricity and water was the main problem faced by the processors. Frequent load shedding and cut in power supply affect the capacity utilization to the maximum possible extent, and reduce the overall efficiency of human labour and that of machinery also. This lower efficiency in turn increases the per unit cost of

production leading to rise in price of the processed products which would ultimately result in fall in demand for these products.

Another major problem faced by these processors (80%) was that of incentive from government was lacking. In real sense, the Government, NGOs and development bodies should have concerted efforts for employment opportunities for female in rural area which was lacking. Higher duties and taxes was another problem faced by the processor. The *kokum* is horticultural crop but processed product from *kokum* was considered as the industrial products and they have to pay 12 per cent VAT charges. Therefore, the *kokum* products should be considered as agricultural products for levying taxes there by lead to decline in price of product which would ultimately result in boosting the demand.

Poor infrastructure and high marketing expenses were the problems faced by the processors. However adequate market charges has to be paid by the intermediaries for the material used in marketing for better disposal. Labour shortage during the peak period of processing was observed in the study area. The harvesting period generally for all fruits in the region is almost same during March to May. Therefore harvesting and processing become the prime for all the fruits. The fruit shortage and late bearing of trees affect the capacity utilization of the processing unit. This problem was faced by 60 per cent of the processors.

Demand for the *kokum* products fluctuate considerably over a period. *Kokum* products are generally used in summer season, which rise the demand considerably but it touches their lowest mark during monsoon season but the demand for *kokum* rind remain stable throughout the year.

5.12.3 Marketing constraints for market intermediaries

The market intermediaries like retailer, itinerant, village trader and traders faced some marketing problems related to *kokum* (Table 4.36). It was revealed that majority of the problems were non-availability of packing material, higher transport cost, price fluctuation, improper market information and delay in payment of sale proceeds. The non availability of packing material, to some extent was expressed by intermediaries as a constraint. The packing material is available every where but timely availability play an important role in increasing the efficiency of market. The transportation cost is directly influenced by the international rate of crude oil. However, price fluctuations were observed due to seasonal demand for the *kokum* products.

6. SUMMARY AND POLICY IMPLICATIONS

The horticultural activity forms an important component of the farming system and does well under hard terrain exposed to the vagaries of the climate. The horticultural crops in the country have occupied 15.97 per cent of gross cropped area and form important part of the agricultural sector. At present the agricultural sector is contributing 18.50 per cent to GDP of Indian Economy.

Fruits are rich source of vitamin and mineral; hence the major and minor fruits are being turned as protective foods. India stands second after Brazil in fruit production accounting about 278 million tones but the value addition in fruits only 2 per cent of total production. Fruit processing is one of the world major agribusiness, the share of developing countries reported to be more than 50 per cent in the world trade related to fruits and vegetables processing. Indian domestic market for processed product and soft drinks industries currently estimated at 21 per cent, which is expected to generate the demand for fruits based drinks to the extent of 20 per cent.

Kokum is an Indian spice used in many parts of the country for making several vegetarian and non-vegetarian '*curry*' preparations including popular '*solkadhi*'. The fruit are steeped in sugar syrup made '*Amrit Kokum*' (*Kokum* syrup) a healthy soft drink to relieve sunstroke which is popular during summer. It is traditional home remedy in case of flatulence heat stroke and infections. Many therapeutic effect of the fruits have been described in traditional medicine based on *ayurveda*, one of the ingredient of *kokum* 'Hydroxy citric acid' has potential of anti- obesity agent which suppressed fatty acid synthesis.

Though commercially important, *kokum* remain neglected and not much attention was given for its research and development. The commercial cultivation of *kokum* is concentrated in western *ghat* region especially only in southern part of Konkan region of Maharashtra state and Goa state. After realizing the importance of existing *kokum* trees in the region, Government of Maharashtra started encouraging the farmers of the region to grow *kokum* by planting *kokum* orchard in systematic manner under employment guarantee scheme. The present production level and area under cultivation in south Konkan region is 2442 MT from 1598 ha. of land. The processing industries also concentrated in the vicinity of the *kokum* cultivation. However there is a continuous increase in its demand for pharmaceutical industry, domestic markets and also foreign markets. The present study is a deliberate selection of Ratnagiri and Sindhudurg district of southern Konkan part of Maharashtra as the study area, since commercial cultivation of *kokum* and processing units are concentrated. The presence of many processing units in the study area has rendered the cultivation of this crop profitable and has been reflected in a steady increase in area expansion under *kokum* plantation. The processing appears to be the prospectful method for the disposal of the fruits as *kokum* fruits compulsorily be processed. Since *kokum* products are exported and growing demand for processed product is emerging, there is need to create sustainable linkage between *kokum* grower, processor, and market functionaries along with exporters to grab the foreign market and to plan future approaches and strategies for the crop and processing units to promote the economic upliftment of the farming community in the study area. In this context, the present study was undertaken with the following objectives.

1. To estimate the establishment cost incurred in the development of *kokum* orchard
2. To study the maintenance cost and return structure concerned to *kokum* cultivation
3. To analyze the financial feasibility of investment in the *kokum* orchard
4. To study the economics of processing of *kokum* fruits
5. To study the marketing of fresh *kokum* fruits and value added *kokum* products
6. To study the export trend of *kokum* fruits and its products.
7. To document the constraints experienced in *kokum* production processing, marketing and suggest suitable policy measures

Methodology

The study is based on both primary and secondary data to fulfill the objectives. Primary data were obtained from farmers, processors, and market functionaries. However, a sampling frame was constructed and pre-tested scheduled was used to gather data by personal interview method.

In case of sampling frame for the *kokum* growers, following the purposive selection of Ratnagiri and Sindhudurg district, five taluks in each district and twelve *kokum* growers from each taluks were chosen at random, thus an total sample consists of 120 growers respondents.

In case of different market functionaries, 50 percent of authorized trader/dealer in five district were selected randomly. However 6 retailer, 3 itinerant merchants, 3 village traders were selected randomly from each of selected taluk. The twenty *kokum* processor were randomly selected at the rate of two processors from each taluk.

Secondary data and information were extensively used from source of State Agriculture department of respective district and Datanet India private limited, New Delhi.

The following analytical techniques were used in the study. Exponential form of growth function was used to estimate the growth in area, production, productivity and export of *kokum* and *kokum* products. Variability in *kokum* export and area, production, productivity was ascertained by using co-efficient of variation as an index of instability. Financial feasibility of investment was carried out to evaluate the feasibility of investment in *kokum* cultivation. The Cobb-Douglas type of production function was used for assessing the resource use efficiency in *kokum* production. Tabular analysis technique was used for estimation of cost, returns and margins, in order to examine the trend in export of *kokum*, the orthogonal polynomial regression was adopted, and following important results were obtained.

FINDINGS OF THE STUDY

I. Growth and Instability in *Kokum*

The growth on area and production of *kokum* increased significantly over the period (1990-2004) at both the district level and the region as a whole. The magnitude of growth rate in area and production was higher in Sindhudurg district compared to Ratnagiri. However growth in productivity was positive but non-significant in both the districts. The better price realization of *kokum* fruits and higher employment opportunities due to processing were some of the reason attributed for positive growth.

The co-efficient of variation for *kokum*, area and production was found to be higher in Ratnagiri district than Sindhudurg. This instability might be due to the existence of the option of retaining the competing other horticultural crops which relatively performed better. Where as, *kokum* productivity was observed to be relatively stable due to the systematic approach followed right from planting and good quality grafts.

II. Cultivation of *kokum*

The average *kokum* growers of the study area were middle age group with secondary education level which indicate that the growers were fairly capable of absorbing the technical knowledge. However, majority of the farmers stated that agriculture was their main occupation. The family size of sample farmers was medium type, this had influenced the growers to take suitable decision to combine the crop enterprises along with *kokum*, which was less labour intensive.

Average size of operational holding was found to be higher in Ratnagiri (13.96 ha) of which irrigated land was very low in magnitude.

The percentage of area under cultivation was found to be higher in both the districts. However, the magnitude of fallow land per farm in Ratnagiri district was higher. Permanent fallow land constituted the rock, bund, gullies and road.

The maximum share of the total assets was constituted by land and construction of residential building by *kokum* growers and very small investment was on livestock, engine

house, store house, machineries, implements and hand tools. This could be attributed to smaller sized, nature and capacities of the respective activities.

The average gross cropped area was 5.11 ha. and cropping intensity was ranging from 104.00 percent to 131.38 percent for the sample *kokum* farmer in the study area, however the horticultural crops were dominated over all others crops in the cropping system of the growers because of the agro-climatic and land terrain conditions in the region. However, seasonal field crop had not entirely displaced. *Kharif* paddy and *kharif* vegetables as intercrops in perennial ensured the food and income security to *kokum* growers.

The *kokum* seed origin plantation dominated in both the districts as compared to grafted planting material of *kokum*. The main reason attributed towards this type of preference could be delay in standardization of grafting technique procedure for *kokum* propagation. In Ratnagiri district, cultivation of *kokum* orchard attracted the attention of sample growers much early compared to Sindhudurg district, as a result in Ratnagiri district the highest number of *kokum* orchards (21.61%) were observed to be older (26 to 35 years) compared to Sindhudurg district.

The per hectare total establishment cost for the grafted *kokum* garden was worked out to Rs.69205.67 whereas, the total per hectare cost of establishment of seed origin *kokum* orchard was Rs.38,883.96 spread over a period of five years. The share of labour cost was observed to be lower (55.85%) in case of *kokum* orchard established by using grafted planting material than that of *kokum* orchard (61.04%) established by using seed origin planting material. The main reason for lower share of labour cost could be attributed to the development of grafted *kokum* orchard in relatively less undulated land terrain compared to high sloppy and terrain land used for seed origin *kokum* orchard.

The material cost for establishment of grafted *kokum* orchard was higher than seed origin orchard because of the higher expenditure incurred for the procurement of grafted planting material and the more use of inputs like manure and chemical fertilizers.

The annual per hectare cost of cultivation (Cost C) for grafted bearing *kokum* orchard was worked out to Rs.42,826.49, at overall level. The per hectare total cost of cultivation (Cost C) in case of Sindhudurg district was Rs.39,462.56 and in Ratnagiri district Rs.51,165.20. This indicated item wise cost of cultivation was substantially higher in Ratnagiri district.

The per hectare cost of cultivation of seed origin *kokum* orchard at overall level was worked out to Rs.26,424.20. In Sindhudurg it was Rs. 22,270.99 and in Ratnagiri district it was Rs.33683.51. The per hectare gross return at overall level was estimated to Rs.47,100.00 in Sindhudurg and Rs.42,763.50 in Ratnagiri district with a net profit of Rs.24,829.01 and Rs.9079.99 to respective group. The per quintal cost of cultivation was found to be higher in Ratnagiri district which accounted Rs.507.48 than Sindhudurg district (263.69).

The per hectare return from grafted orchard was comparatively higher but profitability at different cost was less than the seed origin orchard.

The per farm *kokum* production was the highest from seed origin orchard compared to grafted orchard. This was due to the earlier establishment advantage of seed origin orchards than the grafted orchards.

All the financial feasibility tests NPV, PBP, BCR, and IRR in *kokum* plantation for grafted *kokum* orchard as well as seed origin *kokum* orchard were positive indicating the *kokum* plantation is economically feasible.

The resource use efficiency analysis revealed that the variables like plants age and plant density (plant number) were statistically significant in production of grafted *kokum* orchard, indicating there is scope for diversion of fund from inputs which are excessively used towards significant inputs for optimal production of *kokum* grafts. In case of seed origin *kokum* orchard the resource use efficiency analysis shows that resources like labour and fertilizers were under utilized and elasticity of coefficient for area at overall level was observed to be negative which directed to reduce the area, and coefficient of plant numbers indicated to increase the tree density for better performance.

At overall level, the average per farm *kokum* fruits production was arrived at 38.16 quintal. Of this average per farm production, 63.10 percent of *kokum* fruits were marketed through different market intermediaries and 31.41 percent of fruits were used for home scale processing. Among the home scale processing activities in Sindhurg district, *kokum* grower were observed to use 36.15 percent quantity for processing *kokum ghul*, while in Ratnagiri district 71.70 percent quantity was used for preparation of *lonawala kokum* by the *kokum* growers.

The per farm expenses incurred in marketing of *kokum* fruits and its processed products by the sample grower at overall level, indicated that the highest proportion of the total marketing expenses was incurred (59.69%) on packing material followed by transport and other expenses, which was directly proportionate to quantity processed by the growers.

III) *Kokum* processing

The majority of the *kokum* processing units in the study area belong to small scale group having annual processing capacity of 50 to 100 MT. These processing units were established much early and were managed by individual proprietorship.

At overall level, for the *kokum* processed products, the requirement of working capital ranged between 73.77 percent to 87.16 percent of the total capital investment. Thus the *kokum* processing unit in the study area was more working capital intensive, whose share in the total investment (Rs.247650.20) was 86 percent for working capital and 14 percent for the fixed capital which indicated the direct relationship between extent of capital invested and quantities of the processed products produced.

It was revealed that, in the study area the total capacity utilized in large scale unit for processing the raw material was 673 tonnes, in small scale 64.00 tonnes, in cottage scale 50.25 tonnes, and in home scale 24.00 tonnes. It was also observed that, in all the categories of the processing units, out of the created total capacities for processing, the maximum share was devoted for processing of *kokum* based raw material than compared to non-*kokum* products. This may be due to better comparative advantage of *kokum* cultivation and the less fixed capital intensive investment pattern followed in the establishment of the processing unit.

The average procurement cost of raw material at processing unit level was found to be Rs.447755.50. Out of that 58.20 percent cost was incurred on *kokum* syrup processing unit, which was followed by *kokum agal* (31.27%), *kokum* rind (7.41%) and *kokum* RTS (3.12%) revealed that large share of the raw material cost was incurred towards the production of *kokum* syrup due to the higher demand from market.

The average employment generated in a season per processing unit was 4770 mandays, employment was generated in a season. In this total mandays, temporary labour mandays (77.36%) was comparatively higher than that of permanent labour mandays (22.64%), and under the temporary labours, higher female labour were employed by the processor which indicated that in the *kokum* processing unit female labour greatly influenced the performance of processing unit. Since, this section of labour technically specialized in the preparation of recipe with desired composition enabled effective management of processing, packing and labeling activities with lower labour cost.

At an overall level, to process different *kokum* products Rs.24.62 lakh was incurred per processing unit. In this total processing cost, maximum amount of Rs.19.57 lakh was incurred in the processing of raw material to produce 69907.05 litres of *kokum* syrup. and it was followed by Rs.3.75 lakh for processing of 18704.74 litre of *kokum agal*, Rs.0.75 lakh for processing of 50000 packets of 200 ml capacity *kokum* RTS and Rs.0.54 lakh for processing of 2914.50 kg of *kokum* rind. However, at ex-processing unit level the price received were Rs.37.14 per litre of *kokum* syrup Rs.26.04 per litre of *kokum agal*, Rs.38.46 per kg of *kokum* rind and Rs.3.50 per 200 ml packet of *kokum* RTS. Therefore per processing unit the highest net return (Rs.6.83 lakh) was realized from the processed *kokum* syrup. It was also revealed that, the value addition in *kokum* fruit by preparing *kokum* syrup was Rs.33.81 per litre, which was observed to be maximum when compared with *kokum* rind (27.00 per kg), *kokum agal* (Rs.18.55 per litre) and *kokum* RTS (Rs.3.72 per 100 ml of packet). Therefore in *kokum* raw material based processing activities, the value addition need to be encouraged to processed raw material into *kokum* syrup.

It was observed that the rate of capital turn over was 134.91 percent with *kokum* syrup, 129.65 percent in *kokum agal*, 305.31 percent in *kokum* rind unit and 266.55 percent in *kokum* RTS; where as at overall processing unit level the rate of capital turn over was 141.89 percent, indicating that processing of *kokum* fruits into different processed product is economically profitable. Similarly with respect to return on capital investment it was the highest in (216.54%) *kokum* rind and minimum (40.20%) in *kokum* syrup, where as it was 40.96 percent in *kokum agal* and 177.82 percent in *kokum* RTS and it was 141.08 percent for the total *kokum* products indicating that *kokum* factory was quite a profitable enterprise. Capital per hundred rupee of gross income worked at to Rs.74.28, Rs.76.96, Rs.37.65 and Rs.38.68 for *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS products respectively with Rs.70.87 at total *kokum* production level which indicated that capital requirement for rind and RTS making in *kokum* processing was quite lower. The capital investment per worker at total *kokum* products level was Rs.1,27,935.61. The input output ratio was 1.35 in *kokum* syrup, 1.29 in *agal* unit, 3.05 in rind making unit and 2.66 in RTS making unit, where as it was 1.36 at the total *kokum* processed production level, indicated that capital efficiency was the highest in *kokum* rind preparation unit and lowest in *agal* making unit. The analysis inferred that *kokum* rind processing forms a protective cushion for taking up risky *kokum* processing activities having greater market demand by which sustainability of processor can be enhanced.

The labour efficiency was the highest in *kokum* syrup processing unit because the investment and production scale was higher, resulted in efficient use of labour contributed higher net return, whereas it was observed to be minimum in case of *kokum* RTS. This showed that care need to be taken in allocating the labour force among different *kokum* processing activities.

The ratio of profitability in *kokum* processing units indicates that all the processing units of the *kokum* were in a position to protect their equity and generate income on equity. The ratio of net profit to fixed assets was the highest (9.47) in *kokum* RTS unit due to its lower level of investment made in the fixed assets compared to 2.21 and 6.40 in *kokum* syrup and rind. Ratio of net profit to sale was the highest 0.63 in *kokum* rind making followed by *kokum* RTS (0.58), syrup (0.22) and *agal* (0.19) indicating *kokum* fruit processing was more economically feasible.

The production in each category of *kokum* unit was higher than the break-even point of production. It was found to be three times higher in *kokum* syrup and *agal* unit, two times more in *kokum* rind unit and fifteen times higher in *kokum* RTS unit indicating all activities were generating higher profit at processing unit level.

IV) *Kokum* marketing

The marketing cost incurred by the *kokum* growers was found to be the highest in *lonawala kokum* and *kokum ghul* (Rs.35.00 per quintal each) followed by *kokum* fruits (Rs.30.00 per quintal) and *kokum* seed (Rs.25.00 per quintal). The higher magnitude of total cost with respect to *lonawala kokum* and *kokum ghul* was due to higher handling and labour charges requirement.

In case of *kokum* processors, the processed product like *kokum* syrup and *kokum agal* incurred the highest marketing cost (Rs.1.88 per litre) compared to other processed products viz., *kokum* RTS (Rs.0.10 per packet) and *kokum* rind (Rs.0.50 per kg), this was due to the expenditure incurred on packing material, handling charges, telephone and transport charges which significantly influence the overall total marketing cost.

In the study area, the village trader was observed to be the only intermediary for marketing of *kokum* fruits, whereas for *kokum* seed and *lonawala kokum*, itinerant, village trader and traders form as three marketing intermediaries, while itinerant was not observed in the marketing of *kokum ghul*.

Marketing cost incurred by different intermediaries viz., retailer and dealer for the sale of processed *kokum* products indicated Rs.480 per 100 litre of *kokum* syrup incurred as a total marketing cost by the retailer only, whereas dealer and retailer were engaged in case of *kokum agal* and *kokum* rind marketing, indicating total marketing cost for these two products were higher at retailer level due to higher transportation and other costs.

It was revealed that, the average producers' share in processor's rupee was observed to be 59.33 percent in channel-III, when *kokum* fruits were sold through village trader only. Whereas in case of *kokum* seed marketing, the grower had maximum share of 71.58 percent in processor's rupee under channel-I when the *kokum* seed sold to processors through the trader and it was also observed that itinerants were more profit oriented market intermediary and earn profit margin of Rs.20.63 per kg of *kokum* seed in channel-I.

In case of marketing of half processed *kokum* products like *lonawala kokum* and *kokum ghul*. The producer's share in processor's rupee was observed to be maximum in case of channel-I when these products were sold through traders only as compared to channel-III and channel-II. The sale of processed *kokum* products like *kokum* syrup and *kokum* RTS mainly resorted to only channel-I, where processor's share in consumer's rupee was observed to be maximum (75.64%) with respect to *kokum* syrup as compared to *kokum* RTS (68.0%). The main reason for this was attributed to the maximum net price received from *kokum* syrup.

The processors sold *kokum agal* and *kokum rind* directly to the consumer under channel-I while in channel-II this was marketed through dealer. With the addition of dealers margin to the processor's price of *kokum agal* and *kokum rind* in channel-II, the processor's share in consumer rupee was reduced which indicated that involvement of dealer in the marketing of these products influenced the processors share and net price of the *kokum* processors.

V) *Kokum* export

The compound growth rate with respect to quantity and value of *kokum* product export from India to major importing countries clearly indicated that, the quantity of export in *kokum* was negative (-0.07%), while it was positive (0.52%) but non-significant for other importing countries, this may be attributed to the constant level of processed *kokum* products and increase in demand for *kokum* products to other importing countries which were demanding *kokum* product recently. Though the growth rate for overall total export of *kokum* processed products was observed to be negative, the corresponding growth rate for value was observed to be positive but non-significant. This was due to the type of *kokum* products exported and price fluctuation in international market.

Export of *kokum* products in term of quantity and value were relatively unstable to all the countries. Instability in quantity exported was observed in case of U.K. (187.07%), U.S.A. (166.37%), other countries (107.88%), Oman (77.58), Australia (75.2%) and UAE (66.57). Imposition of phyto-sanitary measures in the interim and deficient production of *kokum* product like butter caused the instability for U.K. and U.S.A., while the presence of Indian migrant population was the reason for the relative stability in the U.A.E. and Oman. Instability in prices was not similar to that of quantity export except in case of Oman where the fluctuation in price was stable.

VI) Constraint in *Kokum* production

Labour shortage, late bearing, wastage of fruits for want of processing, laborious processing procedure and problems of stray cattle were the major constraints in the *kokum* orchard plantation as perceived by the *kokum* growers. Among the marketing problems low prices rates to fruits, no demand for fruits, no standard grades followed in market for the processed products and malpractices by the intermediaries were the major constraints as opined by the *kokum* growers. However, irregular supply of electricity and water, no incentive by government, high taxes and duties, inadequate infrastructure, high marketing expenses and labour shortage during peak period of processing were the major problems faced by the *kokum* processors. The most arresting problems faced by the market functionaries were delay in payment, high transportation cost, price fluctuation and improper market information.

POLICY IMPLICATIONS

1. As the *kokum* plantation is profitable in the study area, and National Horticulture Mission has given main attention towards the value addition of horticultural products, this crop has to continue under on going Horticultural Development Programme in Employment Guarantee Scheme of Maharashtra state. In this regard it is necessary to build up high quality scientific and technical man power to undertake problems of management of *kokum* plantation and create training facilities for the benefit of

farmers in post harvest management and there is need to conduct research on the preparation of new value added *kokum* products.

2. The *kokum* growers, who were willing to expand their plantation and those who want to replace their grafts, mainly complained the non-availability of sufficient number of grafts and incidence of high mortality in the initial years of planting, the major constrains for the development of new plantation of *kokum*. Hence, the Government through Horticultural development programme should ensure quality grafts with the collaborative efforts of nurseries and SAU's. Further research efforts are required at SAU's level for the standardization of plant propagation methods and evolution of suitable dwarf varieties to overcome the harvesting problem of fruits.
3. As the *kokum* fruits and its different products are marketed through various market intermediaries, the producer's share in consumer's rupee was very low in some products, therefore to eliminate such intermediaries; Government has to take initiatives to establish modern organizational set up for marketing of *kokum* products and effort should be taken for establishment of collection centers at local level through self-help groups operated in the region.
4. This crop has good commercial potential and the area under this crop is significantly increasing in the study area, hence Government should plan for establishing new processing units and arrange marketing set up in the region to safeguard the interest of *kokum* growers and processors.
5. As the growth rate in export of *kokum* product had declined over the period of time, Government should maintain codex and branding for high quality standards of the *kokum* product like *kokum* butter which fetches higher prices. Government should organize seminars and workshops cum exhibitions in different parts of the country for introducing and popularizing the different *kokum* products, refreshing health drinks and its medicinal importance.

REFERENCES

- Abdul Salam, M., 1997, Cashew plantation – Establishment and management. *The Cashew*, **11**(3): 13-32.
- Alagh, Y.K. and Sharma, P.S., 1980, Growth of crop production: 1960-61 to 1978-79, is it decelerating. *Indian Journal of Agricultural Economics*, **35**(2): 104-108.
- Ananth, G.S., 1984, Performance appraisal of Bangalore Grape Grower Marketing and Processing Co-operative Society Ltd., Lalbagh, Bangalore, Karnataka – A case study *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.
- Anantram Verma., 1989, Economics of processing and marketing of gur in the district of Indore (Madhya Pradesh). *Indian Journal of Agricultural Economics*, **44**:369.
- Anonymous., 1977, *Indian Food Packer*. **3**(1): 24-53.
- Anonymous., 1981, Cost of production of Alphonso mango. Research Highlights 1972 – 1980. Publication of Konkan Krishi Vidyapeeth, Dapoli, pp.50–51.
- Anonymous., 1989, Package of practices in mango production. *Annual Report*, Department of Horticulture, Bangalore, Karnataka, : 10 – 12.
- Ansari, A.A.,1990, Organisation and Management in Co-operative Sugar Mills of Uttara Pradesh. *The Maharashtra Co-operative Quarterly*, **73**: 162-170.
- Anthony, J.I.X. 1997, *Garcinia indica* - A natural fat regulating Beverage. *Beverage and Food World*, **24**(3): 24-25.
- Apparao, R. and Krishnaiah, J., 2001, Cost of production of cashew nut in Srikakulam district of andhra Pradesh. *The Cashew*, **15**(1): 21-28.
- Balasubramaniam, P.P., and Rema, M., 1996, Pricing and Transaction Trend of Raw Cashewnut in India. *The Cashew*, **10**(4): 13-19.
- Balasubramaniam, D., 2003, Cashew nut processing and its economic feasibility in Kolar district of Karnataka – A case study. *The Cashew*, **17**(4): 6-11.
- Birari, K.S., 1981, Study of economics of production and marketing of banana in Jalgaon district: *M.Sc. Thesis*, University of Agricultural Sciences, Rahuri
- Bisen, R.K., Annu Chandraker, Sanjay Verma and B.S. Thakur., 2003, Studies on intercropping and cultural practices on growth and yield of mango orchard. In Abstract of National Seminar on “Mango Challenges In Management of Production, Post-Harvest, Processing and Marketing” organized by Gujarat Agricultural University, Junagadh on 14 - 15 June, 2003, p.39.
- Borude, S.G., G.G. Thakare and S.S. Wadkar., 1990, Economics of mango production in the Konkan region. A paper presented in the seminar on “Strategies for increasing mango production” organized by Konkan Krishi Vidyapeeth, Dapoli on 22–23 March, 1990, pp.201–207.
- Chand, R. and Tewari, S.C.,1991, Growth and instability of Indian exports and imports of Agricultural. *Indian Journal of Agricultural Economics*, **46**(2): 159-165.
- Chengappa, P. G., 1981, Growth rates of area, production and productivity of coffee in India. *Journal of Coffee Research*, **11**(2): 19-26.
- Dalvi, V.D., 1989, Economics of production, marketing and processing of cashewnut in Sindhudurg district. *M.Sc.(Agri.) Thesis*, Konkan Krishi Vidyapeeth, Dapoli.
- Dalvi, V.D., Thakare, G.G. and Borude, S.G., 1992, Economics of processing cashewnut in Sindhudurg district of Maharashtra State. *The Cashew*, **6**(3): 14-19.
- Dalvi, V.D., Thakare, G.G. and Borude, S. G., 1992, Economics of processing cashewnut in Sindhudurg district of Maharashtra state.: *The Cashew*, **6**(3): 14-19.
- Dangat, S.B., Rahane,R.K. Kasar D.V., 1997, Marketing and export of grapes from Maharashtra: A case study. *Indian Journal of Agricultural Marketing*, **11**(3): 202-207.

- Dass, S.R. Vashisht, A.K. and Singh C., 1985, Quantum, unit value and export value of coffee exports. *Agricultural Situation in India*, **39**(10): 175-755.
- Davis, C.G., Mathis, W. K. and Futa, M.T., 1980, The determinants of instability of agricultural export earning in sub-saharan Africa Economics, 1950-1973. *Social and Economic Studies*, **29**(213): 89–106.
- Dayakar, Rao. B., 2003, Trend in production, price and market arrivals of Sorghum Vs. Competing crops – An critical Analysis:
- Deepak Shah., 2000, Production and Marketing pattern of Grape in Maharashtra. *Indian Journal of Agricultural Marketing*, **14**(1): 40-49.
- Dhage, S.K. and Rahane, R.K., 2003 Marketing of Grapes in Nashik district. *Indian Journal of Agricultural Marketing*, **17**(1): 93-99.
- Flink, J.A., Grunewald, D., 1969. *Managerial Finance*. John Wiley and sons, Inc. New York and London, pp. 71-111.
- Gangwar, L.S., Dinesh Singh and Gautam Mandal, 2008, Economic Evaluation of Peach Cultivation on North Indian Plains. *Agricultural Economics Research Review*, **21**. 123-129
- Gawankar, M.S., Shingare, D. V., Patil, B. P., Sagavekar V.V and Wadakar S.S., 2005, Economic Evaluation of Rainfed Aonla cultivation in Konkan region of Maharashtra: *Indian Journal of Agricultural Marketing*, **19**(1): 73-78.
- Gemtesa, K., 1991, An analysis of the structure of Ethiopian Coffee. *M.Sc. (Agri.) Thesis*, University of Agril. Sciences, Bangalore.
- Gulnagolmath, K.C., Hiremath, G. K. Basavraj, H. and Kulkarni, V., 2002, Mango cultivation in Dharwad district - An analysis of cost and resource productivity. *Indian Journal of Agricultural Marketing*, **10**(2): 148-152.
- Gupta S. and Mueller, R.A.E., 1982, Inter-temporal pricing efficiency in agricultural markets. The case of slaughter hogs in west. West Germany. *European Review of Agricultural Economics*, **9**(1): 2-40.
- Gupta S.P. and Prashant D.S., 2004, Marketing and Processing of cashew nut in Goa state: An Economic analysis. *Agricultural Marketing*, **97**(1): 20-29.
- Gupta, V.K., Gopalswamy, T.P. and Mathur, D.P., 1971, *Setting up of modern rice mills*. Indian Institute of Management, Ahmedabad.
- Gurao, S.M., 1993, Economics of investment in mango plantation in Ratnagiri district. *M.Sc. (Agri.) Thesis*, Konkan Krishi Vidyapeeth, Dapoli.
- Hassan, A. and Raghuram, P., 1987, Cashew processing and marketing *Agricultural Marketing*. **30**: 13-19
- Hemchand Jain, 1989, Economics of processing units of arhar pulse in Narasinghpur district of Madhya Pradesh *Indian Journal of Agricultural Economics*, **44**(4): 317-318.
- Hopkin, J.A., Barry, P.J. and Baker, C.B., 1973, *Financial Management in Agriculture*. The Inter State Printers and Publishers Inc. Illinois, USA, pp.377-396.
- Hosmani, B.S., 1995, Performance and impact of Regional Rural Banks – A case study of Malaprabha Grameena Bank in Karnataka. *Ph.D. Thesis*, University of Agricultural Sciences, Dharwad.
- Ipte, P.G. and Borude, S.G., 1982, Economics of marketing and processing of cashewnut in Ratnagiri/Sindhudurg Districts (Maharashtra State). *Cashew Causeerie*, **4**: 22-27.
- Jalajakshi, C.K., 1994, Export of Shrimps from India – An economic analysis. *M.Sc.(Agri.) Thesis*, University of Agricultural Sciences, Bangalore.
- Jalajakshi, C.K., 1994, Exports of shrimps from India : An economic analysis. *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.

- Jawahar Thakur., 1988, An analysis of trends, growth and technological development of oilseeds in Bihar: *Indian Journal of Agricultural Economics*, **43**(3): 464-472.
- Jayalekshmy, V.G. and Abdul Salam, M., 2001, Cost of establishment of a cashew apple processing unit and production cost of cashew apple syrup. *The Cashew*, **16**(2): 29-33
- Jeromi, P.D. and Ramanathan, A., 1993, World market and India : An analysis of growth and instability. *Indian Journal of Agricultural Economics*, **48**(1): 88-97.
- Karnik, A. R; Raorane, G. P; Kore, V. N; Joshi, G. D; 2001, Effect of shade and season on success of softwood grafting in kokum. *Proceeding of First national seminar on Kokum*, 12-13 May 2001, pp.31-35.
- Katre, R.S., M.M. Patil and D.B. Malave., 1992. Trends and variability in the export of fresh fruits and vegetables from India. *Mah. J. of Agric. Econ.*, **4** (1): 57-58.
- Khunt, K.A., Gajipara, H. M., Gadhvi, B. K. and Vekariya, S. B., 2003 Economics of Production and marketing of pomegranate. *Indian Journal of Agricultural Marketing*, **17**(1): 100-107.
- Krishnamurthy, N., Lewis, Y.S. and Ravindranath, B. 1981, On the structures of garcinol, isogarcinil and camboginal, *Tetrahedron Letters*, **22**: 793.
- Krishnamurthy, N., Lewis, Y.S. and Ravindranath, B. 1982, Chemical constituents of Kokum fruit rind, *J. Food Sci. Technol.*, **19**: 97-100.
- Kshirsagar, P.J., Waghmore, G.M., Patil, B.P. and Dalvi, M.B., 2001. Economics of establishing kokum plantation. *Proceeding of First National Seminar on Kokum*, 12-13 May 2001, pp.46-50.
- Ladaniya, M.S. and Wanjari Vinod., 2003, Marketing pattern of 'Mosambi' sweet orange in selected district of Maharashtra. *Indian Journal of Agricultural Marketing*, **17**(1): 52-62.
- Lakshman, P., Pouchepparadjou, A., and Sendhil, R., 2005. Growth and Instability: A study of pulse economy in India. *Agricultural Situation in India*, **62**(2): 101-103.
- Lancieri, E., 1979, Instability of agricultural exports : World markers developing and developed countries. *Quarterly Review*, **130**: 287-310.
- Mali, B.K., Bhosale, S.S. Shendage, P. N. and Kale, P.V., 2003, Economics of Production and Marketing of Banana in Jalgaon district of Western Maharashtra. *Indian Journal of Agricultural Marketing*, **17**(1): 173-181
- Mamatha, T.G., Gummagolmatt, K.C, and Shripad, P.V., 1999, Trend analysis in production and export of cashew in India. *The Cashew*, **16**(1): 13-17.
- Mani and Srinivasan., 1990, A study on feasibility of establishing fruit and vegetable processing plants in Tamil Nadu. *Indian Journal of Agricultural Marketing*, **20**(1):
- Mathew, P. A.; Krishnanamoorthy, B; and Rema, J; 2001, Collection and conservation of Garcinia germplasm at Indian Institute of Spices Research, Calicut, *Proceeding of First national seminar on Kokum*, 12-13 May 2001, pp.5-8.
- Mohamed, A., 1992, An analysis of fruit and vegetable processing – A comparative study of Private and Public sector units. *M.Sc. Thesis*, University of Agricultural Science, Bangalore.
- Muhammed, M., Rosen, R., Mccarty, M., Conte, A., Patil, D. and Butrynm, E., 1994, Citrin – A Revolutionary Herbal Approach to Weight Management. *New Editions Publishing*, Burlingame CA.
- Muralidharan, C.R., 1981, Comparative study of processing sugarcane into sugar, gur and khandsara – A case study in Mandya taluk, Mandya district. *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.
- Nagaraj and Prakash., 1989, Economic analysis of Karnataka fruit processing incase of Karnataka Agro Fruits Ltd. *Indian Journal of Marketing*, **19**(8-10): 9-16.

- Nagesh, A. Raikar, Shankar Murthi R.K. and Kunnal, L. B., 1990, Price spread of cashew in Karnataka. *Indian Journal of Agricultural Marketing*, **4**(2): 173-177.
- Nagesh, A.R., 1990, Investment in production and marketing of cashew in Karnataka – An economic analysis. *M.Sc. Thesis*, University of Agricultural Sciences, Dharwad.
- Nagraj, N., L. Choth and T. Prakash., 1989, Economic analysis of Karnataka fruit processing in the case of Karnataka Agro-fruits Ltd. *Indian J. Marketing*, **19**(8, 9 and 10): 9–16.
- Naik, V.G., 2005, An Economic analysis of mango Production, Processing and Export in South Konkan region of the Maharashtra. *Ph.D. Thesis*, University of Agricultural Sciences, Dapoli.
- Natarajan, R., Ganshyam Dass, O. and Krishna Reddy, K., 1980, Working of consumers co-operatives in andhra Pradesh – A case study. *Indian Co-operative Review*, **18**(1): 7-20.
- Navadkar, D.S. Sale, D.L. and Patil, U.D. 2005, Marketing of Vegetables Grown Around Pune City. *Agricultural Situation in India*, **62**(3): 259-262.
- Page, R.E., Schermerhorn, R.W. and Romine, B.D., 1970, Financial analysis of grain and supply co-operative in Oklahoma. *Co-operative Extension Service*, Oklahoma, State University Oklahoma, USA
- Pagire, B.V., 2000, Marketing of grape: Factor responsible for variation in the net price received for grape from Nashik district. *Indian Journal of Agricultural Marketing*, **14**(2): 77-80.
- Pal, S., 1992, Agricultural Exports of India: Issues of Growth and Instability. *Indian J. Agric. Econ.*, **47**(2): 185-194.
- Pant, D.C. and Pradeep Pal, 2004, Comparative Economic of Agro-Processing units for groundnuts in southern Rajasthan. *Indian Journal of Agricultural Marketing*, **18**(1): 50-57.
- Pant, P.G. and Thakare, R.P., 1997 Employment generation through cashew nut and cashew apple processing factories in Goa State. *The Cashew*, **11**(3): 12-14.
- Paranjape, A.L. and Borade, S.G., 1978 Resource productivity in Alphonso mango production in Deogad tehasil of Ratnagiri district of Maharashtra.:*Collage Magazine*, Collage of Agril. Dapoli, **78**: 36-42.
- Pawar. B. P.1996, Economics of processing of kokum fruits in South Konkan region of Maharashtra state. *M.Sc. Thesis*, University of Agricultural Sciences, Dapoli.
- Parasher, R.S. and S.K. Bahl., 1998, Growth and instability in Himachal Pradesh agriculture – decomposition analysis. *The Bihar J. Agric. Marketing*, **6**(1): 43–49.
- Prakash, T.N., 1986, A study on supply response, market margins and growth rates of Indian Coffee. *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.
- Rane, A..A, Bagade, S.R., Patil, B.P. and Waghmare, G.M., 2001, Economics of kokum cultivation – A case study. *Proceeding of First National Seminar on Kokum* 12-13 May 2001, p.51.
- Rao, S.A.R., 1985, An analysis of business performance of CAMPOC Ltd., Mangalore *M.Sc. Thesis*, University of Agricultural Sciences, Bangalore.
- Reddy Indrasena, 1994, Financial performance of co-operative banks – A ccase study. *Agricultural Banker*, **18**(2): 17-26.
- Sarkar, B., Bnath, S.C. and Debnath, S., 1989, Problem and Prospect of cashew (*Anacardium occidentale* L.) in Tripura. *The Cashew*, **3**(1): 19-21.
- Sham Singh, Krishnamurthi.S., Katyal, S. L.,1967, "Importance of Fruit Industry." A Book "Fruit Culture in India" Published by Indian Council of Agriculture Research, New Delhi, pp.1-6.

- Shanmugavelu, K. G., 1987, "Importance of Fruit Growing in India" A Book "Production Technology of Fruit Crops." Published by SBA publications Calcutta, pp.1-8
- Sharma, R.K., Chauhan, S. K. and Sonica Gupta., 2008, Technical efficiency in north-western Himalaya region: A study of Himachal Pradesh Agriculture. *Agricultural Economics Review*, **21**: 82-90
- Sidhu, J.S. and Sidhu, R.S., 1988, Growth and Area response of commercial crops in Punjab: Some policy Issues. *Indian Journal of Agricultural Economics*, **43**(3): 473.
- Singh, B. and Sindhu, D. S., 1974, Economics of scale in groundnut processing industry in Punjab. *Agricultural Marketing*, **17**: 18-26.
- Singh, B.B., Singh, R.K.P, Singh, D. K. and Roy, D.P., 1990, Marketing of Pineapple in North Tripura. *Indian Journal of Agricultural Marketing*, **4**(2): 212-217.
- Singh, C. and V.C. Mathur., 1994, Growth and instability in production and prices of potato in India. *Agricultural Situation in India*, **44**(6): 429 - 436.
- Sivanandam, R., Kandaswamy, A. and Ramaswamy, C., 1980., Economics of forest plantations – Cashew. *Kisan World*, **7**: 40-42.
- Sivanatham, M., Pugalendhi, L. Jeeva, S and Somasunderam, D., 1990, An economic analysis of cashew cultivation in South Arcot district, Tamil Nadu: *The Cashew*, **4**(1): 11-19.
- Srilatha, C.H., Narender. I., Krishna G. V., Rao and. Eswaraprasad, Y., 2003, An analysis of seed production in India with special reference to andhra Pradesh. *Indian Journal Agriculture Marketing, Conf. Spl.*, **17**(3): 243-249.
- Subha Rao, D.V. and Nageshwara Rao., 1986, An analysis of growth in area, production and productivity of barley and tobacco. *Agricultural Situation in India*, **11**(10): 900-903.
- Talathi, J.M., Naik, V.C. and Wadkar, S.S., 2001, *Kokum* plantation – A boost to the Konkan economy. *Proceeding of First National Seminar on Kokum*, 12-13 May 2001, pp.72-77.
- Talathi, J.M., S.S. Wadkar and H.K Patil., 2003, Variability in mango exports and export competitiveness. In Abstract on National Seminar on "Mango Challenges in management of production, post-harvest, processing and marketing" organized by Gujarat Agricultural University, Junagadh on 14-15 June, 2003, p.122.
- Thakare, G.G., 1990, Agro-Horticultural extension management strategies for increasing mango production. A paper presented in the seminar on 'Strategies for increasing mango production' organized by Konkan Krishi Vidyapeeth, Dapoli on 22–23 March, 1990.
- Thakur, J., Singh, D.K. and Roy, M., 1988, An analysis of trends, growth and technological development of oil seeds in Bihar. *Indian Journal of Agricultural Economics*, **43**(3): 464-472.
- Thomas, E.K. and S.K. Gupta., 1987, Economics of banana cultivation. A case study in Kottayam district of Kerala. *Indian J. Agric. Econ.*, **42**(3): 458.
- Tripathi, R.S., 1997, Role of grading and packing in price spread of Apple fruits: A case study of U.P. Hills. *Indian Journal of Agricultural Marketing*, **11**(1&2): 6-13.
- Tripathy, S., P.N. Pradhan and S.N. Mishra., 1998, An analysis of growth and instability of pulses production in Orissa. *The Bihar J. Agric. Marketing*, **6**(2): 211 - 219.
- Varghese, P.K., 2004, Trend analysis in area, production, productivity and price behaviour of cardamom in Kerala. *Indian Journal of Agricultural Economics*, **59**(4):798-807.
- Veerkar, P.D. and Borude, S.G., 1990, Comparative economics of scale of processing Alphonso mango into pulp in Ratnagiri district of Maharashtra. *Indian Journal of Agricultural Marketing*, **4**(1): 15-18.
- Veerkar, P.D. and Borude, S.G., 1993, Economics of mango products in Ratnagiri district (Maharashtra). *Journal of Maharashtra Agricultural Universities*, **20**(1): 105-108.

- Veerkar, P.D. and Borude, S.G., 1995, Economics of mango products in Ratnagiri district (Maharashtra) *Maharashtra Agricultural Univ. Journal*, **20**(1): 105-108.
- Veerkar, P.D. and S.G. Borude., 1995, Economics of mango products in Ratnagiri district. *J. Mah. Agric. Univ.*, **20**(1): 105 – 108.
- Veerkar, P.D., Wadkar S.S., Patil H.K. and Dalvi M.B., 2001, Constraint analysis in kokum processing industry. *Proceedings of First National Seminar on Kokum*, 12-13 May 2001, pp.78-80.
- Venkatesa Palanichamy N. and Suresh Kumar D., 1994, Cashew Exports in India – An Analysis of issues and performance. *The Cashew*, **8**(1): 15-17.
- Venna, U.M., 1992, An economic analysis of Indian coffee exports. *M.Sc.(Agri.) Thesis*, University of Agril. Sciences, Bangalore.
- Wadhvani M.K. and Bhogal T.S., 2003, Economics of production, post harvest management and price behavior of cole crops in western U.P. An Empirical Analysis. *Agricultural Marketing*, **156**(1): ISSN-002-1555
- Wadkar, S.S., Talathi, J.M., Dalvi, M.B., Pawar, M.B. and Naik, K.V., 2001, Economic analysis of kokum fruit processing units. *Proceedings of First National Seminar on Kokum*, 12-13 May 2001, pp.63-71.
- Wadkar, S.S., Talathi, J.M., Patil, H.K., Dalvi, M.B., and Pawar, M.B., 2001, Economic of processing of kokum fruits at household level. *Proceedings of First National Seminar on Kokum*, 12-13 May 2001, pp.55-62.
- Wadkar, S.S., Talathi, J.M. and Torane S. R., 2005, Performance of cashew Exports from India. *Agricultural Marketing*, **98**(1):24-27.
- Yasodha, N. and Padmanaban, N.R., 1996, Selling behaviour of coconut growers in Tamil Nadu. *Indian Journal of Agricultural Marketing*, **10**(3):97-100.
- Yogindar, K. Alagh and P.S. Sharma., 1980, Growth of crop production : 1960-61 to 1978-79 Is it decreasing?: *Indian Journal of Agricultural Economics*, **35**(1):104-118.

APPENDIX I

Recommended package of practices for *kokum* plant (*Garcinia indica* Choisy)

Kokum (*Garcinia indica* choisy) belongs to family cruciaceae. Being a pyramid shaped, evergreen tree, it is a good choice for avenues. Reliable information regarding the area of this fruit crops in India is lacking, because it is seldomly planted in the form of an orchard and generally scattered trees are found in coconut and arecanut gardens and on waste lands.

Botany : *Kokum* (*Garcinia indica* choisy) belongs to family cruciaceae (2n=54). There are approximately 400 species of *Garcinia* identified so far, of which 40 are known to be edible. About 30 species occur in India. Amongst them *G.cambogia*, *G.morella* and *G.indica* yield non-drying edible fat. *G.mangostena* is considered to be the most delicious among the tropical fruits. The fruit is used as desert. It can be made into preserves. A full grown tree of *kokum* attains a height of about 16 to 20 meters. The leaves are ovate or oblong, lanceolate. The fruit is generally globose or spherical and dark purple when ripe. The flowering commences from October-November and is staggered till February-March. The ripening period starts in February and continues upto June.

Karnik and Gunjate (1978) studied floral biology in *kokum*. Maximum dehiscence of anthers takes place between 6 a.m. to 8 a.m. The dehiscence of anthers takes place 15 to 20 minutes prior to anthesis of flowers. Wind appears to be an important agent of pollination in *kokum*. *Kokum* being predominantly dioecious plant. Cross pollination of the flowers on female trees is essential. Very high percentage (68-78%) of female flowers of *kokum* set fruits and require at least 10 per cent of male trees in a garden.

Soil and Climate : Being a tropical crop, it grows well within a temperature range of 25°C to 30°C and thrives best in an area receiving annual rainfall between 2000 to 3000 mm. It is a hardy crop and can be grown well in all types of soils like acidic soils, lateritic soils with poor fertility. The only prerequisite is a well drained soil. Luxurious growth and high yield potential is observed under konkan condition, having warm and humid climate.

Varietal Improvement : Though there are no named and clonally propagated varieties of this crop, continuous work on screening of seedlings and maintenance of germplasm of *kokum* is in progress at various research stations of Konkan Vidyapeeth, Dapoli. Khanvilkar (1984) and Khanvilkar *et.al.* (1986, 1987) made an effort to evaluate central types in *kokum* and reported that genotypes 'KK-87', 'KK-155', 'KK-149' and 'KK-153' were promising in respect of fruit yield and fruit number. At Regional Fruit Research Station, Vengurla 43 early bearing, high yielding and bold sized fruit types have been collected since 1991 and maintained at germplasm block. Recently, Konkan Krishi Vidyapeeth has released *kokum* variety under the name 'Konkan Amrita' having fruit wt. of about 30 gms.

Propagations : Earlier, it was a common practice to propagate *Kokum* on commercial scale by seeds, which shows a lot of variation in yield potential and quality of fruits due to cross pollination. On account of its dioecious nature, seedling progeny gives 50% of each sex. The sex of the seedling can be determined only when it starts flowering (i.e. after 6 to 8 years). To overcome this problem vegetative propagation methods like inarch grafting and softwood grafting have been standardized by the Konkan Krishi Vidyapeeth, Dapoli. Inarch grafting with 10 to 18 months old seedlings gives 90% success, when done in the months of December-January. Recently, softwood grafting has been found to be successful and easier than inarching. According to Haldankar *et.al.* (1985) revealed that October was the best season for softwood grafting and the grafts could be successfully maintained either in glass house or under open sun after grating.

Preparation of land and planting : Before planting, the area should be cleared by removing bushes and trees. In the month of April-May, pits of 60 x 60 x 60cm are dug at 6 x 6 m spacing and are filled up with good soil and about 10 kg F.Y.M. In each pit about 100 g of 4% Lenden powder may be added to protect seedlings from termite attack. At the onset of monsoon, one year old vigorously growing seedling or graft is planted per pit by mixing 1 kg

Single Super Phosphate in the pit. At the time of planting rootball should be kept intact and graft union should be kept above the soil surface.

Aftercare : After planting, seedlings/grafts are required to be protected from stray cattles. In the first year young seedlings should be protected from scorching heat by providing overhead shade from October onwards. Hand weeding or chemical weed control using Gramoxone @ 4 ml/lit. + 2% urea is necessary to control the weeds and to allow good growth of grafts/seedlings. For initial two years, about 15 litres of water be given per week per plant during winter and summer months. Mulching of dry grass may be done in the basin of plant to conserve the soil moisture. Most of the time water sprouts are seen below the graft joint, if the grafts have been planted. These watershoots are to be removed as and when observed.

Manures and fertilizers : Since *kokum* is a perennial crop bearing fruits every year, it is necessary to give manures and fertilizers for higher yields. On ad-hoc basis, Konkan Krishi Vidyaapeeth has recommended following manure and fertilizer dose per year.

In the first year, each plant should be applied with 2 kg F.Y.M., 50 g N (125 g urea), 25 g P^2O^5 (155 g Single Super Phosphate) and 25 g, K^2O (50 g. Muriate of Potash). This dose is increased every year and from tenth year onwards each plant may be given 20 kg F.Y.M., 500g N (1.25 kg Urea), 250 g P^2O^5 (1.50 kg Single Super Phosphate) and 250 g K^2O (500 g Muriate of Potash). Manures and fertilizers are applied in a circular trench prepared under the canopy of the plant during the month of August, after the heavy rain are over.

Intercropping : During early 10 to 12 year after planting, rainfed crops like sweet potato, vegetables, flowering annuals and stylo grass can be grown as inter-crops.

Harvesting : In *kokum*, flowering starts from October-November and continues upto February. Fruits are ready for harvest during the month of March to June. When the fruits turn from green to reddish in colour, they are plucked carefully by hand. Properly cared well grown *kokum* tree from 15 years onwards yields about 30 to 50 kg fruits per year.

Pests and Diseases : *Kokum* being a hardy crop, it is seldomly affected by pests and diseases. Many times leaf miner and jacids are noticed, which can be easily controlled by spraying phosphamidon 3 ml or Dimethoate 10 ml per 10 lit. of water. 'Die-back' disease can be controlled by removing deadwood, followed by spray of 1% Bordeaux mixture.

APPENDIX II

Country-wise export performance of *Kokum* quantity in tonnes

Sl.No.	Year	U.S.A.	U.K	U.A.E	Australia	Oman	other	Total
1	1993-1994	91.3	3.3	6.9	0.3	0.3	4.6	106.7
2	1994-1995	5.2	1.7	2	0.3	0.3	8.8	18.3
3	1995-1996	20.7	5.8	2.5	0.3	0.3	7.9	37.5
4	1996-1997	6.4	2	7.7	0.3	0.3	37.1	53.8
5	1997-1998	4.2	48.6	7.8	0.3	0.3	2.2	63.4
6	1998-99	0.31	97.88	0.3	0.001	0.8	3.4	102.69
7	1999-2000	0.2	1.36	4.5	0.22	0.33	10	16.61
8	2000-01	4.47	2.49	0.2	0.07	1.1	47	55.33
9	2001-02	0.3	0.001	5.65	0.001	0.17	16.05	22.17
10	2002-03	26.16	4.49	3.37	0.001	0.001	74.72	108.74

APPENDIX III

Country-wise export performance of *kokum* quantity in value (Rs. 000)

Sl. No.	Year	U.S.A.	U.K	U.A.E	Australia	Oman	other	Total
1	1993-1994	1825.7	175.4	137.8	16.1	11.1	131.1	2297.2
2	1994-1995	158.3	108.1	64	14.1	21.3	113.4	479.2
3	1995-1996	882.6	133.3	137.5	3.8	27.6	636.6	1821.4
4	1996-1997	163.3	117.8	244.8	92.2	10.2	2500.3	3128.6
5	1997-1998	249	5583.7	357.8	0.001	0.001	156.8	6355.1
6	1998-1999	31	1582	14	0.1	33	10763	12423
7	1999-2000	18	109	220	13	42	1383	1785
8	2000-01	429	117	16	7	49	2717	3335
9	2001-02	0.14	0.1	120	0.1	17	605	756
10	2002-03	9448	491	190	0.1	0.1	3627	13756

APPENDIX IV

Area and Production of *kokum* cultivation under Sindhudurg and Ratnagiri District

(Area in hectares, Production in tonnes)

Year	Sindhudurg District		Ratnagiri District		Productivity of Konkan region
	Area	Production	Area	Production	
1990-91	1.71	19.152	40	448	11.2
1991-92	4.36	46.652	40	428	10.7
1992-93	11.56	129.472	40	448	11.2
1993-94	12.66	140.526	40	444	11.1
1994-95	13.21	145.31	40	440	11
1995-96	22.24	233.52	42.34	420	10.5
1996-97	24.58	275.296	49.71	448	11.2
1997-98	27.55	297.54	58.21	457.272	10.8
1998-99	35.31	395.472	76.17	556.752	11.2
1999-00	59.56	1072.08	95.31	1047.78	18
2000-01	67.51	783.116	115.79	883.572	11.6
2001-02	76.72	943.656	128.94	1172.313	12.3
2002-03	85.54	915.278	138.69	1238.953	10.7
2003-04	103.06	1089.3442	148.82	1362.8958	10.57
TOTAL	545.57	6486.4142	1053.98	9795.5378	162.07

APPENDIX V

Districtwise and Talukawise area under *kokum* cultivation 2003-04

Sl. No.	Districts							
	Ratnagiri		Sindhudurg		Raigad		Thane	
	Talukas	Area (ha)	Talukas	Area (ha)	Talukas	Area (ha)	Talukas	Area (ha)
1.	Mandangad	1.85	Vaibhavwadi	1.60	Masala	0.01	Talasari	--
2.	Dapoli	12.37	Deogad	1.80	Srivardhan	0.50	Dahanu	--
3.	Khed	3.15	Kankawali	15.70	Poladpur	--	Palghar	0.01
4.	Chiplun	21.42	Malvan	32.50	Mangaon	0.01	Vasai	0.05
5.	Guhagar	25.18	Kudal	22.30	Tala	--	Bhivandi	--
6.	Devarukh	11.63	Vengurle	30.00	Mahad	--	Wada	--
7.	Ratnagiri	15.95	Sawantwadi	22.79	Murud	0.04	Vikramgad	--
8.	Lanja	5.15	Dodamarg	12.00	Alibag	1.20	Jawar	--
9.	Rajapur	6.36	--	--	Pen	--	Mokhada	--
10.	--	--	--	--	Panvel	--	Shahapur	--
11.	--	--	--	--	Karjat	--	Murbad	--
12.	--	--	--	--	Khalapur	--	Thane	--
13.	--	--	--	--	Uran	--	Kalyan	--
14.	--	--	--	--	Roha	--	Ulhasnagar	--
15.	--	--	--	--	Sudhagad	--	Ambarnath	--
	Total	103.06	Total	138.69	Total	1.76	Total	0.06

APPENDIX VI

SCHEDULE - A

SCHEDULE FOR KOKUM GROWERS

Information of the year 2005-2006

I. General information of kokum grower

1. Name : _____ 2. Age : _____
 3. Education : _____
 4. Village : _____ i) Rainfall:..... ii) Soil type:.....
 iii) Avg. Temp.:..... iv) Humidity:.....
 5. Taluka : _____ 6. Phone No.: _____
 7. Occupation : _____ Mobile No.: _____
 a. Main: _____ 8. Location of village from seashore:-
 b. Subsidiary : _____ Distance
 9. Size of family : _____ Type of family:.....

II. Operational holding (ha)

Sr. No.	Particulars	Irrigated (ha.)	Unirrigated (ha.)	Total (ha.)
1.	Owned			
2.	Leased in			
3.	Leased out			
	Total			
	Land revenue and other cesses (Rs.)			
	Per hectare value (Rs.)			
	Opportunity cost of Leased in land (Rs.)			
	Opportunity cost of Leased in land (Rs.)			

Age group	Male		Female		Total	
	working	Non-working	working	Non-working	working	Non-working
a) Up to 14 years						
b) Above 14 years						

III Land use pattern

Particular	Area (ha)	Returns (Rs.)
I.) Cultivated land		
II.) Fallow land		
A) Temporary fallow		
B) Permanent fallow		
1) Rocks /stones		
2) Bunds		
3) Gullies		
4) Roads		
5) Others		
Total		

IV) Cropping pattern :

A) Crops taken during last season

Sr. No.	Crop	Variety	Area (ha)	
			Irrigated	Unirrigated
I	Sole crop			
a)	Kharif season			
	1.			
	2.			
	3.			

	4. 5.			
b)	Rabi/summer season 1. 2. 3. 4.			
II	Field crop as intercrop in Perennial			
i)	Main crop:..... 1. Kharif i) ii) 2. Rabi i) ii)			
ii)	Main crop:..... 1. Kharif i) ii) 2. Rabi i) ii)			
iii)	Main crop:..... 1. Kharif i) ii) 2. Rabi i) ii)			
iv)	Main crop:..... 1. Kharif i) ii) 2. Rabi i) ii)			

B) Details of Perennial crops :

Sr. No.	Crop	Variety	Area (ha)	
			Irrigated	Unirrigated
I a)	Horticulture 1.Kokum 2 Mango 3 Cashew 4. 5. 6.			

II	Plantation crop 1 2 3 4			
III	Forestry plants 1 2 3 4 5			

C) Details of Horticultural crops :

Sr. No.	Crops	Variety	Area(ha)	No. of trees	Year of plantation	Bearing stage	Remarks/mixed or pure
1.	Kokum	1.Konkan Amrita 2. Local					
2.	Mango	1.Alphnso 2. 3 4 5					
3.	Cashew	1 2 3 4 5 6					
4.		1 2 3					
5.		1 2 3					
6.		1 2 3					
7.		1 2 3					

V. Inventory of implements and machinery :

Sr. No.	Item	Number	Present value (Rs.)	Expenditure on repairs during last year (Rs.)
1.	Plough a) Iron plough b) Wooden plough			
2.	Harrow			
3.	Bullock cart			
4.	Oil engine			
5.	Electric motor			
6.	Sprayers			
7.	Dusters			
8.	Tractor			
9.	Power tiller			
10.	Any other hand tools : a) Sickle b) Axe			

3.	Irrigation i) Diesel ii) Electricity												
4.	Repairs of basin												
5.	Manuring a) Digging of trench b) FYM												
6.	Fertilizer a) b) c)												
7.	Repairs of fence												
8.	Watching												
9.	Harvesting												
10.	Others												

e) Cost incurred for kokum orchard during fifth year onwards :

Sr. No	Particulars	Material used			Hired labour				Family labour				
		Type	Qty.	Value (Rs.)	M	F	C	B	M	F	C	B	
1.	Weeding												
2.	Mulching												
3.	Irrigation i) Diesel ii) Electricity												
4.	Repairs of basin												
5.	Manuring a) Digging of trench b) FYM												
6.	Fertilizer a) b) c)												
7.	Repairs of fence												
8.	Watching												
9.	Harvesting												
10.	Others												

XI. A) Cost and Returns from adult kokum orchard :

- i) Area : _____
- ii) Year of plantation : _____
- iii) Number of trees : _____

Particulars	2005 - Material used		
	Type	Quantity	Value (Rs.)
1. Interculturing : a) Cutting of grasses and removing of old bushes. b) Manures i) Digging of trenches for manuring ii) F.Y.M./compost iii) Others			
2. Fertilizer : a) b) c)			
3. Removal of water suckers			
4. Plant protection : a) Spraying			

Packing													
Transport													
Any other													

XVI. Market charges for quantity sold :

Sr. No.	Item	Quantity	Market	
			Rate	Amount (Rs)
1.	Octroi			
2	Market fee			
3	Commission			
4	Charity			
5	Postage			
6	Others			

XVII. Other information :

A) What is your opinion regarding bearing and yield pattern of kokum?

- I. At what stage tree starts bearing?
- II. Upto what stage it goes on increasing?
- III. Upto what stage it remain constant?
- IV. When it starts declining?
- V. When it stops bearing?

B) Do you give any special treatment ? Yes/No

F) Any special innovation of the farmer with respect to cultivation to increase the yield?

.....

2. What are problems experienced by you in production & marketing of kokum? And what are the suggestions to overcome the problems ?

	Production	Marketing
Problems	1.	
	2.	
	3.	
	4.	
	5.	
	6.	
	7.	
Suggestions	1.	
	2.	
	3.	
	4.	
	5.	
	6.	
	7.	

E) Whether the prices received are remunerative? Yes/no

F) What is the previous years price ?.....

SCHEDULE – B

SCHEDULE FOR KOKUM PROCESSING UNIT OWNERS

1. General information regarding processing unit:

a) Name of the factory : FPO Licence No. :

b) Type of ownership : Individual/Partnership/Co-operative/Any other

c) Name of owners : i) Age: ____yrs. ii) Education : _____

d) Location : i) Village : ii) Taluka :

e) i. Distance (km) from nearest bus stand:..... ii. Nearest Railway Station:.....

f) Years of establishment :

g) Category of preservation factory : Large/Small/Cottage/Home scale OR processing capacity of unit :.....

2. Capital investment in processing unit :/ Lease Rate:

Sr. No.	Item	No./Qty	Year of Purchase	Purchase Price (Rs.)	Present value (Rs.)	Life	Depreciation rate
1	Land						
2	Building						
3	Storage i. Raw material ii. Processed product						
4	Machinery and equipments						
5	Office equipments,						
6	phone etc.						
7	Furniture						
8	Vehicle						
9	Utensils a) Baskets plastic b) Baskets bamboo c) China clay jar d) Plastic jar e) Glass jar						

3) Activities related to Kokum /Items processed/preserved :

- | | |
|---------------------|--------|
| i) Dried kokum rind | Yes/No |
| ii) Kokum syrup | Yes/No |
| iii) Agal | Yes/No |
| iv) Kokum butter | Yes/No |
| v) Any other | Yes/No |

4. Working seasons /Capacity utilization of the plant:

No.	Particular	Kokum			Non-Kokum			Idle		
		When/ Months	No. of Days	Tonnage	When/ Months	No. of Days	Tonnage	When/ Months	No. of Days	Tonnage
1	Pre-processing	Jan			Jan			Jan		
		Feb			Feb			Feb		
			
			
2	Preservation	Jan			Jan			Jan		
		Feb			Feb			Feb		
			
			
3	Storage	Jan			Jan			Jan		
		Feb			Feb			Feb		
			
			
4	Packing	Jan			Jan			Jan		
		Feb			Feb			Feb		
			
			
5	Others	Jan			Jan			Jan		
		Feb			Feb			Feb		
			
			

							prod uct			sold)	(i), (ii),(iii)
1	Dried Kokum rind	Kg.	Plastic bag....kg									
2	Kokum syrup	Ltr	Plastic canltr. Bottle... ltr									
3	Kokum Agal	Ltr	Plastic can..... ltr Bottle... ltr									
4	Kokum butter	Kg	Bag...kg									
5	Any other											

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

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

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

8. Give details about process followed in processing of the products :

Sr.No.	Items	Quantity
1.	Basic material (Fruits)	
2.	Sugar	
3.	Salt	
4.	Jira	
5.	Preservatives	
6.	Procedure : a) Hand gloves (cleaning) b) Cutting of fruits c) Cleaning of utensils d) Type of utensils used for mixed products	
7.	Boiling time (min.)	
8.	Sterilization time (min.)	
9.	Any other steps followed	
10.	Cooling in cold water (time)	
11.	Storage place	

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

Sr.No.	Product	Percentage of spoilage	Nature of spoilage
1.	Dried kokum rind		
2.	Kokum syrup		
3.	Agal		
4.	Any other		

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

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

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

Sr.No.	Purpose	Source	Amount (Rs.)
1.	Purchase of equipments		
2.	Purchase of raw material		
3.	(fruits, sugar, salt etc.)		
4.	Payment of labour charges		
5.	Any other		

12. Problems : What problems do you face in the processing of kokum ?

Sr.No.	Problems	Solution/Suggestions
1	Raw material	
2	Transport	
3	Marketing	
4	Govt. policy . 1. Infrastructure 2. electricity, water, Road 3. Taxes, duties, octri. 4. Need for incentives 5.	
5	Finance	
6	Technical Assistance	
7	Labour	
8	Adoption of improved processing practices	
9	Any others	

13. How do you maintain sanitary standards? Which are they? How?

a) Location of processing unit:

- i) Near the river
- ii) In low lying area
- iii) At high elevation

- b) Is fresh water supply adequate? Yes/No
- c) Is electricity supply is adequate? Yes/No
- d) Is ventilation arrangement good? Yes/No
- e) Whether floor of the factory is of cement/tile built Yes/No
- f) At what interval do you wash the floor? _____ days
- g) Do you use any germicidal at the time of washing Yes/No
- h) What arrangement do you make for disposal of waste products?

You have any waste material utilization plant? Yes/No

- i) Do you spray any insecticide on the waste material for declaration of harmful insects? Yes/No
- j) Do you make medical check-up of your workers? Yes/No
- k) Do you provide following material to your workers? If yes, which ones?
Mask
Apron
Head wear
Hand gloves
Foot wear

14. Do you follow ISI standards or any other standard Yes/No
Prescribed in fruit product order (F.P.O.) at the time of preparation of your product?
If no, why not? (state the difficulties)

15. Future prospects for your processing plants:

- (i) Expansion of existing capacity / maintaining same / reduction / closing down
- (ii) Do you want to diversify into processing into other fruits? Yes/ No
- (iii) Do you want to add other activities to current kokum processing
(cultivation of kokum / Trading in Kokum/ Export of kokum products/ others)

3. How much money borrowed _____ and rate of interest _____
4. Which are the sources of borrowing :
- i) Money lenders
 - ii) Landlords
 - iii) Friends and relatives
 - iv) Commercial /Co-operative banks
 - v) Finance corporation
 - vi) If any other (specify)

- V. Expenditure incurred in the business :
- 1) Licence fee
 - 2) Labour charges
 - 3) Salary paid (to permanent employees)
 - 4) Market cess/commission paid
 - 5) Tax paid
 - 6) Electricity charges
 - 7) Shop rent (if rented)
 - 8) Interest on working capital
 - 9) Any other expenses (specify)

- VI. Purchase activity of kokum :
1. Which are the products of kokum that you purchase (name them)?
 2. What criteria do you follow in fixing the price?
 3. Do you consider the price prevailing in other market while quoting price for the commodity, If yes, which are the markets do you consider.
 4. What are the sources of market information?
 5. Do you know the different qualities/grades/standards of different kokum
 6. Do you grade kokum
 7. How do you grade?
 8. Do you make payment according to grades?

VII. Buying activities :

Months	From where	From whom	Methods followed	Qty. purchased	Price (Rs./qtl.)	Total value
1						
2						
3						
.						
12						

VIII . Selling activity :

Months	Place of sale	To whom sold	Methods of sale	Qty sold	Price received	Wastage	Total value
1							
2							
3							
.							
12							

IX. Cost incurred in kokum transaction :

Items	Kokum Fruit	Amrit kokum	Kokum Sole	Kokum Agal	Kokum butter	Other prodn.
1. Transport						
2. Loading and unloading						
3. Commission paid						
4. Market fee						
5. Sales/purchase tax						
6. Octri						
7. Licence						
8. Insurance						
9. Others						

X. Processing activity :

1. Building rent:_____
2. Tax paid:_____
3. Labour charges :_____
4. Electricity charges:_____
5. Depreciation:_____
6. Repair charges:_____
7. Transport cost:_____
8. Interest on borrowed funds if any:_____

XI. Services Provided by the intermediary to producers :

(i) Credit

No. of producers	Maximum duration	Total amount advanced	Rate of interest if any	Condition for advancing	Mode of recovery

(ii) Input supply

Type of input	No. of Producers	Quantity	Price per unit	Total value
Seedlings				
Fertilizers				
Pesticides				
Other (Specify)				

XII. Problems in marketing :

- a. Availability of packing material : _____
- b. Availability of transport vehicle : _____
- c. Commission to intermediaries : _____
- d. Sales tax : _____
- e. Correct/incorrect weighments : _____
- f. Price fluctuation in kokum fruits/products : Yes/No
- g. Availability of market information : _____
- h. Payment of market fees is low/high (specify) : _____
- i. Awareness about grading of kokum products : Yes/No

XIII. Problems in export :

- a. Are you aware about export of kokum products : Yes/No
If yes, to which country _____
- b. Competition/competitors : _____
- c. Market information : _____
- d. Prices of product : _____
- e. Demand for products : _____
- f. Did you get quality produce for export? Are you producing exportable quality produce?
- g. Whether government providing in assistance to this crop for export / not?
If provide what type of assistance (specify) _____
- h. Do you know about what type of produce is required for export?
- i. Did you get better price for your produce in domestic market/export market?
- j. Government policies : Satisfactory/unsatisfactory
- k. Labour policy : Satisfactory/unsatisfactory
- l. Taxes : Satisfactory/unsatisfactory
- m. Incentives : Satisfactory/unsatisfactory

PRODUCTION, PROCESSING AND MARKETING OF *KOKUM (Garcinia indica)* IN KONKAN REGION OF MAHARASHTRA – AN ECONOMIC ANALYSIS

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2008

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ABSTRACT

Kokum (Garcinia indica) is one of the most important indigenous tree spice having numerous medicinal properties. The value addition to the *kokum* fruits through processing assumes an important activity because raw/ripe fruits need to be processed before their consumption. In this context, *kokum* crop has attained the status of economical importance.

The growth rate on area and production of *kokum* increased significantly over a period (1990-2004) for both Ratnagiri and Sindhudurg districts, where in only this crop is being commercially cultivated. The per hectare cost of establishment of *kokum* orchard for initial five years was found to be higher (Rs.69,205.67) in grafted *kokum* orchard as compared to seed origin *kokum* orchard (Rs.38,883.96). The cost of production of seed origin *kokum* orchard at overall level was worked out to Rs.26,424.20 per ha whereas it was Rs.42,826.49 per ha for grafted orchard. For this cost structure *kokum* fruit production was observed to be highest in seed origin orchard compared to grafted orchard. The seed origin orchards enjoying this performance due to early orchard establishment.

The financial feasibility test in *kokum* plantation for grafted *kokum* orchard as well as seed origin *kokum* orchard were positive and indicated the *kokum* cultivation observed to be economically feasible.

The profitability ratio in *kokum*, processing units indicated that all the processing units of *kokum* were in the position to protect their equity and generated proportionately income on the particular equity. The ratio of net profit to fixed assets was highest (9.47) in *kokum* RTS unit due to its lower level of investment made in the fixed assets compared to 2.21 and 6.20 in *kokum* syrup and rind respectively. It was also observed that Rs.10,31,875.53 realized at overall level as the net return per factory by processing *kokum* fruit into *kokum* syrup, *kokum agal*, *kokum* rind and *kokum* RTS.

The processed product like *kokum* syrup and *kokum agal* incurred the highest marketing cost (Rs.1.88/litre) compared to others processed product viz., *kokum* RTS (Rs.0.10/packet) and *kokum* rind (Rs.0.50/kg) by the *kokum* processor, whereas *kokum* grower was found to be highest marketing cost in *Lonawala kokum* and *kokum ghul* (Rs.35.00/q) followed by *kokum* fruits (Rs.30.00/q) and *kokum* seed (Rs.25.00/q). For identified importing countries the export of *kokum* products from India in term of quantity and value were observed to be relatively unstable.