PRODUCTION AND MARKETING PERFORMANCE OF CHILLI IN KARNATAKA – AN ECONOMIC ANALYSIS

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By

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I. INTRODUCTION

There are over 50 spices produced in India and a good number of them are grown in the country, which are indigenous. Among them, pepper, cardamom, ginger and turmeric are important. There are few spices viz., clove, nutmeg, vanilla and certain varieties of chillies were introduced to the country.

Raju and Luckose (1991) reported that chillies were first introduced into India in 15th century and today a popular spice used on the preparation of food, preservation of food and as a medicine.

Chilli (Capsicum annuum L.) is one of the important commercial crops of India. It is a crop of tropical and sub-tropical regions and requires a warm humid climate. Though, chilli can be grown in many variety of soils, well drained loamy soils, rich in organic matter are best suited for the cultivation. There are more than fifty chilli varieties grown in India. The chillies are believed to be originated in the tropical America and known from pre-historic times in Peru. Columbus carried chilli seed to Spain in 1493. The cultivation of chilli and capsicum spread rapidly from Spain to Europe.

Chilli is an indispensable condiment of every Indian household. It is used in daily diet on one form or the other. It is a rich source of vitamin A and C with good medicinal properties. Among the spices consumed per head, dry chilli fruits constitute a major share. The pungency in chilli is due to the alkaloid ‘capsaicinoid’. It occurs in the cores or septa walls and placenta.

In India, chillies are grown in almost all states of the country. The important states growing chilli in terms of production are Andhra Pradesh (49%), Karnataka (15%), Orissa (8%), Maharashtra (6%), West Bengal (5%), Rajasthan (4%) and Tamil Nadu (3%). The total production was around 8.46 lakh tonnes from 8.30 lakh ha in the country (2002-03). In Karnataka, the production of chilli was 0.95 lakh MT from an area of 1.61 lakh ha (2002-03).

India exports chilli oleoresins, which increased from value Rs. 741 lakhs (2000-01) to Rs. 2313.10 lakhs and chilli powder exports increased value Rs. 62.76 crores (2000-01) to Rs. 89.00 crores (2001-02). The world demand is expected to go upto 11.30 lakh tonnes by the end of 2010 AD, (Anon, 2005), therefore, it is predicted that there is a great scope for export of chillies. Demand is increasing for value added products using chillies such as chilli paste, curry powders and other sauces for the convenience of food industry. In the extraction industry, there is always a demand for high capsaiain content (over 1%) chillies. This offers an extraction to direct saving on unit costs of extraction.

The irrigation scenario over the years, discouraged the importance of canal irrigation in the country. On one side, the mounting cost of construction, exhaustion of favourable construction sites and disputes over sharing reparian rights between neighbouring states constrained the investment on new project (Seckler, 1981). On the other side, the poor performance of the project reflected in the poor utilization of the potential created, which discouraged the government’s developmental interest on canal irrigation.

Under Upper Krishna Project, the area under chilli had a major share in Gulbarga district (14,644 ha) followed by Bijapur (1,706 ha) and Raichur districts (770 ha).

The Upper Krishna Project in Karnataka is going to become an economic lifeline of chronically drought hit districts of Gulbarga, Bijapur, Bagalkot and Raichur in Northern Karnataka. Upper Krishna Project executed in two stages, initially with the World Bank aid, comprised of two composite dams across river Krishna near Almatti and Narayanapur, to irrigate about one million ha on full development. Presently, the irrigation potential is about 4.29 lakh ha (2002).

One of the key areas of agricultural exports is the spices sector and India’s share in the world spices trade was nearly 25 per cent. The country exported 59743.67 MT of chillies worth Rs. 21,737.58 lakhs during 2003-04, earning an average unit value of Rs. 36.38 per kg.
Among the spice exports, chillies share was about 12 per cent, it earned Rs. 21,737.58 lakhs (2003-04) and hence the economic analysis of chilli production and marketing assumes the paramount importance.

The present study was undertaken to analyse cost and returns of chilli, to estimate the marketing costs and margins, marketing efficiency and to identify the different channels existing in chilli marketing in the study area. The study was undertaken to analyse the pattern of market arrivals, prices and the extent of market integration and also to study the growth pattern in exports, trade competitiveness and direction of chilli export from India. The study was intended to make an attempt to identify the problems related to producers about its production and marketing and also problems related to various market functionaries involved in marketing of chilli. Based on the findings of the study, it is possible to suggest appropriate policy measures to overcome the problems faced by the producers in the production and marketing of chilli. The study will also help the planners and policy makers to frame appropriate policies relating to the chilli.

Specific objectives of the study are:

1. To analyse the growth in area, production and productivity of chilli and the sources of instability in chilli production in Karnataka
2. To study the economics of chilli production
3. To analyse the pattern of market arrivals, prices and the extent of market integration among major chilli markets of Karnataka
4. To analyse the marketing costs and margins at different markets of chilli
5. To estimate the growth pattern in exports, trade competitiveness and direction of chilli export from India
6. To study the value addition in chilli
7. To document the problems faced by farmers and traders in the production and marketing of chilli and to suggest the suitable policy measures

HYPOTHESIS OF THE STUDY

1. There is high growth and instability in chilli production in Karnataka
2. Chilli production is a profitable enterprise
3. Chilli markets are spatially integrated
4. There is a considerable growth in export of chilli
5. There is good amount of value addition in chilli.
6. Indian chilli industry is subjected to the production, marketing and export constraints

PLAN OF THE THESIS

For convenience and better understanding the thesis is presented in six chapters. A brief introduction to the problems under investigation with specific objectives are presented in chapter I. Chapter II deals with the review of the existing literature on the subject while, chapter III covers the details of the methodology adopted for the present study. Chapter IV and V, respectively present the results of the study and discussion on the theme. Chapter VI presents summary and conclusions of the study.
II. REVIEW OF LITERATURE

There are number of theoretical and empirical studies on the various aspects of production, marketing and export of agricultural commodities. In this chapter, the most relevant literature is presented keeping in view the objectives and methodology of the present study. The reviews of past studies are presented under the following heads.

2.1 Growth rate analysis and sources of instability

2.2 Costs and returns structure

2.3 Studies related to marketing channels, marketing costs and margins

2.4 Studies relating to market arrivals and prices and market integration

2.5 Studies on export performance, direction of trade and changing pattern of exports

2.6 Problem related to production, marketing and export of agricultural commodities

2.1 GROWTH RATE ANALYSIS AND SOURCES OF INSTABILITY

The studies pertaining to the contribution of area, production and their interaction effect towards production of a crop are reviewed hereunder.

Hazell (1982) employed variance decomposition model to investigate the sources of instability in cereal production in India. He reported that the variance of total cereal production increased by 342 per cent between 1954-65 and 1967-78 and 82 per cent of this variance was due to increase in co-variance of production between crops grown in different states. He pointed out that as continued growth in food grain production is of paramount importance to India, the most promising approach is to focus on maximizing growth and to offset the resulting effects of increased production instability through policies designed to stabilise consumption rather than production.

Ray (1983) used decomposition of variability techniques to find out the growth and instability. He indicated that major causes for change in the pattern of production were increases in the variability of rainfall and prices.

Sikka and Vaidya (1985) in their study revealed that most of the increase in output was brought by the positive contribution of area and productivity of different crops in Himachal Pradesh. However, area over-shadowed the productivity and emerged out as main contributor for the increased output. In the case of gram, area alone contributed to the greater extent (24.46%), while yield (15.17%) and cropping intensity (19.19%) were other major contributors. Among the interaction effects, area and yield showed a major contribution (11.33%), compared to yield and cropping pattern (8.89%), and area, yield and cropping pattern (6.63%).

Achot et al. (1988) studied the growth and instability of pulses in Karnataka by employing variance decomposition model. They indicated that production of pulses in Karnataka had registered a significant increase during the decade following the green revolution period and this increase was mainly due to the increase in production in Gulbarga district. However, the districts growing minor pulses as a whole has increased in the decade after the green revolution and this instability contributed for the instability in production for the state. The instability induced by the change in the area variance was the main (single largest) component, which increased the instability of pulse production in Karnataka.

Sushila and Sharma (1989) conducted study on growth and instability in crop output in Uttar Pradesh by using variance decomposition model. They reported that the magnitudes of instability in the output of all the crops except maize declined during second period (1949-50 to 1965-66) relative to first period (1891-92 to 1946-47) and fluctuations in yield of the
crops was a major reason behind this instability. In the third period (1966-67 to 1985-86) also, yield fluctuations contributed most in the output fluctuations for all the crops. This study revealed that fluctuations in yield are the major cause for the fluctuations in output and hence the fluctuations in yield have to be controlled to bring stability in the output.

Pokharkar et al. (1994) studied the economics of production and marketing of onion in Western Maharashtra and found that per hectare profit over cost A was Rs. 6178.23 with cost of cultivation of Rs. 11134.94 at 10.38 quintals of yield.

Ramesh Kumar et al. (1993) in their study on economics of hybrid tomato production in Anekal taluk of Bangalore district reported that farmers obtained net returns of Rs. 95209 per ha out of gross returns of Rs. 154437 by incurring total cost of cultivation including marketing costs of Rs. 59228.00.

Nanja Reddy et al. (1990) in their study on economics of hybrids tomato in Bangalore district observed that the farmer by incurring Rs. 23464 and Rs. 7898 as the total cost of cultivation per acre on hybrids and local varieties, respectively obtained a commensurate net returns in hybrids (Rs. 22414/acre) and local (Rs. 1232/acre) varieties. The cost of production per quintal worked out to Rs. 89.92 for hybrids as against Rs. 99.48 for local varieties. However, rate of returns per rupee of investment was Rs. 1.96 for hybrids as against Rs. 1.12 for local varieties.

Karisomanagoudar (1990) in his study conducted in Gadag district on economics of production and marketing of onion found that the total cost of cultivation of rainfed onion was lower (Rs. 2774.63/acre) in small farmers. Consequently, the net return obtained by small farmers was also lower (Rs. 3647.07/acre) when compared to large farmers (Rs. 5312.70/acre). The cost of production per quintal was Rs. 86.54 in the case of small farmers as against Rs. 96.78 in large farmers. Out of the total cost, human labour formed major component both in small (40.14%) and large (30.06%) farmers followed by cost on farmyard manure (16.28% and 29.97%).

Mundinamani (1993) in his study on production and marketing performance of oilseeds in Kamataka, estimated the contribution of area, yield and their interaction in affecting production of individual as well as total oilseeds. The results indicated that the area had negative impact on production of individual and total oilseeds in the study area except for Dharwad district during pre-green revolution period while it had positive impact in most of the locations of the study area during post-green revolution and overall periods. The yield and interaction effects recorded mixed results. He concluded that, increase in output of oilseeds in the study area was due to result of expansion of area rather than increments in the yield.

Singh and Mathur (1994) examined instability in potato production in India by employing co-efficient of variation technique and found that increase in area was the main source of growth in major potato growing states. Production of potato was unstable particularly in the state where the production increased due to adoption of new technology. In some states, the acreage under potato was more un-stable indicating responsiveness of potato to prices of its competing crops in the state.

Lal et al (1994) revealed that during pre-green revolution period (1951-52 to 1968-69), compound growth rates of area, production and productivity were positive and significant for rice, wheat and maize in Bihar. Whereas during post-green revolution period (1969-70 to 1987-88), wheat had shown significant improvement in area, production and productivity in Bihar. In contrast to the significant growth performance of maize in area, production and productivity during post-green revolution period, there has been non-significant growth in area, production and productivity during pre-green revolution period. Rice has shown continued positive and significant growth performance. For overall period, the growth rate of production was significant for rice, wheat and maize, which resulted due to increase in productivity. Contribution of area was non-significant for rice production.

Hiremath (1994) studied growth rates for dry chillies in Dharwad district and found that the growth rate with respect to area was higher (5.9%) which was closely followed by
production (5.18%) and productivity (0.011%). All these parameters showed positive growth rate with respect to dry chillies in Dharwad district.

Vishweshwar (1994) in his study on economics of hybrid cotton with special reference to pest management in Malaprabha command area showed that in Naragund taluk, the area under cotton increased at the rate of 32.69 per cent, production at the rate of 18.60 per cent, while growth rate in productivity decreased at the rate of 1.69 per cent. In Navalgund taluk, there was an increase in area (21.33%) and production (15.54%) but decrease in productivity (5.22%).

Mundinamani et al (1995) employed exponential and decomposition technique to evaluate the growth performance of oilseeds in Karnataka during pre-green revolution period (1955-56 to 1965-66) and post-green revolution period (1966-67 to 1989-90). The results of the study showed that the growth in production was achieved mainly due to expansion of acreage (except groundnut in Dharwad and Bijapur district) and to some extent the yield effect in recent years. The improvement in yield levels was observed in areas where irrigation facilities are extended.

Tripathy and Srinivasagowda (1995) employed Hazell’s decomposition model to study the variability of food grain production in Orissa. The findings of the study suggested the need for area stabilising policies such as price policy for maize, ragi, millets and pulses with yield stabilising policies for rice, wheat, jowar and bajra. The dominance of coastal districts in increased production variability emphasised that yield stabilising measures have to be concentrated in these districts as they supply more than one-third of total food grains output of the state.

Veena (1996) studied the growth and instability of vegetables in Karnataka by employing Hazell’s decomposition analysis. The findings of the study revealed that changes in mean yield were the major sources of increase in mean production of vegetables in the state during second period (1985-1994). However, increase in mean area accounted for larger share in brinjal (48.70%) and tomato (43.26%) crops. The use of high yielding varieties, increased irrigation facilities especially tube-well irrigation and increased use of chemical fertilisers have contributed to increased yield in the state. The components of change in variance of individual vegetable crops showed that change in yield variance has contributed more towards increased variability in the state followed by change in the mean area under these vegetables. This stresses the need for adoption of yield stabilising policies for vegetable crops in the state.

Kerur (1996) observed that the area and production of sunflower recorded significant and positive growth rate in Bijapur and Raichur districts whereas non-significant and negative growth rate in productivity was observed.

Singh et al (1997) studied regional variations in agricultural performance in India using secondary data for the period from 1960-61 to 1992-93. The data were analyzed to compute compound growth rate by fitting log-linear function. The results revealed that the national growth rate in cotton increased by 3.20 per cent in period II (1969-81) from 0.02 per cent in period I (1966-68) and finally slid down to 2.47 per cent in period III (1982-93) due to decrease in acreage growth.

Sawant (1997) in his study on the performance of Indian agriculture, used time series data for the period from 1967-68 to 1995-96. The data were analyzed by compound growth rate after fitting log linear function. It was found that, of the two cash crops, namely, cotton and sugarcane, the former moved to high growth range compound growth rate of its output expanding four per cent during 1981-82 to 1994-95, mainly due to significant advances in its seed technology and resultant high growth in the yield per hectare.

Gaddi et al (1998) studied growth rates in area, production and productivity of cotton for the major cotton producing countries and the state of Karnataka in India for the period from 1982-83 to 1996-97 in the former case and from 1970-71 to 1996-97 in the latter, using exponential function. The results showed that world cotton area declined by 0.33 per cent per
annum due to the improvement in productivity. Similar results were reported at all India level, Karnataka state and in some of the traditional cotton growing districts. Production of cotton registered significant growth in all the cases mainly due to the substantial growth in productivity. This study considered only one period growth analysis that made it incredible compared to the present study, which is comprehensive in its dimensional objective and the period accounted.

Tripathy et al (1998) conducted study on analysis of growth and instability of pulses production in Orissa. The study showed that during entire post-green revolution period, pulses production in the state registered a significant positive growth rate of 6.18 per cent per annum, while the area and productivity contributed 5.33 and 0.81 per cent per annum respectively.

Varghese et al (1998) computed compound growth rate to know the trends in production and arrivals of cereals in Rajasthan. They revealed that the compound growth rate of production and arrivals of major agricultural commodities in the state during the period 1974-75 to 1995-96 increased at the same compound rate of 2.85 per cent per annum. In case of total pulses, the production in the state over the years has been declining at the rate of 0.93 per cent per annum, whereas that of market arrivals has been declining at the rate of 0.3 per cent per annum. For oilseed crops, market arrivals has been at a lower rate of 10.11 per cent per annum as compared to production growth of 12.56 per cent per annum.

Vani and Krishnaiah (1998) reported that estimated growth in export of chillies in terms of quantity (20.16%) and value (38.42%) for a period of ten years between 1987-88 and 1996-97 were found significant. The increase in chilli export was attributed mainly to the increase in area and production.

Singh and Singh (1999) found that highest cost of cultivation was in potato (Rs. 20971/ha) followed by cauliflower (Rs. 14719.50/ha), tomato (Rs. 12296/ha), chilli (Rs. 11970/ha) and Lauki (Rs. 10296/ha) in Varanasi district of Uttar Pradesh. However, per rupee of investment was maximum in chilli followed by lauki, tomato, brinjal, cauliflower, pea and potato.

Sain et al. (1999) in their study on economic analysis of tomato around Ludhiana city found that the farmers obtained a net return of Rs. 20509 per hectare out of gross returns of Rs. 43472 by incurring a total cost of cultivation including marketing cost of Rs. 22963. Among the different categories of farmers, medium farmers earned more profit (Rs. 21494/ha) than the small (Rs. 20184/ha) and large (Rs. 19775/ha) farmers.

Gaddi et al. (1999) conducted study on growth performance of oilseed crops in India. They used co-efficient of variation technique to measure the contribution of area and productivity towards increase in production of crops. The production instabilities were higher when compared to yield and area instabilities. The findings of the study revealed that area was the major contributor of output in the case of linseed (129.45%), sunflower (97.9%), soybean (82.56%) while it was productivity in sunflower (185.16%), sesamum (112.26%), niger seed (106.79%), castor seed (63.44%), groundnut (57.29%) and rape seed (34.09%). They pointed that provision of remunerative prices to farmers, supplying various inputs and provision of good marketing facilities as the most promising approach to achieve continued growth in oilseeds production.

The foregoing studies revealed that the contribution of area, yield and their interaction to the total production varies from region to region and from time to time. Most of the studies revealed that the increased output was due to positive contribution of area and yield. However, the area over-shadowed the yield and emerged as main contributor for increased output.

Balappa Shivaraya et al (1999) attempted to analyze the growth performance of red gram in Gulbarga district and Karnataka state as a whole over the period 1980 to 1994. The quadratic growth function was fitted for the estimation of growth rate in area and cubic function for production and productivity. The study showed that area under red gram declined
significantly by 10 per cent and 9 per cent per annum respectively during 1980-81 to 1994-95 in Gulbarga district and Karnataka state as a whole. The productivity has increased significantly by 11 per cent in Karnataka state. The analysis concluded that even though the area had declined significantly, the production did not decline due to the significant increase in its productivity for the state as a whole.

Ashalatha (2000) analysed the growth rate of Indian cashew industry in two periods, Period-I, covering 1956-57 to 1970-71 and period-II, covering 1971-72 to 1998-99. It was observed that the growth rate of area, production, productivity, kernel export, raw cashew import, cashewnut shell liquid – unit value of export showed positive trend but the cashew nut shell liquid quantity exported showed negative and non-significant growth due to the fact that reduction in the import of raw nuts (-0.75%) and also decrease in prices for Indian cashew in the world market during 1980-1990.

Legesse (2000) found that during eighties wheat area showed a declining growth rate i.e., 3.94 per cent per annum but production and productivity showed a negative growth rate. During nineties the Karnataka state recorded a significant positive growth rate of 3.47 per cent in area while in production the state recorded a mild growth, but productivity showed a negative growth rate.

Angles (2001) assessed the growth performance of turmeric in important south Indian states over the period from 1979-80 to 1998-99, by using the exponential growth function of the form $Y_t = ab^t$. They reported that the growth rates in area, production and productivity of turmeric in Andhra Pradesh, Tamil Nadu, and Karnataka registered positive and a significant growth. While growth rate of area was negative (-0.02%) in Kerala but production and productivity of turmeric were recorded positive and a significant growth. The growth rates in area (2.07%), production (6.57%) and productivity (3.78%) of turmeric in India registered positive and a significant growth. A negative growth rate of area was found (-0.02%) in Kerala as the production of turmeric is undertaken in small patches, where the plantations crops such as rubber, coconut etc. dominated and they were more profitable than turmeric. The other main problem was the labour requirement, wherein around 50 per cent of the cost of cultivation was spent on labour in turmeric production. But the labour availability was scarce and labour wage was very high. Hence, the farmers opted for plantation crops where there was no need of more labour throughout the year. As a consequence, the area under turmeric was reducing year after year.

Kaur et al (2002) computed compound growth rate to examine the trends in area, production and productivity of pulses. The study revealed that growth rates in production and productivity of total pulses in India were found to be significant and positive.

Navadkar (2003) revealed that the area, production and productivity of cotton in India during 2001-2002 were increased by 48.81, 22.71 and 15.00 percent change over 1950-51 respectively. It means that the production increased rapidly than once due to increased productivity by 2.5 times over 1950-51.

Tejaswi (2004) observed that the supply of coffee has steadily increased both at global and national levels. But demand was not as elastic as that of supply. He observed that there was a violent price fluctuation in coffee, i.e., which was as high as 134.45 US cents for each pound during 1994-95 in the global market, reached the rock bottom of just 45.60 US cents per pound in a span of just seven years. In case of different domestic markets, the coffee price averaged at Rs. 84.45 per kg in 1994-95, slumped to Rs. 45.19 per kg in 2001-02.

Bhullar (2005) studied the trends in production of dry chillies in India and found that Andhra Pradesh, Karnataka, Maharashtra and Orissa put together account for 75.00 per cent of the total Indian production. Punjab state occupied 3.10 per cent of area and was ranked eighth during 1974-77, which decreased substantially to only 0.46 per cent in 1998-2001. Production-wise, Punjab accounted for 4.61 per cent of production during 1974-77, which fell to 0.74 per cent during 1998-2001. There has been significant improvement in the productivity
of chillies at 1945 kg per ha, followed by Punjab at 1688 kg per ha Rajasthan at 1064 kg per ha and Arunachal Pradesh at 1272.7 kg per ha and Gujarat 786 kg per ha.

2.2 COSTS AND RETURNS STRUCTURE

Hiremath et al. (1984) found higher profits on irrigated farms of Sorapur taluk (Karnataka) than in non-irrigated farms in the cultivation of sorghum, groundnut, safflower and wheat. The profit per acre worked out to be maximum for groundnut (Rs. 5559) followed by sorghum (Rs. 390), wheat (Rs. 348), safflower (Rs. 311) and sunflower (Rs. 136).

Dhongade and Dangal (1985) studied the cost and income structure of farm business on Sina command area (Maharashtra). The per hectare cost of irrigated kharif hybrid sorghum worked out to Rs. 4334.90. The average per hectare yield was 23.75 quintals. The gross value of produce was Rs. 6327.87 and the profit at cost C was Rs. 2024.47. The per hectare total cost of cultivation of irrigated rabi sorghum was Rs. 2144.10, the yield of grain was Rs. 8.15 quintals and the profit at cost C were Rs. 586.05. The per hectare total cost of cultivation of wheat worked out to Rs. 2778.61 and the yield was 15.28 quintals, the per hectare profit at cost C being Rs. 153.69. The total cost of cultivation of groundnut was Rs. 3139.00 and the per hectare profit at cost C worked out to Rs. 1501.10.

Reddy and Hiremath (1986) found cotton is the most important crop in Sindhanur and Raichur taluks (Karnataka), consisting about 37.2 and 45.16 per cent of the gross cropped area, respectively. Higher proportion of area was devoted to DCH-32 cotton, wherever assured irrigation was available. The nature and extent of crops grown on large farms were based on profitability of other alternative crops.

Singh and Grover (1992) in their study worked out the economics of wheat crop which followed by rice, maize, potato and cotton, by collecting data from farmers selected from different agro-climatic areas of Punjab state. Variable cost of wheat per acre worked out to Rs. 2503, Rs. 2002, Rs. 2027 and Rs. 1887, when the crop was followed by potato, maize, cotton and rice, respectively.

The returns over variable cost were the highest (Rs. 2023/acre) for wheat and maize fields followed by Rs. 1823 on wheat fields, Rs. 1248 on cotton fields and Rs. 857 on potato fields.

Koppad (1993) studied the comparative profitability of different crops in Malaprabha command area in Karnataka state. The gross income from cotton was higher in head reach and mid reach than the gross income from maize and wheat system, but it was almost the same in the tail reach. Cotton was found to be the most important commercial crop and farmers realized better prices than maize and wheat. The study also revealed that on large farms, cotton was the most remunerative crop with net income of Rs. 18714.37 per hectare followed by maize-wheat system (Rs. 13565.18/ha). The rabi sorghum was the least profitable crop with net income of Rs. 4368.46 per ha. In case of small farmers also, cotton was the most profitable crop (Rs. 17343.80/ha) and it was higher by Rs. 5988.40 compared to maize-wheat system. The benefit: cost ratio was highest in cotton on both large and small farms than any other cropping systems.

Hiremath (1994) analysed the cost and returns of dry chillies in Dharwad district. The total cost of cultivation of chilli per acre was Rs. 5942.64, while cost A was Rs. 3865.90 and cost B was Rs. 5110.39. The value of gross output was Rs. 5531.72. The farm business income was Rs. 1466.08 per acre and family labour income was Rs. 221.33 per acre.

Venkataraman and Gowda (1996) while studying the economics of tomato production on Kolar district of Karnataka computed the cost and returns of tomato production. The results revealed that the total cost of production was Rs. 36611.51 of which variable costs were Rs. 15648.26, fixed costs Rs. 2556.48 and marketing costs Rs. 18406.77. Though, the net return obtained was high compared to many other costs, the high cost of production along with some other factors discouraged farmers from increasing tomato production.
Kerur et al. (1997), while studying the economics of sunflower production in Northern Karnataka viewed that the per hectare cost of production of sunflower was Rs. 5652.55, Rs. 5693.11 and Rs. 5587.73 for small, medium and large farmers, respectively. The average yield obtained for the overall sample was 8.99 quintal per hectare. The benefit: cost ratio was found to be 1.88 indicating sunflower production was a profitable enterprise.

Mishra et al. (1999) studied the production and marketing cost of chilies and found that the total cost incurred by the marginal farmers was Rs. 22782.63 per ha, while it was Rs. 18488.90 in the case of medium farmers. Of the total cost, expenditure on manure and fertilizer and human labour accounted for 28.19 per cent and 16.56 per cent, respectively. However, there were no substantial differences in the yield between marginal and medium farmers.

Rajendra Prasad et al. (2001) conducted study on costs and returns in cotton production vis-a-vis its competing crops in Guntur district and revealed that the per hectare expenditure on PPC on cotton was Rs. 11331.37. This was very high compared to Rs. 4217.92 in soybean-bengalgram cropping system, Rs. 4379.81 in soybean-redgram and Rs. 1334.00 in soybean-jowar cropping systems. The PPC in total operational cost was highest in cotton (Rs. 29884.77) compared to soybean-bengalgram (Rs. 27802.84), soybean-redgram (Rs. 29171.42) and soybean-jowar (Rs. 2954.78), whereas net returns were very low in cotton compared to other cropping systems.

Mahantesh (2002) analysed costs and returns structure of cotton in Belgaum district. The total cost of cultivation was found to be Rs. 30058.77 per hectare. The gross returns realized from the sale of output amounted to Rs. 33147.75 per ha and thus the net returns obtained per hectare were Rs. 3088.98.

Anonymous (2002) a comparison of per hectare cost and returns from moong, gram, maize, wheat, mustard and cotton on sample farms revealed that pulse crops were less favourable in terms of net returns. Whereas, wheat followed by cotton have maximum net returns per hectare. Among pulses, moong yielded significantly higher returns than that of gram.

2.3 MARKETING CHANNEL, MARKETING COSTS AND MARGINS

Chata and Kaul (1982) examined the marketing costs and margins of potato in Punjab and found that out of the total cost of marketing incurred by producers (9.83% of retail price), packing cost had the highest share (6.25%) of the retail price followed by commission charges (2.48%) and transportation cost (2.50%). However, the total marketing cost incurred by the market functionaries accounted for 10.72 percent of the consumer’s price, of which retailer (6.0%) had higher share followed by primary wholesaler (4.22%) and secondary wholesaler (0.5%). In the case of margins obtained, retailers (19.00%) realized higher share in the total marketing margin (27.28%) followed by primary wholesaler (4.5%) and secondary wholesaler (3.78%). It was concluded that the margins of primary wholesaler was justified since he borne the risk of investing more capital, time and labour to create time, place and possession utilities to the commodities unlike secondary wholesalers who obtained higher share without much risk.

Subramanyam (1982) studied the efficiency of different channels in marketing of vegetables in Madurai district of Tamil Nadu and observed that 77.97 percent of the producers disposed their cabbage to pre-harvest contractors, followed by carrot (50%), as against 22.03 and 30.00 per cent of cabbage and carrot sold through wholesalers at the field. However, majority of the producers (93.10%) sold cauliflower directly to the retailers.

Hugar and Hiremath (1984) studied the efficiency of alternative channels in marketing of vegetables in Belgaum city of Karnataka state, found that the price spread in the case of cabbage (48.31%) and brinjal (52.79%) were lower when sold through co-operative society, as compared to 50.29 and 24.74 per cent, respectively when sold through commission agents. Thus, it was obvious, that the net price received by the producer was observed to be
higher from cabbage (57.69%) and brinjal (47.21%) when sold through the co-operative society as compared to 49.72 and 45.26 per cent, respectively when sold through the commission agents.


Of these two main channels identified, channel-I was found to be more efficient in terms of the net price received by the producer-seller and the price spread. Channel-I was found to be more popular than the Channel–II in terms of number of farmers and quantity sold.

Sharma and Pant (1988) in their study on marketing of vegetables in south Saurashtra zone of Gujarat found that the total marketing cost incurred by the producer was the highest in highly perishable vegetables, namely tomato (Rs. 108.04/q) followed by chillies (Rs. 101.84/q), brinjal (Rs. 61.75/q), cabbage (Rs.50.44/q) and bottle gourd (Rs.45.74/q). The commission charge paid to the commission agent formed the major component of total marketing cost. At the retailers level, the total expenditure incurred was also the highest in the case of tomato (Rs.139.76/q) followed by chillies (Rs. 65.98/q), brinjal (Rs. 61.12/q), cabbage (Rs. 45.82/q) and bottle gourd (Rs.33.32/q). Among the different items of expenditure at retail level, the spoilage cost formed major component of total retail cost in all the vegetables. However, producer’s share in consumer’s rupee was found to be lower in brinjal (56.87%) and tomato (56.89%) compared to cabbage (62.30%), chillies (61.01%) and bottle gourd (59.65%).

Subrahmanyam (1988) identified three channels for marketing of vegetables in Karnataka namely, Producer—Commission agent at the market (channel-I), Producer – Preharvest contractor (Channel-II) and Producer—Retailer (Channel-III). The commission charge paid was found to be the major cost constituting 44 to 66 percents of the total marketing cost incurred in all the vegetables, namely cauliflower (Rs 23.75/q), french beans (Rs.21.46/q), carrot (Rs. 20.36/q), brinjal (Rs. 19.79/q) and bhendi (Rs. 18.16/q). This was followed by cost on transportation, loading and un-loading, packing and marketing fee.

Chahal et al. (1997) in their study on marketing of tomato in Amritsar market of Punjab identified the following two major channels

Channel-I : Producer → Wholesaler → Retailer → Consumer

Channel –II : Producer → Retailer → Consumer

The price received by the producer was found to be higher in channel-II (Rs.145.26/q) over channel –I (Rs.117.91/q) in summer season. Similar trend was observed in winter season also.

Patel et al. (1997) in their study on marketing efficiency of vegetables in Anand market, Gujarat found the concentration of market power with 10 big firms in the case of both the cabbage (28%) and potato (20%). About 28 percent of the marketing firms performed two or three marketing functions indicating their vertical integration. However, 12 firms were having horizontal integration. They concluded that even though market was regulated since long, some malpractices were still existed.

Chauhan et al. (1998) reported that for the marketing of vegetables in Azamgarh district of Uttar Pradesh; three channels were patronized by the vegetable growers for disposal of their vegetables. The channel involving commission agent and retailer was found to be the most important and adopted by majority of the farmers. However, the producer’s share in consumer’s rupee was maximum (90 to 94 %) in direct sale of vegetables to consumers whereas, it ranged between 85 and 89 percent when sold through commission agent. Further, in the most predominant channel, which included producer, commission agent, retailer and consumer, the net price received by the producer (60.63%) was found to
be the lowest. Thus, there is a need of the most popular channel which would be efficient, cost effective and producer-friendly, by regulating the substantial trade margins taken by the traders.

Channel-II: Producer -> Retailer -> Consumer, and

Channel-III: Producer->Wholesaler->Retailer->Consumer.

The share of the producer's in consumer’s rupee was found to be higher in channel-I (89% to 96%) as compared to channel-II (68.50% to 83.60%) and III (62.70% to 73.15%). However, channel-II was found to be popular among the farmers than the other two channels in terms of quantity disposed.

Singh et al. (1999) studied the marketing of tomato in Hoshiarpur district of Punjab and observed that the net price received by the farmers was higher (Rs.172.50) when sold in local market as compared to the processing units. Similarly, per acre net returns obtained by farmers was also higher when the produce was sold through local market (Rs.24, 150/acre) than those sold to Pepsi foods Rs.20, 808/acre) and Nijjar Agro Foods, even though the marketing costs were, higher in local markets.

Vasudev and Chowdry (1999) identified two marketing channels which were predominant in marketing of tomato in all the three regions of Andhra Pradesh, viz., Channel-I: Producer -> Commission Agent -> Secondary Wholesaler -> Retailer -> Consumer, Channel-II: Producer -> Commission Agent -> Primary Wholesaler -> Retailer -> Consumer.

The producer's share in consumer's rupee was found to be substantially higher in channel-I over channel-II in all the regions (coastal Andhra, Rayalseema and Telangana) of Andhra Pradesh, indicating better efficiency of channel-I over channel-II.

2.4 PATTERN OF MARKET ARRIVALS AND PRICES, MARKET INTEGRATION

Natarajan (1973) revealed that the arrivals of kapas in Hubli and Gadag markets were highest in the month of February, March and April whereas, March, April, May and June were the peak months for lint arrivals. The seasonal indices for arrivals of kapas were highest in March (506.50) followed by April (434.14), May (98.24) and February (84.70) in Hubli market. In case of lint in Hubli market, the seasonal indices for arrivals was the lowest in the month of November (8.55) followed by December (10.62) and January (14.93). Arrivals of lint started in the month of February and reached its peak in April. The seasonal indices for prices indicate that the price variation of Jayadhar cotton in Hubli market was the lowest in June followed by May.

The price variation for Jayadhar lint in Hubli market was the lowest in January and highest in February. Seasonal price variation of Laxmi kapas in Gadag market was the lowest in the month of June and the highest in the month of February. The seasonal price of Laxmi lint in Gadag market was the lowest in the month of January and highest in the month of March.

Hosamani and Hiremath (1984) revealed that the proportion of arrivals of cotton in the peak period (December to February) in Soundatti market was more than 70 per cent. For the peak period (March to May) in Bailhongal market, the percentage of market arrivals of cotton exceeded 95%.

Narasimhareddy (1986) revealed that the annual growth in market arrivals in Raichur and Sindhanur markets were found to be 16.42 per cent and 33.40 per cent, respectively. During the months of January, February, March and April, the per cent of market arrivals worked out to 83.33 and 94.10 for Raichur and Sindhanur markets, respectively. During the lean months, the percent of market arrivals came down to 16.67 per cent and 5.84 per cent for Raichur and Sindhanur markets respectively.
Kainth and Mehra (1988) while studying seasonality pattern of market arrivals and prices of potatoes in Amritsar (Punjab) found that marketing season began with the arrivals of fresh potatoes in the month of December and ended in the month of March (peak season). April and May as well as November month formed the midseason. However, lean period started from June and ended in October month. Potato prices were much higher (Rs.137.58/q.) in the lean season as compared to peak season (Rs. 74.60/q.). The regression analysis indicated that there was significant negative ($r^2 = -0.8595$) relationship between arrivals and prices as expected.

Parthasarathy et al. (1988) analysed the price behaviour of vegetables in Hyderabad market from 1980 to 1987 and found that an increase in arrivals, in general, did not declined the prices. Further, price variations were not of uniform magnitude in the same month in different years in case of both tomato and brinjal. The regression analysis of prices over a period of seven years showed a slight upward movement in prices.

Dinakar (1990) assessed the extent of price integration between the markets by using co-efficient of variation technique. He noticed a poor integration between the village markets and secondary markets and it was demonstrated by significant differences in the co-efficient of variation of prices.

Arya. (1991) analysed the spatial integration of four markets in Gujarat using zero order price series correlation analysis. She noticed significant and high correlations in the price movements between the markets and concluded that the markets under consideration were integrated in terms of price movements.

Mundinamani (1993) employed orthogonal polynomial regression technique to see the trend in arrivals and prices of oilseeds in Karnataka. In Bijapur and Talikoti markets, mild fluctuations in the initial years in groundnut arrivals developed into a tremendous growth in later years. A continuous decline in safflower arrivals was observed in all the markets. Similarly, sesamum arrivals showed a declining trend in all the markets except Gadag and Gangavati. In the case of sunflower, with a few exceptions in initial years, a continuous steep rise in arrivals and prices were noticed in Gangavati and Raichur markets. As far as price trend is concerned, a continuous upward movement was observed in all the markets for all the crops.

Upendra and Manohara Chary (1996), while analyzing market arrivals and prices of paddy in regulated markets, pointed out that in the three markets selected for the study, the maximum quantity of arrivals of paddy were observed during the peak market period probably because the farmers who were economically not sound, sold their produce soon after harvest to meet their financial obligations. The trend values of arrivals of paddy exhibited not only an increasing trend over the years but also significant in the three agricultural markets, viz., Karimnagar, Jammikunta and Vemulawada in Andhra Pradesh over time as a result of increasing productivity and production of paddy. The extent of variability in the market arrivals was found to be higher than in the prices of paddy in all markets selected for the study particularly, in Jammikunta and Vemulawada agricultural markets, the price elasticities of market arrivals of paddy were not only positive but also more than unity indicating that price response was very high. On the contrary, in Karimnagar market, the price elasticity of market arrivals was positive but less than unity showing price response was poor. The positive price elasticity of market arrivals reflects the price consciousness of farmers. With a rise in the prices of agricultural products, farmers were tempted to dispose off more and retain less and as a result, the quantity of arrivals was more in regulated markets.

Sharma and Sharma (1996) made an attempt to study the variation in wholesale prices of selected vegetables in India. They found that coefficient of variation in monthly wholesale prices of potato, tomato and onion were 30, 36 and 42 per cent, respectively in Calcutta. However, price variation in Delhi and Calcutta were more than that in Mumbai and Chennai in the case of potato as against high price variation in Mumbai for onion and Calcutta for tomato. Potato prices were less variable relative to onion and tomato prices. The wholesale prices were low during February-March for potato and tomato whereas onion prices were low in February-March.
Mitrannavar and Gummagolmath (1998) attempted to analyze the seasonal indices of arrivals and prices of potato in regulated markets of northern Karnataka. The long run trends in arrivals and prices of potato for the selected Belguam and Hubli markets were analyzed using three years moving average method. The study concluded that arrivals were highest in the month of November in both the markets indicating glut during harvesting season. However, price did not decrease during glut season as the majority of the traders purchased potato at that time in Belguam market, while there was a negative relationship between arrivals and prices in Hubli market.

Nahatkar et al (1998) revealed that seasonal index of cotton prices was minimum in the second quarter (January to March) and maximum in the third quarter (April to June). The coefficient of price variation showed price rise which was higher during first quarter (October to December). Buyers tend to attract more cotton growers to sell their produce at lower prices. The data on cyclical variations showed that after every three years the cycle of cotton prices changes irrespective of the variations in price in the three quarterly periods revealing that within a year there is no sudden shortfall or boom of cotton arrivals in the market. The variation in arrivals of cotton was found to be higher than that of variations in prices.

Mali et al. (1999) analysed the trend in arrivals and prices of vegetables (tomato and lady's finger) in Pune regulated market during the period from 1978-79 to 1996-97. The co-efficient of variation of arrivals (56% to 80%) and prices (40% to 80%) of tomato were higher than the variations in arrivals (27% to 60%) and prices (49% to 75%) of lady's finger. The compound growth rate of arrivals (2.11%) and prices (1.02%) of both the vegetables were significant during the same period and prices of both vegetables showed increasing trend indicating the good integration of Pune regulated/vegetable market.

Nawadkar et al. (1999) reported that co-efficient of variation of arrivals (22% to 79%) and prices (30% to 55%) of cabbage in Pune regulated market from 1978-79 to 1996-97 was found to be higher. Similar trend in arrivals (31% to 69%) and prices (24% to 54%) was observed in cauliflower. The compound growth rates of arrivals and prices (2.20%) of the cole crops were significant in the same period. The seasonal indices of prices and arrivals of both the vegetables were inversely related and prices of both the vegetables showed an increasing trend indicating good market integration for these vegetables.

The reviews of the above studies indicated that different techniques were used to assess the nature and magnitude of competition in vegetable marketing. The views of the various researchers were found to be contrasting with respect to market integration, which varied from crop to crop and over location and time. However, most of the studies reported a near competitiveness for most of the vegetable markets.

Patel (2000) revealed that all markets have around 40 to 75 per cent of the total market arrivals of rapeseed-mustard in peak marketing season. Whereas prices were lower by Rs. 20 to 60 per quintal over mid and lean marketing season in Mehasana district of Gujarat.

Hosamani et al (2001) observed that seasonal index of prices and arrivals of cotton was higher during October to February as this period is the peak harvest season.

MARKET INTEGRATION

Blyn (1973) estimated the degree of market integration by computing the correlation coefficients for de-trended and de-seasonalised prices from eight wheat markets of Punjab and Delhi. Thus, totally nine detrended price series for 12 monthly prices were arranged and correlated. The results showed that the overall average for 12 months was \( r = 0.68 \). He reported that the average ‘r’ was equal to the ‘r’ between Delhi and other markets indicating the dependence of Delhi market prices on the prices at all other collecting markets.

Lundahl and Peterson (1982) studied the market integration for major food grains during the period 1969 to 1974. The number of markets considered were nineteen for rice, eight for grain millet, twenty for grain corn, eleven for ground corn and fifty for seed beans.
Monthly price series were detrended and the residuals were correlated. The results of the study revealed that there was higher correlation between residuals.

Mamle Desai and Hiremath (1984) computed coefficient of variation to find out the market integration between Gulbarga, Chittapur and Sedam markets for tur. The study revealed that the three markets were more or less integrated so far as price variations were concerned.

Bhatta and Bhat (1988) studied the extent of price relationship for arecanut between selected markets of Mangalore and Sirsi, using the correlation coefficient. The commercial nature of the crop and its diversified market conduct was clear from the fact that there was a direct relationship between supply and price.

Saikat and Nair (1994) studied whether the movements in the international prices of Indian pepper had reflected the variations in prices in other exporting countries during the 1980s and also whether the domestic prices of pepper had moved synchronously with international price. The results revealed that due to the open trade status for pepper, the prices have moved synchronously indicating the integration of prices in the world pepper market.

Baharumshah and Habibullah (1994) employed the co-integration technique to analyze the long run relationship between pepper prices in six different markets in Malaysia. The co-integration technique was applied to weekly pepper prices for the period 1986-91. The empirical findings of the study indicated that regional pepper markets in Malaysia were highly co-integrated and the prices of pepper tended to move uniformly across spatial markets indicating competitive pricing behaviour.

Sundaresan and Menon (1994) used correlation method to study the market integration. The study revealed that there was a high level of integration between Calcutta, Cochin, Coonoor and Amritsar markets for tea marketing.

Ahmad Zubaidi and Muzafar Shah (1994) examined the price efficiency in pepper markets in Malaysia. Co-integration tests of spatial price relationships were applied to weekly black pepper and white pepper prices at 6 regional markets in Sarawak, Malaysia using data for the period from 1986 to 1991. The results revealed that the regional pepper markets in Sarawak were highly integrated. Price changes are fully and immediately passed on to the other markets. The low transportation costs and risk associated with transportation may explain the degree of co-integration observed.

Saikat and Nair (1994) revealed that due to the open trade status for pepper, the prices have moved synchronously indicating the integration of prices in the world pepper market.

Thorsen (1998) studied the spatial integration in Nordic timber market. The degree of spatial integration was tested through a co-integration analysis and a complete identification of the statistical models for long-run structure. When the results were interpreted in terms of factor price equalization and efficient commodity arbitrages, the Nordic timber markets were found to be strongly integrated.

Girish (1995) in his study "An econometric analysis of arrivals and prices of potato in major markets of Karnataka has used the co-integration approach to test the market integration between Bangalore and Belgaum markets, Bangalore and Hubli and Belgaum and Hubli. With regard to Bangalore – Hubli, there was a two-way significant interdependence, which was true of Belgaum-Hubli also. This is a clear indication of Hubli acting as a transit market between Bangalore and Belgaum. The influence of Hubli prices on Bangalore prices was more when compared to the influence of Bangalore prices on Hubli prices. Even between Belgaum and Hubli, the influence of Hubli prices on Belgaum prices was more than the influence of Belgaum prices on Hubli prices.}
Kerur (1996) computed coefficient of variation to study the extent of integration between different markets. The study revealed that the coefficient of variation of market arrivals of sunflower was found to be higher in Talikot market (88.48) compared to Raichur market (59.12) and Bijapur market (41.81). The coefficient of variation of sunflower prices revealed that the coefficient of variation in prices in Bijapur market was more (26.93) compared to Raichur (23.76) and Talikot market (20.24). These coefficients suggested that there was a considerable integration between the three markets over a period in case of price but not in case of arrivals.

Rane (1998) used correlation coefficient to know the degree of integration for paddy markets in Maharashtra state. Most of the selected paddy regulated markets within the state and from outside the state were well integrated except Pen market. Correlation coefficients between paddy prices of the selected markets were quite except Pen market of Raigad district.

Hegde (1998) observed that the D-F test statistics for the residuals was found higher than its critical value at the 10 per cent level for all cases during the whole period. Thus, no co-integration was observed between export and growth indicators for any combination for the whole period. Only export and industrial output are found to be co-integrated during the heavy protection period. He concluded that there was a weak evidence for co-integration between manufacture and industrial output during both the sub-periods.

Samarajeeva and Gunatilake (1999) employed Dickey Fuller and augmented Dickey Fuller tests and the results revealed that the quantity consumed and prices of palm oil are integrated to the order zero while prices of coconut oil and soya oil and income are integrated to the order one.

Patel (2000) used SND test (Standard Normal Distribution) to judge the existence of perfect market integration. The test revealed that all rapeseed-mustard market pairs were well integrated in Mehasana district of Gujarat with respect to price movement.

Ashalatha (2000) employed the co-integration technique to analyze the theoretical long run equilibrium relation between economic time series. Here she used the model to examine whether the domestic market was integrated with the international market for cashew kernel. The results amply proved that there was a long run equilibrium of the prices of cashew kernel. This explains the tendency of domestic cashew prices to move in unison with the international market prices in the long run confirming the law of one price (LOP).

Arvind Kumar (2000) studied on performance of India’s rice exports used co integration approach to test the extent of integration between Indian Domestic Rice Market (New Delhi) and the major world rice markets (Bangkok and Houston). The results clearly indicated that the domestic rice market was not integrated, in the long run with the major rice markets of the world i.e., Bangkok and Houston. This is inferred from the fact that ‘b’ coefficients of the price series integration were less than their respective Dickey Fuller critical values.

Birukal (2001) used zero order correlation coefficient to ascertain the integration of markets between Dharwad, Raichur and Soundatti regulated markets in north Karnataka for the unadjusted and adjusted price series. The study reveals that all the three markets were well integrated in case of unadjusted price series. For adjusted price also there was a good integration among the selected markets, but extent of integration is low as compared to unadjusted price data. Adjusted price data indicated that Soundatti and Dharwad markets were well integrated.

Jyotish and Dinda (2003) observed that the highest values of ‘r’ for wholesale as well as retail price have been found strongly correlated. It was found that the test statistic obtained from all the pair-wise markets are seen to be greater than the critical value at one per cent level of significance. All the market pairs in Hooghly district in terms of both wholesale and retail price were shown to be co-integrated. So, this was mainly attributed to close proximity, good communication facilities and good infrastructure availabilities among the market centres.
in Hooghly district. The high degree of market integration showed that potato markets in the states are competitive and efficient at the wholesale level.

Amit Kar et al. (2004) indicated that Chennai, Delhi and Bombay markets were well integrated indicating the existence of price dependency among various markets. It was pointed out that the values of ADF test were all significant at 10 per cent level of significance.

Dalawai (2004) analysed the relationship between the prices in major six domestic cotton markets and also at international market (New York) using the co-integration technique. The results clearly indicated that all the price series in major four DCH cotton markets and two Jayadhar cotton markets in the state were assumed to be stationary at order of integration one. The DF test statistics obtained for all the markets including international market were found to be more than the asymptotic critical value even at 10 per cent level. Thus, the major cotton markets in the state were found to be integrated and hence quite competitive pricing behaviour.

2.5 STUDIES ON EXPORT PERFORMANCE, DIRECTION OF TRADE AND CHANGING PATTERN OF EXPORTS

Jeromi and Ramanathan (1993), while analysing the world pepper market and India’s share, reported that there was a significant change in the direction of pepper exports from India during the period 1975 to 1990. It was observed that nearly 44 per cent of India’s pepper exports were directed to former USSR that constituted about 82 per cent of the total pepper import of that country. On the other hand, India not only failed to increase its exports to USA in tandem with increased consumption in that country, but also could not sustain the quality exported in the past years. Instability of exports was lower in case of USSR, Italy and Canada and higher for Poland, USA and Czechoslovakia.

Gulati et al. (1994) concluded that the commodities like rice, banana, grapes, sapota, leeches, onion, tomato and mushroom were highly competitive with NPC less than 0.75, while wheat, mango, potato and tomato paste were moderately competitive with NPC ranging between 0.75 to 1.00.

Mamatha (1996) calculated the Nominal Protection Coefficient’s (NPC) for Indian coffee by taking United States coffee price as the reference price. The NPC of coffee types namely plantation, Arabica and Robusta under the exportable hypothesis were 1.3, 1.3, and 1.85 respectively in 1995, indicating that Indian coffee exports were not competitive and it was not efficient exportable commodity.

Ravi and Govinda Reddy (1998) used nominal protection coefficient technique to work out the export competitiveness of jowar, maize, groundnut, sunflower, cotton and coffee from Karnataka under the importable and exportable hypothesis for a period of eleven years from 1984-85 to 1994-95. The results revealed that among the six commodities, Karnataka lacked comparative advantage in most of the crops except cotton. The export potential of jowar, maize, groundnut and sunflower was found to be significantly low.

Balappa Shivaraya (2000) studied the export competitiveness of Indian fresh vegetables using nominal protection coefficient technique. The results of the study revealed that all the vegetables viz., onion, potato and tomato were competitive for their export to other countries, since the nominal protection coefficient values were less for all.

Balappa Shivaraya (2000) studied the changes in trade directions of export of selected vegetables using Markov Chain Analysis. The results of the study revealed that UAE and Malaysia were the loyal markets for Indian onion. In case of potato, Sri Lanka and Nepal were found to be the most loyal markets whereas; Bangladesh and Nepal were the most stable importers of Indian fresh tomatoes.

Mahesh (2000) indicated that under importable hypothesis, the NPC and DRC were 0.71 and 0.66, respectively and under exportable hypothesis, the NPC and DRC were 0.98
and 0.93 respectively, implying that Indian tea exports were competitive and good import substitute.

Jayesh (2001) used the nominal protection coefficient technique for the export competitiveness of Indian pepper. Under the exportable hypothesis, the nominal protection coefficient value were found to be lesser than unity (0.849) in Calicut and (0.817) in Sirsi markets, indicating that the Indian pepper is competitive in the international market and which is an efficient export oriented commodity.

Desai (2001) examined the export potentialities of mango from India by using nominal protection coefficients for the period 1990-1998, which is the ratio of domestic price to the border price. The findings of the study indicated that on an average, the nominal protection coefficients value in fresh mango (0.89), and mango slices (0.45) were lower than one indicating their competitiveness in international market.

Jayesh (2001) indicated that Russia (64%) and USA (59%) were the stable and loyal markets for Indian pepper as revealed from the values of probability retention that Japan (0.2530) is the most reliable and stable markets for Indian cardamom. It was predicted that the market share of Indian pepper exports to Russia and USA would increase to 24.95 and 34.96 per cent, respectively by 2009-2010. The study further revealed that the market share of Indian cardamom export to Japan would increase to 47.25 per cent during 2009-10 mainly because of their preference for Indian spices.

Angles (2001) noticed that the UK had the highest (42.99%) probability retention index of loyalty to Indian turmeric compared to other importing countries, such as UAE (1.38%) and others (72.02%).

Ramesh Chand (2002) observed that the pepper export from India have average NPC value of 0.92, indicating its marginal competitiveness of pepper.

Mruthyunjaya and Chauhan (2003) indicated that the average NPC of cashew kernel export from India was found to be less than unity (0.79), which indicated that the cashew kernels export from India were marginally competitive.

Tejaswi (2004) employed of the Marko Chain Model and the results indicated that USA was one of the most reliable and loyalty index with probability of retention of 80 per cent than any other importing countries, followed by other countries (51%) and Russian federation (36%) etc.

Sidhu (2005) analysed the export performance of chilli that India exports only 5 to 8 per cent of its output due to high domestic consumption and low international demand for our chillies in the developed countries such as North America and European countries. Despite being low, exports of chilli were also highly fluctuating from year to year. During 1999-2002, the average yearly exports were estimated as 58653 tonnes against 4096 tonnes by 1975-78. The export grew at the rate of 12.0 per cent per annum during 1975-76 to 2001-02.

2.6 CONSTRAINTS RELATED TO PRODUCTION, MARKETING AND EXPORTS AGRICULTURAL PRODUCTS

Kantharaju (1989) reported that the incidence of pest and diseases, failure of rainfall and poor planting material were the problems. The problems related to the credit were insufficient time for repayment of loan, non-availability of credit in time and inadequate amount of credit, high rate of taxes, large transportation cost and lack of transportation were the main marketing problems.

Gulati et al. (1994) observed that the canalization of onion through National Co-operative Marketing Federation (NAFED) has led to loss of share in export market because of intervention of NAFED, whenever there is escalation of price in the domestic market, the
infrastructure for storage, transport, internal as well as international was largely inadequate. The interest on export finance was high (13%) and it should be brought down to nine per cent per annum. Institutions such as farmers-exporters co-operatives like Maha grapes and Maha mango were considered most useful in the export promotion of fruits and vegetables. This is essential to ensure good quality product as well as remunerative returns to the farmers.

Thakur et al. (1994) identified the problems encountered by the farmers in marketing of vegetables. They were (1) Unorganized marketing and low prices paid to farmers, (2) lack of mechanical grading, packing, and proper storage facilities, (3) malpractices, high and undue marketing margins and costs in markets (4) lack of village roads, lack of sufficient and low cost transportation facilities. (5) lack of market information and market news, and (6) lack of processing units and cooperative societies.

Ramamoorthy (1995) studied the main production constraints in rainfed cotton in Coimbatore. The production constraints were identified through rank analysis. Accordingly inadequate credit was ranked first, poor quality of inputs stood at second rank, pest menace and marketing ranked third and fourth, respectively.

Nasurudeen and Balakrishnan (1996) identified the problems of agricultural exports in India. The major constraints were high tariff, qualities restrictions, quota, strict hygienic standards package standards, and labeling requirements. They reported that the most important problem in export of agricultural commodities was inadequate surplus. Adopting modern technology should enhance the productivity. Most of the technological advancement was coupled with capital intensity but the availability of capital was less and also the capital formation in agricultural sector was meagre with 2.2 per cent only.

Ramamoorthy (1996) studied the major socio-economic constraints in cotton production and management. The constraints were identified and ranked through rank analysis. The study identified the major production constraints as poor quality input supply, inadequate credit supply and high production risk and the marketing constraints as price fluctuation, storage problems under weighment and poor market development.

Bonacci (1996) surveyed the constraints on commercial production of vegetable in Pananchery and Duthur, Kerala and reported that increased cost of plant protection chemicals was perceived as the most important factor by the respondents followed by inadequate market facilities, poor storage and other post-harvest facilities, insufficient capital and high labour costs.

Kunnal (1997) while explaining the importance of organic farming to meet twin challenges of producing sufficient foodgrains for growing population and prevention of environmental degradation, opined that combined use of chemical fertilizers with FYM, vermicompost, green manures and biofertilizers will help to attain higher yields as well as to improve soil health and to minimize environmental degradation. Research efforts through these angles should be initiated in the country so as to save the country from further disasters.

Patel et al. (1997) in their study on marketing efficiency of Anand vegetable market in Gujarat reported that lack of storage facilities, delay in payment of sale proceeds, high cold storage charges, monopoly of few middlemen and need of timely display of these perceptive products etc. were the major problems faced by the cabbage and cauliflower growers.

Narappanavar and Bavur (1998) examined the problems in storage, transportation and dissemination of market information in potato marketing in Dharwad, Karnataka and found that farmers were not facing several problems in transportation because of large number of tractors in the villages. Similarly, farmers were making suitable arrangements for storage of potato on the farm itself. However, about 35 per cent of the farmers complained on illegal deductions while selling the produce at the market in the form of weighment charges. The other problems noticed were lack of grading facilities, arbitrary hamali charges, low prices and variations in output price and high commission charges. Therefore, it is suggested that there is need for ensuring improved storage to cities and purchase of potato at the local
market by the Government at the time of heavy arrivals to assure the remunerative returns to the potato growers.

Vivekananda (1999) made an attempt to study the problems and prospects of agricultural development in Karnataka and opined that agricultural development in the state was hindered by the problems such as weak input research, weak extension network, regional imbalances, stagnation in the area under HYV’s etc. He suggested the measures for development of agriculture in the state.

Nagaraja et al. (1999) identified the most important constraints in production and marketing of potato in Kolar district of Karnataka by assigning the ranks. In production, high cost of seed material and diseases (Rank-I) were the major constraints followed by frequent power failure (Rank-II), high cost of fertilizers and plant protection chemicals (Rank-III), scarcity and high cost of labourers (Rank-IV) and non-availability of good seed material on time (Rank-V). The frequent fluctuations in price (Rank-I) involvement of too many middlemen (Rank-II), delayed payment (Rank-III), insufficient storage facilities (Rank-IV), low output prices (Rank-V) and high market charges (Rank-VI) were the main constraints in marketing.
III. METHODOLOGY

This chapter describes the characteristics of the study area, the sources and nature of data used for the study, the sampling methods adopted for the collection of required data, statistical tools and techniques employed for analysing the data and concepts used in the study.

3.1 DESCRIPTION OF THE STUDY AREA

3.1.1 Karnataka

Karnataka is the eighth largest state in India comprising an area of 1,91,791 sq. km occupying 7.75 per cent of the total geographical area of the country, bounded by Andhra Pradesh in the east, Maharashtra and Goa in the north, Tamil Nadu and Kerala in the south and Arabian sea in the west. Karnataka state is situated between 11°31' and 18°48' North latitude and 74°12' and 78°40' East longitude and lies in the west central part of the Deccan Peninsular India. Its length from north to south is 700 kms and from east to west is 400 kms.

As per the 2001 census, Karnataka has a total population of about 5.27 crores. The population density of the state was about 275 persons per sq. km. Karnataka state accounts for 5.14 per cent of the country total population in 2001 as against 5.34 per cent in 1991. The state has 27 districts with 125 taluks and 29,404 villages.

Karnataka is situated in tropical zone and enjoys warm climate throughout the year. The mean temperature ranges from 21.5°C to 31.7°C, the maximum and minimum temperature being 42°C and 14°C, respectively. The average temperature in the state is about 24°C. In general, the climatic condition is favourable for chilli crop cultivation.

The normal rainfall of the state ranges from as low as 509 mm in Bijapur to as high as 4251 mm in Udupi. Average annual rainfall of the state is 1189 mm. The major part of the rainfall of the state is received from the southwest monsoon, which commences in the first week of June and continues till the end of September. Major part of the state has red soils. Laterite soils are found in the hilly and coastal regions of the western parts. The northern part of the state has black soils with high moisture holding capacity. Karnataka is one of the progressive states with excellent potential for horticulture development particularly North Karnataka.

The geographical area of Karnataka state is 190.50 lakh ha, of which an area of 121.82 lakh ha falls under cultivable area, constituting 64 per cent of the geographical area. Out of the cultivable, 15.30 lakh ha is covered under horticulture (Government of Karnataka, 2002). Horticultural area in the state accounts for about 8 per cent of the total geographical area, forming about 13 per cent of the total cultivable area. Out of the 15.30 lakh ha of horticultural area, 6.26 lakh ha comes under plantation crops, 3.77 lakh ha under vegetables, 21.61 lakh ha under fruits, and 2.45 lakh ha under spice and 0.21 lakh ha under commercial flowers.

3.2 AGRO-CLIMATIC ZONES OF KARNATAKA

Based on the rainfall pattern, topography and soil types, cropping pattern etc. the state has been divided into the following 10 broad based agro-climate zones (Table 3.1).

1. North eastern transition zone

The northeastern transition zone is a small zone. The zone is made up of the entire district of Bidar and part of Gulbarga district. It is predominantly kharif zone, receives most of its rain during June to September. The annual rainfall varies from 500-800 mm. The soils are
Table 3.1: Agro-climatic zones and districts covered in North Karnataka region

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Zone (Zone-1)</th>
<th>Districts</th>
<th>Geographical area (lakh ha)</th>
<th>Cultivated area (lakh ha)</th>
<th>Mean annual rainfall (mm)</th>
<th>Soil type</th>
<th>Important crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>North Eastern Transitional Zone (Zone-1)</td>
<td>Bidar, Gulbarga</td>
<td>8.74</td>
<td>5.65</td>
<td>888</td>
<td>Red and laterite shallow medium black</td>
<td>Kharif and rabi jowar, wheat, minor pulses, groundnut, sunflower, tur and sugarcane</td>
</tr>
<tr>
<td>2.</td>
<td>North Eastern Dry Zone (Zone-2)</td>
<td>Gulbarga, Raichur</td>
<td>1.75</td>
<td>1.30</td>
<td>934</td>
<td>Deep black, medium black and sandy loam</td>
<td>Kharif and rabi jowar, bajra, tur, cotton, groundnut, safflower and sunflower</td>
</tr>
<tr>
<td>3.</td>
<td>Northern Dry Zone (Zone-3)</td>
<td>Raichur, Bellary, Bijapur, Dharwad</td>
<td>50.76</td>
<td>35.47</td>
<td>576</td>
<td>Deep black, medium black and red loam</td>
<td>Kharif and rabi jowar, bajra, maize, tur, cotton, groundnut, sesameum and sugarcane</td>
</tr>
<tr>
<td>4.</td>
<td>Northern Transitional Zone (Zone-8)</td>
<td>Belgaum, Dharwad</td>
<td>11.30</td>
<td>8.67</td>
<td>751</td>
<td>Shallow to medium black clay and red sandy loam</td>
<td>Kharif jowar, groundnut, bajra, pulses, chillies, tobacco, rabi jowar, wheat, sugarcane, potato and vegetables</td>
</tr>
<tr>
<td>5.</td>
<td>Hilly zone (Zone-9)</td>
<td>Belgaum, Uttara Kannada</td>
<td>11.60</td>
<td>2.52</td>
<td>2172</td>
<td>Red clay loam and lateritic</td>
<td>Rice, minor pulses, arecanut and pepper</td>
</tr>
<tr>
<td>6.</td>
<td>Coastal zone (Zone-10)</td>
<td>Uttara Kannada</td>
<td>4.10</td>
<td>0.87</td>
<td>3765</td>
<td>Red lateritic and coastal alluvial</td>
<td>Rice, coconut, arecanut, spices and minor pulses</td>
</tr>
<tr>
<td>7.</td>
<td>Total</td>
<td></td>
<td>88.25</td>
<td>54.48</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Annual Report of National Agricultural Extension Project (NAEP) Report, University of Agricultural Sciences, Dharwad
shallow to medium black clay soils in major areas. The crops grown are pulses, rabi and kharif jowar, groundnut, oilseeds, cotton, bajra, sugarcane and paddy.

2. North eastern zone

The zone consists of parts of Gulbarga and Raichur districts. The zone receiving most of the rain between June to September. The rainfall varies from 600 to 700 mm. The soils are deep to very deep black clay in major area and shallow to medium black soils in minor pockets. The crops grown are rabi and kharif jowar, gram, tur, other pulses, small millets, bajra, groundnut, paddy, cotton and chillies.

3. Northern dry zone

It is largest zone and consists of the entire districts of Bijapur, Bellary, parts of Raichur, Dharwad and Belgaum district. The scarce rainfall and its distribution characterize this zone. The soils are medium and deep black area and sandy loam in the remaining areas. The crops grown are kharif and rabi jowar, pulses, small millets, bajra, groundnut, paddy, cotton, wheat, sugarcane and forage crops.

4. Central dry zone

This zone consists of the whole of Chitradurga districts, parts of Tumkur, Davanegere, Chikamagalore and Hassan districts. The annual rainfall ranges from 550 to 720 mm. The soils are red loamy in major areas and shallow to deep black in the remaining area. Important crops raised are jowar, groundnut, tur and other pulses, small millets, bajra, sugarcane, paddy, cotton, ragi, maize and plantation crops.

5. Eastern dry zone

This zone has a low rainfall pattern but with more uniform distribution. The zone consists of whole Bangalore and Kolar and parts of Tumkur district. The soils are red sandy loam in major area. The rainfall varies from 650 to 850 mm. The crops raised are small millets, bajra, pulses, groundnut, paddy, ragi, maize, soybean, horticultural crops, fodder crops and mulberry.

6. Southern dry zone

This zone consists of whole Mandya and parts of Mysore, Tumkur and Hassan districts. It receives low rainfall and soils are red sandy loam in major areas. The important crops that are grown are paddy, ragi, pulses, small millets, groundnut, oilseed, cotton, sugarcane, mulberry and plantation crops.

7. Southern transition zone

This zone comprises parts of Hassan, Shimoga, Mysore and Chikamagalur district. It receives 700-1500 mm rainfall well spread out in three different periods. The soils are lateritic and red sandy loam in major areas and red loamy soils in the remaining areas. Kharif jowar, pulses, groundnut, paddy, ragi, maize, cotton, plantation crops, sugarcane, aromatic plants and tobacco are the important crops grown.

8. Northern transition zone

It consists of parts of Dharwad, Gadag, Haveri and Belgaum districts. The rainfall ranges from 600 to 1200 mm. The soils are shallow to medium black clay soils and red sandy loam in almost equal portions. Important crops of the area are jowar, pulses, groundnut, paddy, fodder crops, small millets, sugarcane, cotton, wheat and horticulture crops.
9. Hilly zone

The Malnad or hilly zone of Karnataka represents unique agro-climate features with following topography of mountains and deep valleys. The zone consists of parts of as many as seven districts. They are Uttara Kannada, Belgaum, Shimoga, Chikkamagalar, Dharwad, Kodagu and Hassan. The rainfall varies from 1200 to 3700 mm. The soils are red clear loamy in major area and paddy, pulses, maize, jowar, sugarcane, ragi, cotton, spices and plantation crops are the important crops grown.

10. Coastal zone

It is characterized by heavy rainfall. It consists of the entire Dakhina Kannada district and parts of Uttara Kannada district. It receives heavy rains, which varies from 3000 to 4700 mm. The soils are red lateritic and coastal alluvial. Paddy, groundnut, pulses, tuber crops, sugarcane and plantation crops are grown in this zone.

3.3 SELECTION OF DISTRICTS

The selection of the districts was based on the area under chilli in Upper Krishna Project (UKP) command area. The top three districts with highest area under chilli were chosen viz., Gulbarga, Bijapur and Raichur (Table 3.2 and Fig. 3.1). Chilli is introduced recently in the selected districts, gaining importance in recent years.

Gulbarga district

It lies between 15°12' and 17°46' N latitude, 76°4' and 77°42' E longitude with a geographical area of 16.10 lakh ha. The district is situated in the two agro-climatic zones viz., northeastern transitional zone and northeastern dry zone of Karnataka state. According to the 2001 census, the population of the district is 25.82 lakh with an overall literacy rate of 50.65 per cent.

The district is covered by both black and red soils. Laterite and alluvial soils found on the banks of Bhima and Krishna rivers and are rich in major plant nutrients. Though, average annual rainfall is 777 mm. There is fluctuation in the actual quantity received from year to year. The climate is generally dry with a temperature ranging from 12°C to 44°C.

Bijapur district

The district is situated entirely in the northern dry zone of Karnataka state and is between 15°21' and 17°28' N latitudes and between 74°50' and 76°28' E longitudes, with a geographical area of 17.23 lakh ha. It falls on the arid zone of Deccan plateau. The district is bounded on the north by Sholapur district, in the northwest by Sangli district of Maharashtra state and on the northeast by Gulbarga, Raichur, Dharwad and Belgaum districts surround this district, on the east, south and west, respectively. According to the 2001 census, the population of the district is 18.08 lakhs with literacy rate of 57.46 per cent. A major portion of the district is covered by slightly alkaline deep black soils, which have good moisture retention capacity but are low in organic matter content. The normal annual rainfall of the district is about 578 mm, which is scanty and erratic and mostly received from the southwest monsoon. The climate is generally dry with a temperature ranging from 14.8°C to 43.0°C.

Raichur district

Raichur district is situated in northeastern dry and northern dry zone of Karnataka state. It lies between 15°09' and 16°34' N latitude and 75°46' and 77°35' E longitude with geographical area of 13.88 lakh ha. Mehaboobnagar district of Andhra Pradesh bound it on the east, Bijapur and Dharwad districts on the west, Gulbarga district on the north, Bellary district and Karnool district of Andhra Pradesh on south. According to the 2001 census, the total population of the district is 13.51 lakhs, with a literacy rate of 49.54 per cent. It has
Table 3.2: District-wise area, production and productivity of chilli under UKP command area (2001-02)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Districts</th>
<th>Area (ha)</th>
<th>Production (tonnes)</th>
<th>Productivity (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gulbarga</td>
<td>2887</td>
<td>4041</td>
<td>1400</td>
</tr>
<tr>
<td>2.</td>
<td>Raichur</td>
<td>1920</td>
<td>1350</td>
<td>703</td>
</tr>
<tr>
<td>3.</td>
<td>Bijapur</td>
<td>2163</td>
<td>2447</td>
<td>1131</td>
</tr>
<tr>
<td>4.</td>
<td>Bagalkot</td>
<td>756</td>
<td>654</td>
<td>865</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7726</strong></td>
<td><strong>8492</strong></td>
<td></td>
<td><strong>1024</strong></td>
</tr>
</tbody>
</table>

Source: Karnataka at a glance, 2002-03

predominantly black cotton soils, with annual normal rainfall of about 640 mm. The part of the district is irrigated from Tungabhadra reservoir (geographical area 835843 ha).

3.4 STUDY PERIOD

In view of the limitation of the data, the present study is restricted for period of 15 to 20 years for all analytical purpose. However, for better understanding the growth and development of chilli, the growth rates of area, production and yield were compared for the period from 1990-91 to 2003-04. To examine the marketing performance, the data on arrivals and prices for the period from 1991 to 2005 was considered. The period (1984 – 2004) was taken into account to estimate growth rates in exports of chilli. However, the data on export pertained to the period from 1984-85 to 2003-04 to compute export competitiveness and from 1998-99 to 2003-04 to workout trade direction (Table 3.3).

The primary data on cultivation of chilli from farmers pertained to 2005-06 agricultural year.

3.5 NATURE AND SOURCES OF DATA

As per the selected objectives of the study, the data from primary as well as secondary sources were collected. The primary data from sample farmers were collected by personal interview method by using pre-tested structured questionnaire prepared for the purpose. The time series data on area, production, productivity, arrivals, prices, exports etc. were elicited from secondary sources.

3.6 SAMPLING DESIGN

The multistage random sampling technique was adopted in designing sampling frame for the study. In the first stage, UKP command area is selected purposively. In the second stage, three districts viz., Gulbarga, Raichur and Bijapur were selected based on the highest area under chilli. Similarly, in third stage, two taluks were selected based on potentiality and highest area under chilli, 20 farmers each from selected taluk of the district were selected at random, in view of spread of chilli growers in different villages. Thus, the sample size constituted of 120 for the study (Table 3.4).

For studying marketing aspects, three markets viz., Raichur, Gulbarga and Bijapur were chosen based on the size of the market. From each of the market, 10 wholesalers, 10 commission agents-cum-wholesalers and 10 retailers were chosen and interviewed personally to elicit required information with the help of well-structured and pre-tested
Fig. 3.1: Map showing the study districts
Table 3.3: Periods and range of secondary data used in the study

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Period-I</th>
<th>Period-II</th>
<th>Overall</th>
</tr>
</thead>
</table>
questionnaire (Table 3.5). For studying the processing aspect, 10 processing units were randomly selected.

3.7 ANALYTICAL TOOLS AND TECHNIQUES EMPLOYED

For analyzing the objectives of the study, data were subjected to analysis through the following statistical techniques.

3.7.1 Tabular presentation

3.7.2 Compound growth rate analysis

3.7.3 Hazell’s Decomposition analysis

3.7.4 Trend Analysis

3.7.5 Co-integration technique

3.7.6 Nominal Protection Coefficient

3.7.7 Markov Chain model

3.7.1 Tabular presentation

The data collected were presented in tabular form to facilitate easy comparisons. This technique of tabular presentation was employed for estimating the cost and return structure; marketing of chilli and price spread, marketing cost and profit accrued to the farmers as well as intermediaries. Different channels followed by the farmers were identified and the efficiency of each channel was compared in marketing of chilli. The data were summarized with the aid of statistical tools like average, percentage etc., to obtain the meaningful results.

3.7.2 Compound growth rate analysis

Growth rates on area, production, yield and exports of chilli were computed for a period of 15-20 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 $Y_t = ab^t$ was most frequently used. In the present study, compound growth rates in area, production, yield and export of chilli were estimated by specifying the following relationship.

$$Y_t = ab^tU_t \quad \text{-------------------(1)}$$

Where,

$Y_t$ : Area, production, yield, quantity and value of chilli 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;

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

Equation (2) was estimated by using ordinary least squares (OLS) technique.
Table 3.4: List of sample farmers selected for the study

<table>
<thead>
<tr>
<th>District</th>
<th>Taluks</th>
<th>Villages</th>
<th>No. of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulbarga</td>
<td>Shahapur</td>
<td>a) Mudagol</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Gogi</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Jevargi</td>
<td>a) Kelur</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Halagatla</td>
<td>10</td>
</tr>
<tr>
<td>Bijapur</td>
<td>Indi</td>
<td>a) Rodagi</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Marinahalli</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Sindagi</td>
<td>a) Kannoli</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Moratagi</td>
<td>10</td>
</tr>
<tr>
<td>Raichur</td>
<td>Lingasugur</td>
<td>a) Eechanal</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Devadurga</td>
<td>b) Jagirmandehal</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) Masarkal</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Sankeshwarhal</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

Table 3.5: Distribution of sample size of market intermediaries from the selected markets and processing units

<table>
<thead>
<tr>
<th>Intermediaries</th>
<th>Selected markets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bijapur</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>10</td>
</tr>
<tr>
<td>Commission agents-cum-wholesalers</td>
<td>10</td>
</tr>
<tr>
<td>Retailers</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
<tr>
<td>Processing units</td>
<td>4</td>
</tr>
</tbody>
</table>
Compound growth rate (g) was then estimated by the identify given in equation (3).

\[
\hat{g} = (b - 1) \times 100
\]  

(3)

Where,

\( \hat{g} \): Estimated compound growth rate in per cent per annum  
\( b \): Antilog of \( \log b \)

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

3.7.3 Hazell's instability model

Hazell's decomposition technique (Hazell, 1982) was adopted to study the instability in chilli production in selected districts as well as Karnataka state as a whole. To estimate the variability in production of chilli, the study period was divided into two periods. The period-I extends from 1990-91 to 1996-97, while the period-II from 1997-98 to 2003-04.

The time series data on area and productivity were first detrended to remove the systematic or trend compounds using linear regression of the form.

\[
Y_t = a + b_t + U_t
\]  

(4)

Where,

\( Y_t \): Area in ha and productivity in kg/ha  
\( t \): Time period in years  
\( U_t \): Random residual with zero mean and variance \( \sigma^2 \)

The residues were computed from the equation (4) and then entered around their respective means for both the periods. The resultant detrended time series data were of the following form:

\[
Y_t = \bar{Y} + U_t
\]  

(5)

Where,

\( \bar{Y} \): Mean yield  
\( U_t \): Error in \( t \) year

The production of chilli was computed using following equations.

\[
P_t = A_t \times Y_t
\]  

(6)

Where,

\( P \): Production of chilli at time \( t \)  
\( A \): Area under chilli at time \( t \)  
\( Y \): Yield of chilli at time \( t \)

The production variance and co-variance were decomposed to know the sources of change between the periods.
The variation in production during the period-I (year) can be expressed as,

\[ V(P_1) = A_1^2 V(Y_1) + 2 A_1 Y_1 Cov(A_1, Y_1) - Cov(A_1, Y_1)^2 + R_1 \tag{7} \]

Where,

- \( V(P_1) \) : Variance of production in period-I
- \( A_1 \) : Mean area in period-I
- \( Y_1 \) : Mean yield in period-I
- \( V(A_1) \) : Variance of area in period-I
- \( V(Y_1) \) : Variance of yield in period-I
- \( Cov(A_1, Y_1) \) : Covariance of area and yield in period-I
- \( R_1 \) : Residuals in period-I

Similarly, each variable in period-II can be expressed in terms of its counterparts in period-I plus the change in the variable between the two periods.

For example, \( A_2 = A_1 + \Delta A \) and \( Y_2 = Y_1 + \Delta Y \)

Where,

- \( \Delta A \) : \( A_2 - A_1 \)
- \( \Delta Y \) : \( Y_2 - Y_1 \)

Therefore, the change in the variance or production of chilli between two periods is given by;

\[ \Delta V(P) = V(P_2) - V(P_1) \]

And this can be decomposed into various components as shown in Table 3.6 and 3.7.

However, for covariance of presentation and discussion all interaction terms were pooled together and put under heading change on interaction term.

3.7.4 Trend analysis

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

\[ Y = \bar{Y} + b_1 Z_1 + b_2 Z_2 + b_3 Z_3 \]

Where,

- \( \bar{Y} \) : The predicted area/production/yield of chilli
- \( Y \) : The general mean area/production/yield 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.
Table 3.6: Components of change in average production

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description/Source of change</th>
<th>Symbols</th>
<th>Component of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Change in mean yield</td>
<td>$\Delta Y$</td>
<td>$A_1 \Delta Y$ $-,$</td>
</tr>
<tr>
<td>2.</td>
<td>Change in mean area</td>
<td>$\Delta A$</td>
<td>$Y_1 \Delta A$ $-,$</td>
</tr>
<tr>
<td>3.</td>
<td>Interaction between changes in mean area and mean yield</td>
<td>$\Delta A \Delta Y$</td>
<td>$\Delta A_1 \Delta Y$ $-,$</td>
</tr>
<tr>
<td>4.</td>
<td>Change in area yield</td>
<td>$\Delta \text{cov} (A, Y)$</td>
<td>$\Delta \text{cov} (A, Y)$</td>
</tr>
</tbody>
</table>

Table 3.7: Sources of change in variance of production of chilli

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Symptoms</th>
<th>Components of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Change in mean yield</td>
<td>$\Delta Y$</td>
<td>$[2A_1, \Delta Y \text{cov} (\bar{A}, Y_i)] + [2 Y_1 \Delta Y^2 + (\Delta Y)^2] V(A_i)$</td>
</tr>
<tr>
<td>2.</td>
<td>Change in mean area</td>
<td>$\Delta A$</td>
<td>$[2Y_1, \Delta A \text{cov} (\bar{A}, Y_i)] + [2 A_1 \Delta A^2 + (\Delta A)^2] V(A_i)$</td>
</tr>
<tr>
<td>3.</td>
<td>Change in yield variance</td>
<td>$\Delta V (Y)$</td>
<td>$(A_i)^2 \Delta V (Y)$</td>
</tr>
<tr>
<td>4.</td>
<td>Change in area variance</td>
<td>$\Delta V (A)$</td>
<td>$(Y_i)^2 \Delta V (A)$</td>
</tr>
<tr>
<td>5.</td>
<td>Change in area yield variance</td>
<td>$\Delta \text{cov} (A, Y)$</td>
<td>$[[2A_1, Y_1 - 2 \text{cov} (A_1, Y)] \Delta \text{cov} (A_1, Y)] + [\Delta \text{cov} (A, Y)]^2$</td>
</tr>
<tr>
<td>6.</td>
<td>Interaction between changes in mean yield and mean area</td>
<td>$\Delta A \Delta Y$</td>
<td>$2(\Delta Y) (\Delta A) \text{cov} (\bar{A}, Y_1)$</td>
</tr>
<tr>
<td>7.</td>
<td>Interaction between changes in mean area and yield variance</td>
<td>$\Delta A \Delta V (Y)$</td>
<td>$[2 (A_i) (\Delta \bar{A}) + (\Delta A)^2] [\Delta V (Y)]$</td>
</tr>
<tr>
<td>8.</td>
<td>Interaction between changes in mean yield and area variance</td>
<td>$\Delta Y \Delta V (A)$</td>
<td>$[2 (Y_i) (\Delta \bar{Y}) + (\Delta Y)^2] [\Delta V (A)]$</td>
</tr>
<tr>
<td>9.</td>
<td>Interaction between changes in mean area and yield and changes in area yield variance</td>
<td>$\Delta Y \Delta A \Delta \text{cov} (A, Y)$</td>
<td>$[2 (Y_i) (\Delta A) + 2 (A_i) (\Delta Y) + 2 (\Delta A) (\Delta Y)] \Delta \text{cov} (A, Y)$</td>
</tr>
<tr>
<td>10.</td>
<td>Changes in residuals</td>
<td>$\Delta R$</td>
<td>$[\Delta V (A, Y)] - \text{sum of other components}$</td>
</tr>
</tbody>
</table>
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 chilli and computational ease with which step-wise forward polynomial regression analysis is facilitated.

This technique was also used to analyse trends in arrivals and prices of chilli in selected markets as well as exports of chilli.

### 3.7.5 Co-integration Test

On the basis of the availability of wholesale price data on raw chilli in selected markets, viz., Hubli, Byadagi, Bijapur, Gulbarga and Raichur, these markets were selected for detailed analysis for market integration.

Spatial price relationships have been widely used to indicate overall market performance. The usual definition is that integrated markets are those where prices are determined interdependently. This has generally been assumed to mean that the price changes in one market will be fully transmitted to the other markets.

Co-integration test was developed by Engle and Granger (1987) to show the integration between different markets.

In short, if markets are efficient, then prices in different markets must be co-integrated. To examine the price relation between two markets, the following basic relationship is commonly used to test for the existence of market integration.

\[
P_{ij} = \alpha_0 + \alpha_1 P_{ij} + \varepsilon_t \quad \text{............... (9)}
\]

Where,

- \(P_i\) = Price series of a raw chilli in \(i^{th}\) market.
- \(P_j\) = Price series of a raw chilli in \(j^{th}\) market.
- \(\varepsilon\) = is the residual term assumed to be distributed identically and independently.
- \(\alpha_0\) = represent domestic transportation costs, processing costs, sales taxes etc.

The test for market integration is straightforward if \(P_i\) and \(P_j\) are stationary variables. Often, economic variables are non-stationary in which case the conventional tests are biased towards rejecting the null hypothesis. Thus, before proceeding to further analysis, it is important to check for stationarity of variables.

Stationary series is defined as one whose parameters that describe the series (namely the mean, variance and autocorrelation) are independent of time or rather exhibits constant mean and variance and have autocorrelation that are invariant through time. Once the non-stationarity status of the variables is obtained, the next step is to test for the presence of co-integration relationships between the variables.

Dickey-Fuller (1979) test (DF test) can be used to determine the stationarity of variable. The test is based on the t-statistic of \(\beta_1\) given by following equation.
\[ \Delta P_t = \beta_0 + \beta_1 P_{t-1} + \sum_{k=1}^{n} \delta \Delta P_{t-k} + \eta_t \quad \text{............... (10)} \]

Where, \( \Delta P_t = P_t - P_{t-1} \). The test statistic is simply the t-statistic, however, under the null hypothesis, it is not distributed as student-t, but this ratio can be compared with critical values. In estimation of the equation, the null hypothesis is \( H_0: P_t \) is I(1) which is rejected [in favour of I(0)], if \( \beta_1 \) is found to be negative and statistically significant. The above test can also be carried out for first difference of the variables. That is, estimate the following regression equation

\[ \Delta^2 P_t = \theta_0 + \theta_1 \Delta P_{t-1} + \sum_{k=1}^{n} \theta_k \Delta^2 P_{t-k} + \eta_t \quad \text{............... (11)} \]

Where the null hypothesis is \( H_0: P_t \) is I (2), which is rejected [in favour of I(1)] if \( \theta_1 \) is found to be negative and significant. In general, a series \( P_t \) is said to be integrated of order \( d \), if the series achieves stationarity after differencing \( d \) time, denoted \( P_t \sim \text{I}(d) \). Consequently, if \( P_t \) is stationary after differencing once then it may denote \( P_t \sim \text{I} (1) \) and \( P_t \sim \text{I} (0) \). However, in most applied work the procedure is terminated after the first or second differences.

Having established that the variables are non-stationary in level, it may then test for co-integration. Only variables that are of the same order of co-integration may constitute a potential co-integration relationship. The definition of co-integration used here is that of Engle-Granger (1987) and is defined as follows.

Consider a pair of variables \( P_i \) and \( P_j \), each of which is integrated of order \( d \). Their linear combination, that is,

\[ \varepsilon_t = P_{it} - \alpha P_{jt} \quad \text{............... (12)} \]

Will generally be I (d). However, if there is a constant \( \alpha \), such that \( \varepsilon \) is I (d-b), where \( b>0 \), then \( P_i \) and \( P_j \) are said to be co-integrated of order \( d \), \( b \) and the vector \( (1, -\alpha) \) is called the co-integrating regression. The relation \( P_i = \alpha P_j \) may be considered as long run or equilibrium relation (Engle and Granger, 1987 a, b) and \( \varepsilon \) is the deviation from the long run equilibrium. When \( P_i \) and \( P_j \) are co-integrated, the long run relationship \( P_i - \alpha P_j = 0 \) will tend to be reestablished after a stochastic shock.

### 3.7.6 Nominal Protection Coefficient (NPC)

Nominal Protection Coefficients were computed to determine the extent of competitive advantage enjoyed by the commodity in the context of free trade. The coefficients highlight on whether a country has comparative advantage in the export of that commodity in a free trade scenario or not.

The Nominal Protection Coefficient (NPC), a simple indicator of the incentives or disincentives in place and is defined as the ratio of domestic price of dry chilli to the world reference price. The domestic price used in this computation could be either the procurement price or the farm gate price, while the world reference price is the international price adjusted for transportation cost, packing cost, port clearing charge, insurance etc.

Symbolically, \( \text{NPC} = \frac{P_d}{P_r} \)

Where,

- \( P_d \) = Domestic price of the chilli
- \( P_r \) = World reference price of the chilli in question i.e. what the farmer would have received in case of free trade.
The wholesale price was taken as the price of Byadagi market because it gives a better representation of the prices of export quality dry chilli as compared to the wholesale price of other markets of Karnataka. For the world reference price, the price of New York market was taken because New York is one of the major markets of chilli and due to the non-availability of data of any other market. Estimation of world reference price entails adding freight charges, insurance charge, trading margins, transportation cost etc. from New York market/USA to Cochin port. The resulting international price is compared with domestic price.

If the nominal protection coefficient is greater than one, then the commodity is protected, compared to the situation that what would prevail under free trade and if it is less than one the commodity is disprotected.

NPC helps in measuring the divergence of domestic price from the international price and thus determines the degree of protection (incentive)/disprotection (disincentive) of the commodities in question. NPC can be estimated under two main scenarios, i.e., under importable scenario and under exportable scenario. If one is interested to know whether a particular commodity is an efficient import substitute, it is the importable scenario, which is more relevant. If the NPC under this scenario is less than the unity, the commodity is an efficient import substitute. And, if one is interested in knowing whether a particular commodity is an efficient exportable commodity, it is the exportable scenario, which is more relevant.

Under the importable scenario, competition is deemed to take place at domestic port and therefore, international transportation costs accord a natural protection to domestic commodity. While, under exportable scenario, competition is assumed to take place at foreign port and therefore, domestic commodity has to be extra efficient to be in tune with the international transportation costs atleast. The two hypotheses, therefore, yield different estimates of protection.

(a). The point of competition between domestic production and imports from US Gulf was taken for the importable hypothesis.

The international reference price under this hypothesis would thus be calculated by adjusted the FOB (Free On Board) price at Mumbai/Chennai port by adding insurance and maritime freight from US Gulf to the relevant Indian port (Mumbai/Chennai), then by adding domestic transport costs, marketing and trading margins to the Indian port to the specific region. The resulting international reference price is compared with the domestic price (domestic price were approximated by wholesale prices of the country), to derive the NPC of dry chilli.

(b). Under exportable hypothesis, the presumption is that Indian dry chilli would compete with dry chilli in USA. Since, competition is assumed to be taken place in US Gulf estimation of the international reference price calls for adding marketing margins, insurance, port clearing charges etc., to CIF (Cost, Insurance and Freight) price at US Gulf.

(c). Freight and other adjustments for dry chilli.

The first requirement of NPC calculation is the calculation of the reference price of relevant foreign dry chilli under both importable and exportable hypotheses. This is derived as follows:

Dry chilli prices (international) published by ‘Spice India’ journal were collected for the period 1996-97 to 2004-05. Transportation costs and port clearing charges are approximated in line with Gulati et al (1990).

3.7.7 Markov chain analysis

The trade directions of Indian chilli exports were analysed using the first order Markov chain approach (Jayesh, 2001). Approach to Markov chain analysis is the estimation of the transitional probability matrix P. The elements $P_{ij}$ of the matrix P indicates the probability that export will switch from country i to country j with the passage of time. The diagonal elements...
of the matrix measure the probability that the export share of a country will be retained. Hence, an examination of the diagonal elements indicates the loyalty of an importing country to a particular country’s exports.

In the context of the current application, six major importing countries of chilli were considered. The average exports to a particular country was considered to be a random variable which depends only on the past exports to that country, which can be denoted algebraically as

\[
E_{jt} = \sum_{i=1}^{r} E_{it-1} \cdot P_{ij} + e_{jt}
\]

Where,

- \(E_{jt}\) = Exports from India to \(j^{th}\) country during the year \(t\).
- \(E_{it-1}\) = Exports to \(i^{th}\) country during the period \(t-1\).
- \(P_{ij}\) = Probability that the exports will shift from \(i^{th}\) country to \(j^{th}\) country.
- \(e_{jt}\) = The error term which is statistically independent of \(E_{it-1}\).
- \(t = \) Number of years considered for the analysis.
- \(r = \) Number of importing countries.

The transitional probabilities \(P_{ij}\) that can be arranged in a \((c \times r)\) matrix have the following properties.

\[
0 \leq P_{ij} \leq 1 \\
\sum_{i=1}^{n} P_{ij} = 1 \text{ for all } i
\]

Thus, the expected export shares of each country during period ‘\(t\)’ were obtained by multiplying the export to these countries in the previous period (\(t-1\)) with the transitional probability matrix.

There are several approaches to estimate the transitional probabilities of the Markov chain model such as unweighted restricted least squares, weighted restricted least squares, Bayesian maximum likelihood, unrestricted least squares, etc. In the present study, Minimum Absolute Deviations (MAD) estimation procedure was employed to estimate the transitional probability, which minimizes the sum of absolute deviations. The conventional linear programming technique was used, as this satisfies the properties of transitional probabilities of non-negativity restrictions and row sum constraints in estimation.

The linear programming formulation is stated as

\[
\text{Min } OP^* + le
\]

Subject to,

\[
XP^* + V = Y \\
z GP^* = 1 \\
P^* \geq 0
\]
Where,

0 is the vector of zeroes.

P* is the vector in which probability P_{ij} are arranged.

I is an apparently dimensioned vector of area.

e is a vector of absolute error (1 U 1).

Y is the vector of export to each country.

X is the block diagonal matrix of lagged values of Y

V is the vector of errors

G is the grouping matrix to add the row elements of P arranged in P* to unity.

Using the estimated transitional probabilities, the exports of dry chillis to various destinations were predicted by multiplying the same with the respective shares of base year.

Definition of terms and concepts used in the study

Village merchant: A village merchant 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. The village merchant also pay commission to-commission agent while selling the produce in the wholesale market.

Commission agent: He is a person who on behalf of his principal and in consideration of commission on the amount involved in each transacti on, keeps in his custody the goods of his principal and sells the same and holds himself liable to deliver to the buyer and to make payment of its price to his principal. He will incur expenses on shop rent, salary and wages of permanent and temporary employees licence fee, telephone and electricity charges, cost of stationary articles, taxes and miscellaneous expenses.

Commission agent-cum-wholesalers: When the commission agent performs the duties of wholesaler in buying and selling of the commodities in bulk at wholesale market, he is called commission agent-cum-wholesaler. He will incur expenses, which are mentioned earlier.

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.

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

Seeds: The cost of purchased seeds was based on the actual amount paid by the respondents. The farm-produced seeds were imputed based on the prices, which prevailed at the time of sowing.

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, women days were converted into mandays by taking 1.33 women days equal to one manday.

Interest on operational capital: The working capital consists of the expenditure on labour, seeds, farmyard manure, fertilizers and plant protection chemicals, irrigation and-staking materials. The interest on operational capital was calculated at the rate of 14 per cent per annum (the rate at which commercial banks advance short-term and medium-term loans) for 50 per cent of the operational capital since this capital was used at different stages of crop production and was apportioned to the crop based on the duration of crop.

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.

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 calculation of junk value. The depreciation cost of 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 8 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 or land: Rental value of land was calculated at the prevailing rate per acre per annum in the study area and was apportioned to the respective crop.

The costs and returns per quintal on chili were calculated by using the following ratios were used.

Cost concepts

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

Cost $A_1$ = All actual expenses in cash and kind incurred in production by the producer. The items covered in cost $A_1$ are costs on: i) third human labour, ii) hired bullock labour, iii) owned bullock labour, iv) home produced/purchased seed, v) plant protection chemicals, vi) home produced/purchased
manure, vii) fertilizers, viii) insecticides and pesticides, ix) depreciation on farm machinery, equipment and farm building, x) irrigation, xi) land revenue, land development tax and other taxes, xii) interest on working capital, xiii) interest on crop loan and xiv) miscellaneous expenses.

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

Cost $B_1 = Cost A_1 +$ Interest on value of owned capital assets (excluding land)

Cost $B_2 = Cost B_1 +$ Rental value of owned land (net of land revenue) and rent paid for leased-in land

Cost $C_1 = Cost B_1 +$ Imputed value of family labour

Cost $C_2 = Cost B_2 +$ Imputed value of family labour

Cost $C_2* = Cost C_2 +$ estimated by taking into account or actual wage rate which ever is higher

Cost $C_3 = Cost C_2* +$ 10 per cent $Cost C_2*$ to (on account of managerial functions performed by farmers)

1. Gross returns per rupee of investment

\[
\text{Gross return} = \frac{\text{Gross returns}}{\text{Total cost}}
\]

2. Cost of production (quintal)

\[
\text{Total cost (Rs./ha)} = \frac{\text{Total cost}}{\text{Yield (q/ha)}}
\]

3. Gross returns per quintal

\[
\text{Gross returns (Rs./ha)} = \frac{\text{Gross returns (Rs./ha)}}{\text{Yield (q/ha)}}
\]

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 channels prevailing in the study area

In the study area, the chilli producer disposes their produce through different marketing channels. A great majority of the farmers sold the produce in the village itself to the village traders as revealed by the survey.

i. Farmer → Village merchant → Wholesaler → Retailer → Consumer

ii. Farmer → Commission agent - Wholesaler → 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 (PSCR) : 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 realises 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.
IV. RESULTS

Keeping in view the objectives, the data pertinent to the present study were elicited from various sources and analyzed through various appropriate techniques. The results of the analysis are presented as below.

4.1 Growth performance of chilli
4.2 Production performance of chilli
4.3 Pattern of market arrivals and prices
4.4 Marketing performance of chilli
4.5 Export performance of chilli
4.6 Value addition in chilli
4.7 Constraints in production, marketing and processing of chilli

4.1 GROWTH PERFORMANCE OF CHILLI

4.1.1 Growth rates of area, yield and production of chilli

The results of the compound growth rate analysis of area, yield and production of chilli, in the study area as well as in the state as a whole, are presented in Table 4.1.

Gulbarga

In Gulbarga district, growth rate in area showed a positive trend in both periods (3.79% in period I and 7.59% in period II respectively). The growth rate of area in overall period was 1.69%. The growth rate in yield was significantly (31.91%) in the period I, while it was positive but not significant during the period II (9.21%). The overall growth rate of yield in Gulbarga district was 5.40%. In case of production, the growth rate was also significant and more (36.91%) in the period I, while it was positive (17.50%) but not significant in period II. Thus, the overall growth for production in Gulbarga district was positive (7.14%).

Raichur

In Raichur district, the growth rate in area was significantly increasing (34.92%) in period I, while it was negative and significant (-10.51%) during period II. The overall growth in area was found to be positive (4.08%). The growth rate in yield was positive (12.46%) but not significant during period I, while it was negative (-26.83%) and significant during period II. The overall growth in yield was found to be positive (6.35%). In production also the growth was found to be positive and significant (51.71%) during period I, while it was negative and significant (-34.53%) during period II. The overall growth in production was found to be positive (10.69%).

Bijapur

In Bijapur district, the growth rate in area was negative (-6.60%) during period I, while it was significantly decreasing (-22.55%) during period II. The overall growth in area was significantly decreasing (-9.71%). In case of yield, the growth was positive and significant (40.47%) during period I, while it was significantly decreasing during period II (-19.55%). The overall growth for yield in Bijapur district was found to be positive (4.66%). In case of production, the growth was significantly increasing (31.20%) during period I, while it was significantly decreasing during period II (-37.69%). The overall growth for production in Bijapur district was found to be negative (-5.50%).

Karnataka

In Karnataka state as a whole, the growth in area was positive in period I, II and overall periods (4.28%, 13.01% and 5.57%) respectively. In case of yield the growth was high and significant (54.91%) during period I while it was significantly decreasing (-30.57%) during period II. The overall growth in yield was found to be positive (5.60%). In case of production the growth was significantly increasing (61.55%) during period I, while it was significantly
Table 4.1: Compound growth rates of area, yield and production of chilli in selected districts and a state (per cent/annum)

<table>
<thead>
<tr>
<th>Districts</th>
<th>Area</th>
<th>Yield</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P-I</td>
<td>P-II</td>
<td>Overall</td>
</tr>
<tr>
<td>Gulbarga</td>
<td>3.79</td>
<td>7.59</td>
<td>1.699</td>
</tr>
<tr>
<td>Raichur</td>
<td>34.92**</td>
<td>-10.51*</td>
<td>4.08</td>
</tr>
<tr>
<td>Karnataka</td>
<td>4.28</td>
<td>13.01</td>
<td>5.57*</td>
</tr>
</tbody>
</table>

Note:  
Period-I: 1990-91 to 1996-97  
Period-II: 1997-98 to 2003-04  
Overall: 1990-91 to 2003-04  
** Significant at 1% level  
* Significant at 5% level
decreasing (-21.53%) during period II. The overall growth in production for Karnataka state was found to be positive (11.49%).

4.1.2 Instability in chilli production

4.1.2.1 Temporal variation in area, production and productivity

Average area under chilli crop during the period (1990-91 to 2003-04) was worked out to be 2856.64 ha in Gulbarga district followed by Raichur (2196.64 ha) and Bijapur district (1642.35 ha). The average area under chilli in Karnataka was worked out to be 2, 04,925.6 ha. While production of chilli was highest in Gulbarga district (4319.80 tonnes) followed by Raichur and Bijapur districts (Table 4.2). Average production of chilli worked out to be 276490.74 tonnes for the state as a whole.

The mean productivity of chilli worked out to be higher in Raichur district (3.26 t/ha) as compared to Bijapur (1.57 t/ha) and Gulbarga district (1.40 t/ha). The mean productivity of chilli in Karnataka was (1.57 t/ha), coefficient of variation was found to be higher for the state (69.18%) than for the sample districts namely Raichur (48.07%) followed by Gulbarga and Bijapur (42.16%) and 32.49 % respectively. In case of production, it was higher for Raichur district (90.55%) compare to Bijapur (81.36%) and Gulbarga district (76.96%). While for the whole state it was less, compared to all the three districts.

As for the productivity of chilli is concerned the coefficient of variation was little higher in Raichur district (73.12%) as compared to Bijapur (61.24%), Gulbarga (53.08%) and even Karnataka state as a whole (68.18%).

4.1.2.2 Component of change in average production of chilli

The pure effect of change in mean yield and change in mean area, the effect of interaction between changes in mean area and mean yield and the change in covariance between area and yield by using Hazell’s statistical procedure. The decomposition analysis was carried out and the percentage contribution of each component towards change in average production was estimated for each study districts and for the state as a whole. Components of change in average production of chilli are presented in Table 4.3. The analysis for the sample districts showed that change in mean area accounted for 433.57 per cent in case of Bijapur district and was negative in both Gulbarga and Raichur districts. The important positive contribution was observed in change in mean yield in Gulbarga (2136.72%) and Raichur (93.94%) districts. The positive contribution was observed from interaction between area and mean yield in Gulbarga (199.22%) and Bijapur (77.54%) districts. The total change in average production was 93.79 per cent in case of Bijapur district and was negative in both Gulbarga and Raichur districts. The important positive contribution was observed in change in mean yield in Gulbarga (2136.72%) and Raichur (93.94%) districts.

The positive contribution was observed from interaction between area and mean yield in Gulbarga (199.22%) and Bijapur (77.54%) districts. The total change in average production was 93.79 per cent in Bijapur district, while for Gulbarga (-0.24%) and Raichur (-0.01%) districts. The average production for the state as a whole was predominantly due to change in mean yield (84.90%) followed by change in mean area (5.16%). The interaction effect between change in mean area and mean yield was positive in Karnataka (2.02%) and that of change in covariance between area and yield was also positive (7.93%).

4.1.2.3 Component of change in the variance of production

The change in variance of production of chilli was decomposed using the analytical procedure developed by Hazell (1982). The results of the analysis are presented below.

Results on the sources of change in the production variance of chilli production between sub periods are presented in Table 4.4. Gulbarga and Bijapur districts showed the negative change in mean yield (-31.02% and -46.69%) respectively, while positive change in mean yield showed in Raichur district (70.97%) and state as a whole (135.78%). All the three districts showed negative change in mean area, while the state as a whole showed a positive change in area (34.30%).

It is observed that negative changes in area variance (-24.62%) in Gulbarga district and (-9.43%) in Raichur district. However, for Bijapur district change in area variance (28.47%) was positive. Interaction between changes in mean area and yield variance in Gulbarga (24.57%) and in Bijapur (18.67%) districts was positive. Change in yield variance was 125.87 per cent in Gulbarga district and (53.63%) in Raichur district. The change in yield variance...
Table 4.2: Temporal variation in the area, production and productivity in chilli cultivation (1990-91 to 2003-04)

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Particulars</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Coefficient of variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gulbarga</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Area (ha)</td>
<td>2856.64</td>
<td>928.28</td>
<td>32.49</td>
</tr>
<tr>
<td>2</td>
<td>Production (t)</td>
<td>4319.80</td>
<td>3324.77</td>
<td>76.96</td>
</tr>
<tr>
<td>3</td>
<td>Productivity (t/ha)</td>
<td>1.40</td>
<td>0.74</td>
<td>53.08</td>
</tr>
<tr>
<td></td>
<td>Raichur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Area (ha)</td>
<td>2196.64</td>
<td>1056.13</td>
<td>48.07</td>
</tr>
<tr>
<td>2</td>
<td>Production (t)</td>
<td>7951.71</td>
<td>7260.49</td>
<td>90.55</td>
</tr>
<tr>
<td>3</td>
<td>Productivity (t/ha)</td>
<td>3.26</td>
<td>2.38</td>
<td>73.12</td>
</tr>
<tr>
<td></td>
<td>Bijapur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Area (ha)</td>
<td>1642.35</td>
<td>692.47</td>
<td>42.16</td>
</tr>
<tr>
<td>2</td>
<td>Production (t)</td>
<td>2665.35</td>
<td>2168.56</td>
<td>81.36</td>
</tr>
<tr>
<td>3</td>
<td>Productivity (t/ha)</td>
<td>1.57</td>
<td>0.96</td>
<td>61.24</td>
</tr>
<tr>
<td></td>
<td>Karnataka</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Area (ha)</td>
<td>204925.60</td>
<td>141774.10</td>
<td>69.18</td>
</tr>
<tr>
<td>2</td>
<td>Production (t)</td>
<td>276490.74</td>
<td>184359.28</td>
<td>66.67</td>
</tr>
<tr>
<td>3</td>
<td>Productivity (t/ha)</td>
<td>1.57</td>
<td>1.07</td>
<td>68.18</td>
</tr>
</tbody>
</table>

Source: Karnataka at a glance, 2003-04

variance was negative (-30.84%) in Bijapur district. The change in residual was positive in Gulbarga (33.73%), Raichur (13.53%) and (69.13%) in Bijapur districts.

For the state as a whole, change in mean yield (135.78%) and change in mean area (34.30%) was positive. The change in yield variance was negative (-266.98%), while change in area variance was positive (43.05%). The interaction between change in mean yield and area variance (40.34%) and interaction between change in area and yield and change in area yield variance was positive (48.03%). The change in residual for a state as a whole was observed negative (-29.17%).

4.1.3 Cropping pattern of sample farmers in the study area

Cropping pattern of sample farmers given in Table 4.5 indicated that all the three districts have grown variety of crops in both the seasons. Tur, greengram, cotton were the common crops grown during kharif season. During rabi season, bengalgram, jowar and sunflower were the common crops grown. In kharif season, tur crop occupied 17.05 per cent of the gross cropped area in Gulbarga followed by Bijapur and Raichur districts (13.28% and 10.52%), respectively. The cotton crop occupied a major share around 19.62 per cent in Gulbarga district followed by Bijapur district (14.08%) and Raichur (10.73%).
Table 4.3: Components of change in average production of chilli (%)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Source of change</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Karnataka</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Change in mean yield</td>
<td>2136.72</td>
<td>93.94</td>
<td>-208.61</td>
<td>84.90</td>
</tr>
<tr>
<td>2.</td>
<td>Change in mean area</td>
<td>-2180.87</td>
<td>-0.21</td>
<td>433.57</td>
<td>5.16</td>
</tr>
<tr>
<td>3.</td>
<td>Interaction between change in mean area and mean yield</td>
<td>199.22</td>
<td>-0.32</td>
<td>77.54</td>
<td>2.02</td>
</tr>
<tr>
<td>4.</td>
<td>Change in covariance between area and yield</td>
<td>-55.07</td>
<td>6.59</td>
<td>-202.50</td>
<td>7.93</td>
</tr>
<tr>
<td>5.</td>
<td>Total change in average production</td>
<td>-0.24</td>
<td>-0.01</td>
<td>93.79</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Table 4.4: Disaggregation of components of change in the variance of total chilli production (%)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Source of change</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Karnataka</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Change in mean yield</td>
<td>-31.02</td>
<td>70.97</td>
<td>-46.69</td>
<td>135.78</td>
</tr>
<tr>
<td>2.</td>
<td>Change in mean area</td>
<td>-30.38</td>
<td>-0.04</td>
<td>-59.01</td>
<td>34.30</td>
</tr>
<tr>
<td>3.</td>
<td>Change in yield variance</td>
<td>125.87</td>
<td>53.63</td>
<td>-30.84</td>
<td>-266.98</td>
</tr>
<tr>
<td>4.</td>
<td>Change in area variance</td>
<td>-24.62</td>
<td>-9.43</td>
<td>28.47</td>
<td>43.05</td>
</tr>
<tr>
<td>5.</td>
<td>Interaction between changes in mean yield and mean area</td>
<td>0.27</td>
<td>-0.04</td>
<td>3.27</td>
<td>1.19</td>
</tr>
<tr>
<td>6.</td>
<td>Change in area yield variance</td>
<td>-2.73</td>
<td>8.33</td>
<td>144.52</td>
<td>106.31</td>
</tr>
<tr>
<td>7.</td>
<td>Interaction between change in mean area and yield variance</td>
<td>24.57</td>
<td>-0.37</td>
<td>18.67</td>
<td>-12.85</td>
</tr>
<tr>
<td>8.</td>
<td>Interaction between change in mean yield and area variance</td>
<td>4.29</td>
<td>-51.57</td>
<td>11.10</td>
<td>40.34</td>
</tr>
<tr>
<td>9.</td>
<td>Interaction between change in area and yield and change in area yield variance</td>
<td>0.02</td>
<td>15.00</td>
<td>-38.62</td>
<td>48.03</td>
</tr>
<tr>
<td>10.</td>
<td>Change in residual</td>
<td>33.73</td>
<td>13.53</td>
<td>69.13</td>
<td>-29.17</td>
</tr>
</tbody>
</table>
Table 4.5: Cropping pattern of sample farmers in the study area (ha)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Crops</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(ha)</td>
<td>(ha)</td>
<td>(ha)</td>
</tr>
<tr>
<td>I</td>
<td>Kharif</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tur</td>
<td>1.45 (17.05)</td>
<td>0.83 (10.52)</td>
<td>1.10 (13.28)</td>
</tr>
<tr>
<td>2</td>
<td>Chilli</td>
<td>1.58 (18.56)</td>
<td>0.87 (11.06)</td>
<td>1.11 (13.35)</td>
</tr>
<tr>
<td>3</td>
<td>Greengram</td>
<td>1.33 (15.63)</td>
<td>0.94 (11.85)</td>
<td>0.87 (10.52)</td>
</tr>
<tr>
<td>4</td>
<td>Cotton</td>
<td>1.68 (19.62)</td>
<td>0.85 (10.73)</td>
<td>1.17 (14.08)</td>
</tr>
<tr>
<td>5</td>
<td>Bajra</td>
<td>-</td>
<td>0.98 (11.46)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total kharif</td>
<td>6.06</td>
<td>4.47</td>
<td>4.26</td>
</tr>
<tr>
<td>II</td>
<td>Rabi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bengalgram</td>
<td>1.31 (15.36)</td>
<td>0.90 (11.40)</td>
<td>1.09 (13.11)</td>
</tr>
<tr>
<td>2</td>
<td>Jowar</td>
<td>1.17 (13.74)</td>
<td>0.92 (11.59)</td>
<td>0.91 (11.02)</td>
</tr>
<tr>
<td>3</td>
<td>Sunflower</td>
<td>-</td>
<td>0.80 (10.17)</td>
<td>0.80 (19.71)</td>
</tr>
<tr>
<td></td>
<td>Total rabi</td>
<td>2.48</td>
<td>2.63</td>
<td>2.82</td>
</tr>
<tr>
<td>III</td>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sugarcane</td>
<td>-</td>
<td>0.84 (10.57)</td>
<td>1.23 (14.89)</td>
</tr>
<tr>
<td></td>
<td>Gross cropped area</td>
<td>8.55 (100.00)</td>
<td>7.95 (100.00)</td>
<td>8.18 (100.00)</td>
</tr>
<tr>
<td></td>
<td>Net cropped area</td>
<td>5.69</td>
<td>3.57</td>
<td>3.83</td>
</tr>
<tr>
<td></td>
<td>Cropping intensity (%)</td>
<td>150.26</td>
<td>222.68</td>
<td>213.57</td>
</tr>
</tbody>
</table>

Figures in parentheses indicate percentage to the total gross cropped area.

In rabi season, bengalgram and jowar occupied nearly 29 per cent of the cropped area in Gulbarga district followed by Raichur and Bijapur districts. The average area under sugarcane in Bijapur district was 14.89 per cent followed by 10.57 per cent in Raichur district.

The cropping intensity worked out was highest (222.68 per cent) in Raichur district which was followed by Bijapur district (213.57%) and Gulbarga district (150.26%).

4.1.4 Trends in area, production and productivity of chilli

To study the trend in area, production and productivity of chilli over the years, orthogonal polynomial regression analysis was employed and the results are presented in Table 4.6 and indicated with Fig. 4.1 to 4.3.
Fig. 4.1: Trends in area under chilli in selected districts and a state as a whole.
Fig 4.2: Trends in production under chilli in selected districts and a state as a whole
Fig. 4.3: Trends in yield under chilli in selected districts and a state as a whole
Table 4.6: Estimated trend functions of chilli in selected districts

<table>
<thead>
<tr>
<th>Districts</th>
<th>Area</th>
<th>Production</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept</td>
<td>X</td>
<td>X^2</td>
</tr>
<tr>
<td>Gulbarga</td>
<td>7.731</td>
<td>2.457</td>
<td>5.396</td>
</tr>
<tr>
<td>Raichur</td>
<td>6.633</td>
<td>0.507</td>
<td>1.301</td>
</tr>
<tr>
<td>Bijapur</td>
<td>7.798</td>
<td>1.952</td>
<td>4.441</td>
</tr>
<tr>
<td>Karnataka</td>
<td>11.777</td>
<td>2.074</td>
<td>4.752</td>
</tr>
</tbody>
</table>

** Significant at 1% level
* Significant at 5% level
It could be seen from the table and figures that the change in area under chilli varied over space and time. In case of Gulbarga district mild fluctuation was observed over the study period. Initially it was increasing trend up to 1995-96 later it was declining trend up to 2000-01 and thereafter, significant increase was noticed during 2002-03. However Raichur district showed a continuous increase till 1996-97 and continuous declining trend was observed up to 2001-02 and thereafter increasing trend was noticed. The area under chilli in Bijapur district showed a declining trend up to 1992-93 later it showed constant trend up to 1996-97 and thereafter showed a continuous declining trend up to 2002-03. In Karnataka there was an increasing trend up to 1995-96 and later declined up to 2000-01 and thereafter significant increase was noticed up to 2002-03.

As far as production of chilli is concerned the production in Gulbarga showed increasing trend up to 1998-99 later it was decreasing trend up to 2000-01, thereafter it showed a continuous increasing trend up to 2002-03. However Raichur district showed a declining trend during initial period later it was increasing trend up to 1998-99 thereafter decreasing trend was noticed up to 2002-03. In case of Bijapur also decreasing trend was observed during initial period later it was increasing up to 1998-99 thereafter decreasing trend up to 2002-03 later it was observed increasing trend. In Karnataka an increasing trend was observed up to 1998-99 and thereafter steep fall up to 2002-03.

4.2 PRODUCTION PERFORMANCE OF CHILLI

4.2.1 Cost of inputs in cultivation of chilli

The costs of inputs in cultivation of chilli were presented in Table 4.7.

Gulbarga district

The per hectare total material cost of chilli in Gulbarga district was Rs.17250.40. Among material cost fertilizer (27.49%), PPC (20.43%) and FYM (14.61%) were the major components of the total cost of cultivation.

The labour expense on nursery was Rs.895.64 of which seedbed preparation, fertilizer application and hand weeding constituted 1.13%, 1.52% and 0.67%, respectively. The total expenditure on labour cost for main field was Rs.8677.55. Among the labour cost, expenses towards ploughing was more (7.58%) followed by harrowing (6.21%) and intercultivation (6.04%). The per hectare total cost of cultivation of chilli in Gulbarga district was Rs.26823.60.

Raichur district

The per hectare total material cost in the cultivation of chilli in Raichur district was Rs.15321.50. Among material cost, share of fertilizer cost was more (25.96%) followed by PPC (20.41%) and FYM (14.15%) in the total cost of cultivation. The labour expenses on nursery were Rs.827.52 of which fertilizer application was the major item (1.44%) followed by seedbed preparation (1.19%) and hand weeding (0.71%).

The total expenditure on labour cost for main field was Rs.8480.79 per ha. Among the labour cost, ploughing having the major share (8.76%), which was followed by harrowing (6.97%) and intercultivation (5.66%). The labour cost for harvesting of chilli was Rs.869.58. The total cost of cultivation of chilli in Raichur district was Rs. 24629.80 per ha.

Bijapur district

The per hectare total material cost in the cultivation of chilli in Bijapur district was Rs.16583.00. Among the material cost, fertilizer cost was more Rs.6941.90 followed by PPC Rs.5492.30 and FYM cost was Rs.3724.40. The labour expense on nursery was Rs.892.51 of
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Item</td>
<td>(Rs/ha)</td>
<td>(Rs/ha)</td>
<td>(Rs/ha)</td>
<td>(Rs/ha)</td>
</tr>
<tr>
<td>I.</td>
<td>Material cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>FYM</td>
<td>3921.42(14.61)</td>
<td>3487.02(14.15)</td>
<td>3724.40(14.07)</td>
<td>3710.95(14.28)</td>
</tr>
<tr>
<td>2.</td>
<td>Seed</td>
<td>333.12(1.24)</td>
<td>275.89(1.12)</td>
<td>283.46(1.09)</td>
<td>297.48(1.14)</td>
</tr>
<tr>
<td>3.</td>
<td>Seed treatment</td>
<td>138.61(0.51)</td>
<td>136.46(0.55)</td>
<td>141.09(0.53)</td>
<td>184.92(0.71)</td>
</tr>
<tr>
<td>4.</td>
<td>Fertilizer</td>
<td>7376.04(27.49)</td>
<td>6394.83(25.96)</td>
<td>6941.90(26.23)</td>
<td>6780.77(26.58)</td>
</tr>
<tr>
<td>5.</td>
<td>PPC</td>
<td>5481.23(20.43)</td>
<td>5027.24(20.41)</td>
<td>5492.30(20.75)</td>
<td>5333.59(20.53)</td>
</tr>
<tr>
<td></td>
<td>Sub total</td>
<td>17250.4(64.31)</td>
<td>15321.5(62.20)</td>
<td>16583.0(62.66)</td>
<td>16307.7(63.08)</td>
</tr>
<tr>
<td>II.</td>
<td>Labour cost for nursery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Seed bed preparation and sowing</td>
<td>303.98(1.13)</td>
<td>295.51(1.19)</td>
<td>273.18(1.03)</td>
<td>290.89(1.12)</td>
</tr>
<tr>
<td>2.</td>
<td>Fertilizer application</td>
<td>410.19(1.52)</td>
<td>356.79(1.44)</td>
<td>459.79(1.73)</td>
<td>408.90(1.57)</td>
</tr>
<tr>
<td>3.</td>
<td>Hand weeding</td>
<td>181.47(0.67)</td>
<td>175.22(0.71)</td>
<td>159.54(0.64)</td>
<td>176.18(0.67)</td>
</tr>
<tr>
<td></td>
<td>Sub total</td>
<td>895.64(3.33)</td>
<td>827.52(3.35)</td>
<td>892.51(3.41)</td>
<td>875.98(3.37)</td>
</tr>
<tr>
<td>III.</td>
<td>Labour cost (main field)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Ploughing</td>
<td>2034.49(7.58)</td>
<td>2142.95(8.76)</td>
<td>2109.80(7.97)</td>
<td>2095.72(8.06)</td>
</tr>
<tr>
<td>2.</td>
<td>Harrowing</td>
<td>1667.18(6.21)</td>
<td>1716.97(6.97)</td>
<td>1757.70(6.64)</td>
<td>1590.46(6.59)</td>
</tr>
<tr>
<td>3.</td>
<td>Intercultivation</td>
<td>1622.52(6.04)</td>
<td>1394.24(5.66)</td>
<td>1699.00(6.41)</td>
<td>1571.91(6.05)</td>
</tr>
<tr>
<td>4.</td>
<td>Transportation of FYM</td>
<td>691.60(2.57)</td>
<td>691.60(2.80)</td>
<td>768.17(2.90)</td>
<td>717.11(2.76)</td>
</tr>
<tr>
<td>5.</td>
<td>Spreading of FYM</td>
<td>285.90(1.06)</td>
<td>265.37(1.07)</td>
<td>282.20(1.06)</td>
<td>277.40(1.06)</td>
</tr>
<tr>
<td>6.</td>
<td>Marking</td>
<td>205.99(0.76)</td>
<td>203.77(0.82)</td>
<td>189.23(0.71)</td>
<td>199.65(0.76)</td>
</tr>
<tr>
<td>7.</td>
<td>Fertilizer application</td>
<td>288.15(1.07)</td>
<td>284.42(1.15)</td>
<td>301.19(1.13)</td>
<td>291.23(1.12)</td>
</tr>
<tr>
<td>8.</td>
<td>Planting of seedling</td>
<td>386.85(1.44)</td>
<td>391.17(1.58)</td>
<td>369.56(1.39)</td>
<td>382.52(1.47)</td>
</tr>
<tr>
<td>9.</td>
<td>Spraying PPC</td>
<td>543.72(2.02)</td>
<td>520.70(2.11)</td>
<td>540.98(2.04)</td>
<td>535.12(2.06)</td>
</tr>
<tr>
<td>10.</td>
<td>Harvesting</td>
<td>951.14(3.54)</td>
<td>869.58(3.53)</td>
<td>959.13(3.62)</td>
<td>926.62(3.56)</td>
</tr>
<tr>
<td></td>
<td>Sub total</td>
<td>8677.55(32.34)</td>
<td>8480.79(34.43)</td>
<td>8976.90(33.91)</td>
<td>8587.77(33.54)</td>
</tr>
<tr>
<td></td>
<td>Total labour cost (II+III)</td>
<td>9573.20(35.68)</td>
<td>9308.32(37.79)</td>
<td>9869.40(37.33)</td>
<td>9463.76(36.91)</td>
</tr>
<tr>
<td></td>
<td>Grand total (I+II+III)</td>
<td>26823.60(100.00)</td>
<td>24629.80(100.00)</td>
<td>26453.00(100.00)</td>
<td>25771.50(100.00)</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate the percentage to the total amount.
which fertilizer application cost was major (1.73% to the total cost) followed by seedbed preparation (1.03%) and hand weeding (0.64%).

The total expenditure on labour cost for main field in Bijapur district was Rs.8976.90. The expenditure incurred on major items of labour costs was ploughing (7.97%) followed by harrowing (6.64%) and intercultivation (6.41%). The labour cost incurred on harvesting was Rs.959.13. The total cost of cultivation of chilli in Bijapur district was Rs.26453.00.

Overall

The total material cost of chilli in overall districts was Rs.16307.70. The expenditure incurred on fertilizer (26.58%) was the major followed by PPC (20.53%) and FYM (14.28%). The labour cost incurred for raising nursery was 3.37% of the total cost of cultivation. The items like fertilizer application formed 1.57 per cent, seedbed preparation constituted 1.12 per cent and hand weeding accounted 0.67 per cent of the total cost of cultivation.

The total expenditure on labour cost for main field was Rs.8587.77. Among the labour cost ploughing cost was the major (8.06%) followed by harrowing (6.59%) and intercultivation (6.05%). The total cost of cultivation of chilli for overall districts was Rs.25771.50.

4.2.2 Costs and returns in chili production

The per hectare cost of cultivation and returns according to farm business income of chilli for sample districts were worked out and presented in Table 4.8 and Fig 4.4.

Gulbarga district

The per hectare cost of cultivation by cost A2 was Rs. 24189.90, cost B2 was Rs. 37099.40 and cost C3 was Rs. 44902.70. The value of gross output was Rs. 78778.10 per hectare. Farm business income (profit at cost A2) was Rs. 54583.20 and family labour income (profit at cost B2) was Rs. 41673.70. Net income (profit at cost C3) per acre was found to be Rs. 33870.40 and benefit cost ratio was 1.75 in Gulbarga district.

Raichur district

The per hectare cost of cultivation by cost A2 was Rs. 22082.00, cost B2 was Rs. 34137.70 and cost C3 as Rs. 41686.60. The value of gross output was Rs. 76642.10. Farm business income was Rs. 55671.60, net income (profit at cost C3) per hectare was found to be Rs. 34955.50 and benefit cost ratio was 1.83.

Bijapur district

For Bijapur cost A2 was Rs. 23891.30 and cost B2 was Rs. 37164.86 per hectare. Total cost of cultivation of chilli (cost C3) per hectare in Bijapur district was Rs. 45109.80. The gross value of output was Rs. 73945.87. Farm business income (profit at cost A2) was Rs. 50054.55 and family labour income (at cost B2) was Rs. 36781.21. The net income (at cost C3) was Rs. 28836.26 and benefit-cost ratio was 1.63.

Overall

Analysis of cost and returns for overall farms indicated that the total cost of cultivation (cost C3) per hectare was Rs. 43899.71 while cost A2 was Rs. 23388.74 and cost B2 was Rs. 36134.03. The value of gross output in case of overall was Rs. 76455.37. The farm business income (profit at cost A2) was Rs. 53436.47 and family labour income (profit at cost B2) was Rs. 40319.69. The net income of overall districts was Rs. 32554.01 per hectare and benefit cost ratio was 1.73.

The total cost was more in Bijapur district Rs.45109.80 followed by Gulbarga Rs.44902.70 and Raichur (Rs.41686.60) districts. The overall total cost was Rs.43899.71. The total returns were more in Gulbarga district Rs.78778.10 followed by Raichur district Rs. 76642.10 and Rs. 73945.87 in Bijapur district. The overall gross return was Rs. 76455.37. The benefit cost ratio was more in Raichur district 1.83 followed by Gulbarga 1.75 and 1.63 in Bijapur district. The overall benefit cost ratio was 1.73.
Table 4.8: Cost and returns in chilli production (Rs./ha)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Cost A1)</td>
<td>(Cost A2)</td>
<td>(Cost B1)</td>
<td>(Cost B2)</td>
</tr>
<tr>
<td>I</td>
<td>Costs</td>
<td>24189.90</td>
<td>22082.00</td>
<td>23891.30</td>
<td>23388.74</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>(30.70)</td>
<td>(28.81)</td>
<td>(32.30)</td>
<td>(30.59)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>24189.90</td>
<td>22082.00</td>
<td>23891.30</td>
<td>23388.74</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>(30.70)</td>
<td>(28.80)</td>
<td>(32.30)</td>
<td>(30.59)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>27312.00</td>
<td>23824.40</td>
<td>26851.62</td>
<td>35099.98</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>(34.66)</td>
<td>(31.08)</td>
<td>(36.31)</td>
<td>(45.90)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>37099.40</td>
<td>34137.70</td>
<td>37164.86</td>
<td>36134.03</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>(47.09)</td>
<td>(44.54)</td>
<td>(50.25)</td>
<td>(47.26)</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>29859.80</td>
<td>26398.10</td>
<td>29483.40</td>
<td>28580.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(37.90)</td>
<td>(34.44)</td>
<td>(39.87)</td>
<td>(37.38)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39647.20</td>
<td>36711.50</td>
<td>39797.64</td>
<td>38718.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(50.32)</td>
<td>(47.89)</td>
<td>(53.81)</td>
<td>(50.64)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40153.80</td>
<td>37896.90</td>
<td>41008.92</td>
<td>39908.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(51.81)</td>
<td>(49.44)</td>
<td>(55.45)</td>
<td>(52.19)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>44902.70</td>
<td>41686.60</td>
<td>45109.80</td>
<td>43899.71</td>
</tr>
<tr>
<td>II</td>
<td>Total returns</td>
<td>78778.10</td>
<td>76642.10</td>
<td>73945.87</td>
<td>76455.37</td>
</tr>
<tr>
<td>III</td>
<td>Returns over A2</td>
<td>54583.20</td>
<td>55671.60</td>
<td>50054.55</td>
<td>53436.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(69.28)</td>
<td>(72.63)</td>
<td>(67.69)</td>
<td>(69.89)</td>
</tr>
<tr>
<td>IV</td>
<td>Returns over B2</td>
<td>41673.70</td>
<td>42504.40</td>
<td>36781.21</td>
<td>40319.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(52.90)</td>
<td>(55.45)</td>
<td>(49.74)</td>
<td>(52.73)</td>
</tr>
<tr>
<td>V</td>
<td>Returns over C3</td>
<td>33870.40</td>
<td>34955.50</td>
<td>28836.26</td>
<td>32554.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(42.99)</td>
<td>(45.60)</td>
<td>(38.99)</td>
<td>(42.57)</td>
</tr>
<tr>
<td>VI</td>
<td>B: C ratio</td>
<td>1.75</td>
<td>1.83</td>
<td>1.63</td>
<td>1.73</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate the percentage to the total returns
Fig. 4.4 Costs and returns of chilli production in sample districts
4.2.3 Input requirement for chilli cultivation

Table 4.9 gives the per hectare utilization of different factor inputs by sample farmers.

**Gulbarga district**

The total human labour cultivation per hectare in Gulbarga district was 63.13 man days and 18.59 bullock labour. The quantity of seeds used per hectare was 1.48 kgs. Application of FYM was 9.68 tonnes and that of fertilizer in terms of nutrients; nitrogen (N), phosphorus (P) and potash (K) were 267.00, 309.83 and 197.22 kg per hectare, respectively.

**Raichur district**

The quantity of seed used in chilli production in Raichur district was 1.48 kgs per hectare. The total human labour utilization was 61.45 mandays and 16.91 bullock pair days. Application of FYM was 9.01 tonnes per hectare and that of fertilizer in terms of nutrients i.e., nitrogen 273.15 kg, phosphorus 297.85 kg and potash 201.94 kg per hectare.

**Bijapur district**

The per hectare utilization of human labour was 61.97 man-days and total bullock labour used was 17.61 pair days. Here also, the quantity of seed used was same (1.48 kgs) and the FYM was 9.73 tonnes per hectare. The per hectare fertilizer used in terms of nutrients was nitrogen 260.58 kg, phosphorus 283.18 kg and potash 199.45 kg.

**Overall**

It is evident from the table that the per hectare utilization of human labour was 62.16 mandays and bullock labour was 17.70 pair days in overall sample districts. Application of seed was 1.48 kg per ha in all the sample districts. The overall application of fertilizer in terms of nutrients was, nitrogen 266.90 kg, phosphorus 296.94 kg and potash 199.52 kg per hectare. The quantity of FYM application per hectare was 9.46 tonnes in overall sample districts.

The total human labour utilization per hectare was marginally more in Gulbarga district (i.e., 63.13 mandays) followed by Bijapur (61.97 mandays) and 61.45 mandays in Raichur district. The overall total human labour utilization was 62.16 man-days. The total bullock labour use was more in Gulbarga district (18.59 pair days) followed by Bijapur (17.61 pair days) and lowest 16.91 pair days in Raichur district. Application of seed was equal/same (1.48 kgs) in all the districts. The quantity of FYM used per hectare was more in Bijapur district (9.73 tonnes) followed by Gulbarga 9.68 tonnes and 9.01 tonnes in Raichur district. The per hectare application of fertilizers in terms of nitrogen was more in Raichur district (273.15 kgs) followed by Gulbarga (267.00 kgs) and lowest (260.58 kgs) in Bijapur, phosphorus was used more in Gulbarga district (309.83 kg) followed by Raichur (297.85 kg) and lowest (283.18 kgs) in Bijapur district, potash was used more in Raichur district (201.94 kg) followed by Bijapur (199.45 kg) and in lowest Gulbarga district, it was 197.22 kgs per ha.

4.2.4 Labour utilization pattern in chilli production

The per hectare utilization of human as well as bullock labour was given in Table 4.10. The total bullock pair days used were 18.59 in Gulbarga, 16.91 in Raichur, 17.61 in Bijapur and overall of 17.66 pair days. In over all sample districts, ploughing consumed larger proportion of bullock pair days i.e., 6.22, 4.98 and 5.13 in Gulbarga, Raichur and Bijapur districts, respectively. Intercultivation required on an average, 4.91 bullock pair days per ha followed by harrowing, (4.84 pair days) and transportation of FYM (2.47 pair days).

The total human labour used per hectare was 63.13 mandays in Gulbarga, 61.42 mandays in Raichur and 61.97 man-days in Bijapur district. Harvesting required higher proportion of total human labour days i.e., 24.97, 24.82, 25.19 and 24.99 in Gulbarga, Raichur, Bijapur and overall sample districts. The next important operation was planting of seedling, which required 10.91 mandays in overall sample districts.
Table 4.9: Input requirement for chilli production
(Per hectare)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Units</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Seed</td>
<td>kgs</td>
<td>1.48</td>
<td>1.48</td>
<td>1.48</td>
<td>1.48</td>
</tr>
<tr>
<td>2.</td>
<td>FYM</td>
<td>Tonnes</td>
<td>9.68</td>
<td>9.01</td>
<td>9.73</td>
<td>9.46</td>
</tr>
<tr>
<td>3.</td>
<td>Fertilizers</td>
<td>Kgs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>N</td>
<td></td>
<td>267.00</td>
<td>273.15</td>
<td>260.58</td>
<td>266.90</td>
</tr>
<tr>
<td>b.</td>
<td>P</td>
<td></td>
<td>309.83</td>
<td>297.85</td>
<td>283.18</td>
<td>296.94</td>
</tr>
<tr>
<td>c.</td>
<td>K</td>
<td></td>
<td>197.22</td>
<td>201.94</td>
<td>199.45</td>
<td>199.52</td>
</tr>
<tr>
<td>4.</td>
<td>Human Labour</td>
<td>Mandays</td>
<td>63.13</td>
<td>61.45</td>
<td>61.97</td>
<td>62.16</td>
</tr>
<tr>
<td>5.</td>
<td>Bullock labour</td>
<td>Pair days</td>
<td>18.59</td>
<td>16.91</td>
<td>17.61</td>
<td>17.70</td>
</tr>
</tbody>
</table>

4.3  PATTERN OF MARKET ARRIVALS AND PRICES

4.3.1 Trends in annual market arrivals and prices of chilli

The trend in arrivals and prices of chilli in the selected markets were computed using orthogonal polynomial regression analysis and the results are presented in Table 4.11 and 4.12 and indicated with figures 4.5 and 4.6.

The pattern of trend in arrivals of chilli in Bijapur market observed to be 1994-95, later it showed decreasing trend. In Gulbarga market, increasing trend was observed up to 1994-95 and later it was slightly decreased up to 2000-01 and thereafter, increasing trend was observed. In case of Raichur market, there was a declining trend during initial period, then increasing trend up to 1998-99 and thereafter declining trend was observed up to 2003-04. In Byadagi market, decreasing trend was observed during initial period, then increasing trend was observed up to 1998-99 and thereafter it was increasing during 2004-05. In case of Hubli market, decreasing trend was observed during initial period, later it showed a increasing trend up to 1997-98, later it was declining trend during 2003-04 and thereafter showed a increasing trend.

The pattern of trend in prices of chilli in Bijapur market was observed to be similar as in case of arrivals. There was an increasing trend up to 1994-95, later it was declining up to 2004-05. In Gulbarga market, increasing trend was observed up to 1994-95 and later it showed slight decreasing up to 2000-01 and thereafter increasing trend was observed. In case of Raichur market, there was a declining trend during initial period then increasing trend was observed up to 1998-99 and thereafter declining was observed up to 2003-04 and again it was increasing. In Byadagi market increasing trend was observed up to 1998-99 later slight decreasing was noticed during 2002-03. In case of Hubli market increasing trend was observed up to 2000-01 later it showed a declining trend up to 2004-05.
Table 4.10: Labour utilization pattern in chilli production (Per hectare)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Units</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ploughing</td>
<td>No. of pair of bullock</td>
<td>6.22 (9.85)</td>
<td>4.98 (8.11)</td>
<td>5.13 (8.29)</td>
<td>5.43 (8.74)</td>
</tr>
<tr>
<td>2</td>
<td>Harrowing</td>
<td>&quot;</td>
<td>5.01 (7.94)</td>
<td>4.71 (7.67)</td>
<td>4.84 (7.81)</td>
<td>4.84 (2.28)</td>
</tr>
<tr>
<td>3</td>
<td>Intercultivation</td>
<td>&quot;</td>
<td>4.89 (7.74)</td>
<td>4.74 (7.11)</td>
<td>5.16 (8.33)</td>
<td>4.91 (7.90)</td>
</tr>
<tr>
<td>4</td>
<td>Transportation of FYM</td>
<td>&quot;</td>
<td>2.47 (3.91)</td>
<td>2.47 (4.01)</td>
<td>2.47 (3.98)</td>
<td>2.47 (3.97)</td>
</tr>
<tr>
<td></td>
<td>Total bullock pair used</td>
<td></td>
<td>18.59 (29.46)</td>
<td>16.91 (27.53)</td>
<td>17.61 (28.41)</td>
<td>17.66 (28.48)</td>
</tr>
<tr>
<td>5</td>
<td>Spreading of FYM</td>
<td>Mandays</td>
<td>5.68 (8.99)</td>
<td>5.28 (4.01)</td>
<td>5.63 (9.08)</td>
<td>5.53 (8.89)</td>
</tr>
<tr>
<td>6</td>
<td>Marking</td>
<td>&quot;</td>
<td>4.81 (7.62)</td>
<td>4.07 (6.63)</td>
<td>3.77 (6.09)</td>
<td>4.22 (6.29)</td>
</tr>
<tr>
<td>7</td>
<td>Fertilizer application</td>
<td>&quot;</td>
<td>5.75 (9.11)</td>
<td>5.68 (9.24)</td>
<td>6.00 (9.68)</td>
<td>5.80 (9.33)</td>
</tr>
<tr>
<td>8</td>
<td>Planting of seedling</td>
<td>&quot;</td>
<td>11.04 (17.48)</td>
<td>11.16 (18.16)</td>
<td>10.54 (17.01)</td>
<td>10.91 (17.56)</td>
</tr>
<tr>
<td>9</td>
<td>Spraying PPC</td>
<td>&quot;</td>
<td>10.86 (17.21)</td>
<td>10.39 (16.92)</td>
<td>10.81 (17.45)</td>
<td>10.69 (17.20)</td>
</tr>
<tr>
<td>10</td>
<td>Harvesting</td>
<td>&quot;</td>
<td>24.97 (39.55)</td>
<td>24.82 (40.39)</td>
<td>25.19 (40.65)</td>
<td>24.99 (40.20)</td>
</tr>
<tr>
<td></td>
<td>Total human labour used</td>
<td></td>
<td>63.13 (100.00)</td>
<td>61.42 (100.00)</td>
<td>61.97 (100.00)</td>
<td>62.16 (100.00)</td>
</tr>
</tbody>
</table>

Note: Figures in the parentheses indicate percentage to the total

4.3.2 Variations in arrivals and prices

Coefficient of variation was computed to study the variations in market arrivals and prices at chilli were presented in Table 4.13.

The coefficient of variation in prices of chilli was found to be higher in Byadagi market (45.01%) as compared to Bijapur (28.62%) and Hubli (22.95%) markets indicating higher variations in Byadagi market and lowest in Gulbarga (15.61%) and Raichur (14.21%) markets.

In case of arrivals, coefficient of variation was found to be highest in Hubli (126.48%) followed by Raichur (94.20%), Gulbarga (70.57%), Bijapur (56.16%) and Byadagi (48.02%) markets. This clearly showed that the variation in arrivals as well as prices over the years was relatively higher.
<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Markets</th>
<th>Intercept</th>
<th>X</th>
<th>X^2</th>
<th>X^3</th>
<th>X^4</th>
<th>R^2</th>
<th>'F' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hubli</td>
<td>9.765</td>
<td>-3.173</td>
<td>5.237</td>
<td>-2.199</td>
<td>0.273</td>
<td>0.44</td>
<td>2.00</td>
</tr>
<tr>
<td>2</td>
<td>Byadagi</td>
<td>11.833</td>
<td>0.043</td>
<td>-0.453</td>
<td>0.498</td>
<td>-0.108</td>
<td>0.52</td>
<td>2.72</td>
</tr>
<tr>
<td>3</td>
<td>Raichur</td>
<td>7.643</td>
<td>0.233</td>
<td>-2.816</td>
<td>3.006</td>
<td>-0.752</td>
<td>0.66</td>
<td>4.97</td>
</tr>
<tr>
<td>4</td>
<td>Gulbarga</td>
<td>9.379</td>
<td>-1.403</td>
<td>2.428</td>
<td>-1.037</td>
<td>0.162</td>
<td>0.71</td>
<td>6.16</td>
</tr>
<tr>
<td>5</td>
<td>Bijapur</td>
<td>7.588</td>
<td>-4.118</td>
<td>4.304</td>
<td>-1.812</td>
<td>0.289</td>
<td>0.49</td>
<td>2.40</td>
</tr>
</tbody>
</table>
Table 4.12 Estimated trend functions of prices of chilli in selected markets during 1991 to 2005

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Markets</th>
<th>Intercept</th>
<th>$X$</th>
<th>$X^2$</th>
<th>$X^3$</th>
<th>$X^4$</th>
<th>$R^2$</th>
<th>'F' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hubli</td>
<td>7.796</td>
<td>0.062</td>
<td>-0.423</td>
<td>0.518</td>
<td>-0.131</td>
<td>0.65</td>
<td>4.79</td>
</tr>
<tr>
<td>2.</td>
<td>Byadagi</td>
<td>7.462</td>
<td>-0.061</td>
<td>-0.129</td>
<td>0.314</td>
<td>-0.083</td>
<td>0.44</td>
<td>2.00</td>
</tr>
<tr>
<td>3.</td>
<td>Raichur</td>
<td>8.277</td>
<td>-0.408</td>
<td>0.974</td>
<td>-0.704</td>
<td>0.146</td>
<td>0.40</td>
<td>1.68</td>
</tr>
<tr>
<td>4.</td>
<td>Gulbarga</td>
<td>7.706</td>
<td>0.799</td>
<td>-0.169</td>
<td>-0.179</td>
<td>0.0169</td>
<td>0.75</td>
<td>7.80</td>
</tr>
<tr>
<td>5.</td>
<td>Bijapur</td>
<td>7.870</td>
<td>0.711</td>
<td>-0.710</td>
<td>0.430</td>
<td>-0.104</td>
<td>0.70</td>
<td>6.02</td>
</tr>
</tbody>
</table>
Fig. 4.5: Trends in arrivals of chilli in selected markets
Fig. 4.6: Trends in prices of chilli in selected markets
Table 4.13: Coefficient of variation in arrivals and prices of chilli in selected markets (1990-91 to 2003-04)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Markets</th>
<th>Arrivals</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gulbarga</td>
<td>70.57</td>
<td>15.61</td>
</tr>
<tr>
<td>2.</td>
<td>Raichur</td>
<td>94.20</td>
<td>14.21</td>
</tr>
<tr>
<td>3.</td>
<td>Bijapur</td>
<td>56.16</td>
<td>28.62</td>
</tr>
<tr>
<td>4.</td>
<td>Byadagi</td>
<td>48.02</td>
<td>45.01</td>
</tr>
<tr>
<td>5.</td>
<td>Hubli</td>
<td>126.48</td>
<td>22.95</td>
</tr>
</tbody>
</table>

4.3.3 Co-integration

Spatial market integration refers to a situation in which prices of a commodity in separated markets move together and price signals and information are transmitted smoothly across the markets, hence, spatial market performance may be evaluated in terms of the relationship between the prices of spatially separated markets and spatial behaviour in the markets may be used as a measure of overall market performance.

In the present study empirically, evaluated spatial integration of the selected chilli markets by employing co-integration technique and assessed the market integration. In the present context, co-integration analysis is employed to examine whether the one market is integrated with the other market. This is studied by testing whether the low of one price (LOP) holds in these markets.

Dickey-Fuller test for stationary of the price series of chilli in selected markets were presented in Table 4.14 indicates that the price series of chilli in all the selected markets attain stationary at same orders, differencing except in Byadagi market, which was found to be negative and significant at first order of integration. The Dickey-Fuller values for the differenced series in all the markets found to be negative and significant at same levels of differencing. This indicates that the price series of all the selected markets attains its stationary at zero order of integration. But, in Byadagi market, the price series attains stationary at first order of integration, eventhough, different markets have attained stationary at different orders of integration.

4.4 MARKETING PERFORMANCE OF CHILLI

The selection of marketing channel becomes imperative for the farmers, since the real benefit accrued to them is mainly depend upon the choice of agency and channel for disposal of their produce. The channel selected by them must account for minimum marketing cost and ensure higher share in consumer’s rupee. The selection of marketing channel depends upon quantity of marketable surplus available with the farmer, withholding capacity of the farmer, price structure, availability of infrastructure facilities etc.

In the study area, two important marketing channels were identified in marketing of chillies in different markets.

Channel-I: Producer-seller → Village merchant → Wholesaler → Retailer → Consumer

Channel-II: Producer-seller → Commission agent - Wholesaler → Retailer → consumer
Table 4.14: Dickey-Fuller test for stationary of the price series of chilli in selected markets

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Market</th>
<th>Order of integration</th>
<th>ADF value</th>
<th>Assy. Critical value at 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gulbarga</td>
<td>0</td>
<td>-5.16</td>
<td>-2.57</td>
</tr>
<tr>
<td>2.</td>
<td>Raichur</td>
<td>0</td>
<td>-4.52</td>
<td>-2.57</td>
</tr>
<tr>
<td>3.</td>
<td>Bijapur</td>
<td>0</td>
<td>-4.25</td>
<td>-2.57</td>
</tr>
<tr>
<td>4.</td>
<td>Hubli</td>
<td>0</td>
<td>-4.10</td>
<td>-2.57</td>
</tr>
<tr>
<td>5.</td>
<td>Byadagi</td>
<td>1</td>
<td>-5.34</td>
<td>-2.57</td>
</tr>
</tbody>
</table>

4.4.1 Marketing costs incurred by the farmers in marketing of dry chilli

Channel-I: (Producer-seller ➔ Village merchant ➔ Wholesaler ➔ Retailer ➔ Consumer)

The average marketing cost incurred by the producer-seller in channel I (Table 4.15) in the overall study area accounted to Rs. 30.00 per quintal, its magnitude was almost similar in all the sample districts. This lowest cost was due to the purchase made by the village merchant, which included only the sorting cost.

Channel-II: (Producer-seller ➔ Commission agent ➔ Wholesaler ➔ retailer ➔ Consumer)

Under the channel-II, various marketing costs incurred by the producers were on items like sorting, packing, transportation, weighment and commission (Table 4.15 and Fig 4.7). The total cost incurred by farmers was highest in Raichur market (Rs. 112.65/quintal) followed by Bijapur market (Rs. 110.02/quintal) and Gulbarga market (Rs. 103.80). While an average marketing cost incurred by farmers in this channel was to about Rs. 108.82 per quintal.

Out of the total marketing cost incurred by the producer-seller, the cost of packing (29.83%) accounted for major component followed by sorting cost (28.31%) and expenditure on transportation (20.51%) in the overall study area. Similar pattern was observed in all the markets, wherein cost on packing was the major component followed by sorting cost and transportation cost. These three components alone accounted for about 80 per cent of the total marketing cost incurred by the farmers. The cost incurred on weighment was (1.04%) least to the total cost.

4.4.2 Marketing costs, margins and price spread

4.4.2.1 Marketing cost incurred by different intermediaries in marketing of chilli

Gulbarga district

Table 4.16 indicates that various costs incurred by village merchant in Gulbarga on the items like commission charges, transportation cost, market fee, packing cost etc. and the total cost incurred per quintal was Rs. 106.10. The major share was towards commission charge (Rs. 37.20) accounting for 35.06 per cent followed by market fee (Rs. 19.60), which formed 18.47 per cent of the total cost. Transport cost incurred was Rs. 14.80. The other costs were towards labour charges (Rs. 9.20), packing cost (Rs. 11.80), loading and unloading (Rs. 9.40), which accounted for 8.67, 11.12 and 8.85 per cent of total costs, respectively.
### Table 4.15: Marketing costs incurred by sample farmers under channel I & II

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Gulbarga (Rs/qtl)</th>
<th>Raichur (Rs/qtl)</th>
<th>Bijapur (Rs/qtl)</th>
<th>Overall (Rs/qtl)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Channel I</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sorting</td>
<td>30.92</td>
<td>30.80</td>
<td>30.72</td>
<td>30.81</td>
</tr>
<tr>
<td></td>
<td><strong>Channel II</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sorting</td>
<td>30.92 (29.78)</td>
<td>30.80 (27.34)</td>
<td>30.72 (27.12)</td>
<td>30.81 (28.31)</td>
</tr>
<tr>
<td>2</td>
<td>Packing</td>
<td>29.62 (28.53)</td>
<td>32.72 (29.04)</td>
<td>35.06 (31.86)</td>
<td>32.46 (29.83)</td>
</tr>
<tr>
<td>3</td>
<td>Transportation including loading and unloading</td>
<td>20.12 (19.38)</td>
<td>24.82 (22.03)</td>
<td>22.05 (20.04)</td>
<td>22.33 (20.51)</td>
</tr>
<tr>
<td>4</td>
<td>Weighment</td>
<td>1.12 (1.07)</td>
<td>1.21 (1.07)</td>
<td>1.07 (0.97)</td>
<td>1.13 (1.04)</td>
</tr>
<tr>
<td>5</td>
<td>Commission</td>
<td>22.02 (21.21)</td>
<td>23.10 (20.50)</td>
<td>21.12 (19.19)</td>
<td>22.08 (20.28)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>103.80 (100.00)</td>
<td>112.65 (100.00)</td>
<td>110.02 (100.00)</td>
<td>108.82 (100.00)</td>
</tr>
</tbody>
</table>

Note: Figures in the parentheses indicate percentage to the total

**Commission agent**

It could be seen from the Table 4.16 that the total cost per quintal of chilli was Rs. 32.10. The major item on cost was on tax (Rs. 20.30), which formed 63.23 per cent of total cost. The other items of cost were labour charge (Rs. 9.60), license fee (Rs. 1.25) and miscellaneous (Rs. 0.95), which constituted 29.90, 3.89 and 2.95 per cent of total cost, respectively.

**Wholesaler**

Study also indicates that the wholesaler incurred Rs. 145.45 per quintal towards marketing cost. The main items of cost were towards transportation cost Rs. 68.90 (47.50%), tax Rs. 29.50 (20.33%), market fee Rs. 23.20 (15.99%) and labour charges Rs. 10.4 (7.16%), packing cost Rs. 6.20 and miscellaneous charge was Rs. 1.05 per quintal.

**Retailer**

It indicates that the total marketing cost of retailer was Rs. 46.8, out of which commission charges accounted for a major share i.e., Rs. 26.40. The other items of cost were labour charge of Rs. 8.20, transportation cost Rs. 9.20 and miscellaneous Rs. 0.9 (1.92%).
Fig. 4.7: Components of marketing costs incurred by farmers in marketing of chilli.
Table 4.16: Marketing cost incurred by different intermediaries in chilli marketing

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Village merchant</th>
<th>Commission agent</th>
<th>Wholesaler</th>
<th>Retailer</th>
<th>Village merchant</th>
<th>Commission agent</th>
<th>Wholesaler</th>
<th>Retailer</th>
<th>Village merchant</th>
<th>Commission agent</th>
<th>Wholesaler</th>
<th>Retailer</th>
<th>Village merchant</th>
<th>Commission agent</th>
<th>Wholesaler</th>
<th>Retailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Labour charge</td>
<td>9.20 (8.67)</td>
<td>9.6 (29.90)</td>
<td>10.4 (7.16)</td>
<td>8.20 (17.52)</td>
<td>10.40 (10.12)</td>
<td>10.3 (29.64)</td>
<td>11.2 (79.80)</td>
<td>7.40 (16.74)</td>
<td>6.6 (6.34)</td>
<td>9.20 (29.94)</td>
<td>8.5 (6.05)</td>
<td>7.4 (15.67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Transport cost</td>
<td>14.80 (13.94)</td>
<td>-</td>
<td>68.9 (47.50)</td>
<td>9.20 (19.65)</td>
<td>13.40 (13.04)</td>
<td>-</td>
<td>66.10 (47.09)</td>
<td>7.30 (17.64)</td>
<td>15.6 (15.00)</td>
<td>-</td>
<td>65.70 (46.77)</td>
<td>8.6 (18.22)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Packing cost</td>
<td>11.80 (11.12)</td>
<td>-</td>
<td>5.2 (4.27)</td>
<td>-</td>
<td>12.60 (12.26)</td>
<td>-</td>
<td>5.8 (4.13)</td>
<td>-</td>
<td>13.4 (12.88)</td>
<td>-</td>
<td>-</td>
<td>6.7 (4.77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Loading and unloading</td>
<td>9.4 (8.85)</td>
<td>-</td>
<td>5.8 (3.99)</td>
<td>-</td>
<td>10.80 (10.51)</td>
<td>-</td>
<td>6.2 (4.41)</td>
<td>-</td>
<td>8.6 (10.96)</td>
<td>-</td>
<td>-</td>
<td>5.8 (4.12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Weighing charges</td>
<td>1.8 (1.69)</td>
<td>-</td>
<td>2.10 (4.40)</td>
<td>1.20 (1.16)</td>
<td>-</td>
<td>-</td>
<td>3.3 (7.46)</td>
<td>-</td>
<td>2.4 (2.30)</td>
<td>-</td>
<td>-</td>
<td>2.9 (6.14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Commission charges</td>
<td>37.20 (35.06)</td>
<td>-</td>
<td>26.40 (56.41)</td>
<td>33.60 (32.71)</td>
<td>-</td>
<td>-</td>
<td>24.60 (55.65)</td>
<td>35.6 (34.23)</td>
<td>-</td>
<td>-</td>
<td>27.6 (58.47)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>License fee</td>
<td>0.80 (0.75)</td>
<td>1.25 (3.89)</td>
<td>-</td>
<td>1.2 (1.16)</td>
<td>1.45 (4.17)</td>
<td>-</td>
<td>-</td>
<td>1.1 (1.05)</td>
<td>1.05 (3.41)</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Tax</td>
<td>-</td>
<td>20.3 (63.23)</td>
<td>29.5 (20.33)</td>
<td>-</td>
<td>21.90 (63.02)</td>
<td>27.5 (19.59)</td>
<td>-</td>
<td>-</td>
<td>19.50 (63.47)</td>
<td>-</td>
<td>28.3 (20.14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Market fee</td>
<td>19.6 (18.47)</td>
<td>-</td>
<td>23.2 (15.99)</td>
<td>-</td>
<td>18.4 (17.91)</td>
<td>22.7 (16.17)</td>
<td>-</td>
<td>18.6 (17.88)</td>
<td>-</td>
<td>24.2 (17.23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Miscellaneous</td>
<td>1.5 (1.41)</td>
<td>0.95 (2.95)</td>
<td>1.05</td>
<td>0.9 (1.92)</td>
<td>1.1 (1.07)</td>
<td>1.1 (3.16)</td>
<td>0.85 (0.60)</td>
<td>1.1 (2.48)</td>
<td>2.1 (2.01)</td>
<td>0.97 (3.15)</td>
<td>1.25 (0.88)</td>
<td>0.7 (1.48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>106.10 (100.00)</td>
<td>32.10 (100.00)</td>
<td>145.05 (100.00)</td>
<td>46.8 (100.00)</td>
<td>102.70 (100.00)</td>
<td>34.75 (100.00)</td>
<td>140.35 (100.00)</td>
<td>44.2 (100.00)</td>
<td>104.00 (100.00)</td>
<td>30.72 (100.00)</td>
<td>140.45 (100.00)</td>
<td>47.2 (100.00)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Figures in the parentheses indicate percentage to the total.
II. Raichur market

Village merchant

The marketing cost incurred by village merchant was Rs. 102.70, which was lower than the cost incurred by the intermediaries in Gulbarga market. The major constituents of marketing cost were commission charges Rs. 33.60, market fee Rs. 18.40 and transportation cost Rs. 13.40 and least was on miscellaneous costs (1.07%).

Commission agent

Commission agent spent Rs. 34.75 per quintal towards marketing cost, of which labour charges, tax and license fee, accounted for Rs. 10.3, Rs. 21.90 and Rs. 1.45 forming 29.64, 63.02 and 4.17 per cent of total marketing cost in that order and least was miscellaneous cost (3.16%).

Wholesaler

Table 4.16 indicated that marketing cost incurred in Raichur market was lower as compared to Gulbarga market i.e., Rs. 140.35. The larger proportion of the cost was incurred on transportation, which formed 47.69%. The items like tax and market fee accounted for 19.59% and 16.17%, respectively. The packing cost was Rs. 5.8 (4.13%) and loading and unloading was Rs. 6.20 (4.41%).

Retailer

The total marketing cost incurred by retailer was Rs. 44.20 per qtl, out of this, cost incurred on commission charges was Rs. 24.60, labour charges was Rs. 7.40 and transportation Rs. 7.80. The other item of cost was weighment charges (Rs. 3.30).

The cost incurred by all intermediaries like village merchant commission agent, retailer and wholesaler was high in Gulbarga market as compared to Raichur market.

III. Bijapur market

Village merchant

In this market, the per quintal marketing cost incurred by village merchant was Rs. 104.00, the major cost was of the commission charges Rs. 35.60 (34.23%), followed by the market fee Rs. 18.60 (17.88%) and transportation cost Rs. 15.60 (15.00%). The rest of the items constituted 29 per cent.

Commission agent

Commission agent spent Rs. 30.72 per quintal towards marketing cost, of which labour charges, tax and license fee, accounted for Rs. 9.20, Rs. 19.50 and Rs. 1.05 forming 29.94, 63.47 and 3.41 per cent of total marketing cost, respectively.

Wholesaler

It is observed from Table 4.16 that the per quintal marketing cost of Rs. 140.45 incurred by wholesaler in Bijapur market was less compared to Gulbarga market (Rs. 140.45). The larger proportion of the cost was incurred on the transportation, which formed Rs. 65.70 (46.77%) followed by tax Rs. 28.30 (20.14%), market fee was Rs. 24.20 (17.23%) and labour charges Rs. 8.50 (6.05%).

Retailer

The total marketing cost incurred by retailer was Rs. 47.20 qtl of this, the cost incurred on commission charges was Rs. 27.60 (58.47%), labour charges was Rs. 7.40 (15.67%) and transportation cost Rs. 8.60 (18.22%).

The per quintal total marketing cost incurred by village merchant was more in Gulbarga district (Rs. 106.10) followed by Bijapur (Rs.104.00) and lowest (Rs. 102.70) in Raichur market. The total cost incurred by commission agent was more in Raichur market (Rs. 34.75) followed by Gulbarga (Rs.32.10) and lowest (Rs.30.72) in Bijapur market. The total cost incurred by wholesaler was more in Gulbarga market (Rs.145.05) followed by
Bijapur (Rs.140.45) and lowest (Rs.140.35) in Raichur market. The total cost incurred by retailers was highest in Bijapur market (Rs.47.20) followed by gulbarga market (Rs.46.80) and lowest (Rs.44.20) in Raichur market.

4.4.2.2 Marketing margin and price spread in marketing of chilli in selected markets

A systematic analysis of costs and margin of various intermediaries involved in marketing of chilli would help to know the various services rendered by these intermediaries and their economic performance in the marketing of chilli.

The price spread is one of the measures of market efficiency, as it indicates the increase in the price of a commodity as it changes hands from one intermediary to another in the marketing set up. The price spread includes marketing cost incurred and margins obtained by various market intermediaries and producer. The marketing costs and margins of different market functionaries were worked out as percentage to consumer's price for the effective comparison.

Marketing cost, margins and price spread in channel-I

The marketing cost and margin of intermediaries involved in the marketing of chilli in Gulbarga, Raichur and Bijapur markets are given in Table 4.17.

Gulbarga

In Gulbarga market, producer received Rs.3722 per quintal price for chilli. The marketing cost incurred by wholesaler was Rs.145.05, followed by village merchant Rs.106.10, retailer Rs.46.80 and Rs.30.92 by producers. The profit earned by retailer was more Rs.283.20, followed by village merchant Rs.111.90 and Rs.94.95 by wholesaler from marketing of one quintal chilli. The producers share in consumer's rupee in Gulbarga district was 81.84%, while marketing cost per quintal was 18.16 per cent.

Raichur

In Raichur district producer received Rs.3745.00 per quintal price for chilli. The per quintal cost incurred by wholesaler was highest i.e., Rs.140.35, followed by village merchant Rs.102.70, retailer Rs.44.20 and Rs.30.80 by producer. The highest profit was earned by retailer (Rs.130.80) followed by village merchant Rs.107.30 and Rs.99.65 by wholesaler. The producers share in consumer's rupee in Raichur district was 84.99%, while marketing cost was 15.02 per cent.

Bijapur

The producers' price, in Bijapur district was Rs.3825.00 per quintal for chilli. The cost incurred by wholesaler was more Rs.140.45 followed by village merchant Rs.104.00, retailer Rs.47.20 and Rs.30.72 by producer. The profit earned by retailer was highest i.e., Rs.193.80, followed by village merchant Rs.101.00 and Rs.54.55 by wholesalers. The producers share in consumer rupee in Bijapur district was 84.95 per cent, while marketing cost was 15.05 per cent.

Overall

The producers', in overall districts received price of Rs.3764.00 per quintal for chilli. The per quintal cost incurred by wholesalers was highest Rs.141.95 followed by village merchant Rs.104.26, retailer Rs.30.34 and Rs.30.81 by producer. The profit earned by retailer was more Rs.202.60 followed by village merchant Rs.106.73 and Rs.83.05 by wholesalers. The producers share in consumer's rupee (in overall districts) was 83.92 per cent and marketing cost was 16.08 per cent.

The producers' share in consumer's rupee was found to be more in Raichur market (84.98%) followed by Bijapur (84.95%) and lowest (81.84%) in Gulbarga market. The maximum price spread was found in Gulbarga market Rs.818.92 per quintal, followed by Bijapur market Rs.671.72 and Rs.655.80 in Raichur market.
Table 4.17: Marketing costs and margins and price spread in channel I in the study area
(Rs./qtl)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Producers price</td>
<td>3722 (82.52)</td>
<td>3745 (85.69)</td>
<td>3825 (85.64)</td>
<td>3764.00 (84.60)</td>
</tr>
<tr>
<td>2</td>
<td>Cost incurred by producer</td>
<td>30.92 (0.68)</td>
<td>30.80 (0.70)</td>
<td>30.72 (0.68)</td>
<td>30.81 (0.69)</td>
</tr>
<tr>
<td>3</td>
<td>Producer’s net price</td>
<td>3691.08 (81.84)</td>
<td>3714.20 (84.99)</td>
<td>3794.28 (84.95)</td>
<td>3733.18 (83.91)</td>
</tr>
<tr>
<td>4</td>
<td>Cost incurred by village merchant</td>
<td>106.10 (2.35)</td>
<td>102.70 (2.35)</td>
<td>104.00 (2.32)</td>
<td>104.26 (2.34)</td>
</tr>
<tr>
<td>5</td>
<td>Purchase price of village merchant</td>
<td>3722 (82.52)</td>
<td>3745 (85.69)</td>
<td>3825 (85.64)</td>
<td>3764.00 (84.60)</td>
</tr>
<tr>
<td>6</td>
<td>Wholesalers purchase price (sale price by village merchant)</td>
<td>3940 (87.36)</td>
<td>3955 (90.50)</td>
<td>4030 (90.23)</td>
<td>3975 (89.35)</td>
</tr>
<tr>
<td>7</td>
<td>Profit by village merchant</td>
<td>111.90 (2.48)</td>
<td>107.30 (2.45)</td>
<td>101.00 (2.26)</td>
<td>106.73 (2.39)</td>
</tr>
<tr>
<td>8</td>
<td>Cost incurred by wholesaler</td>
<td>145.05 (3.21)</td>
<td>140.35 (3.21)</td>
<td>140.45 (3.14)</td>
<td>141.95 (3.19)</td>
</tr>
<tr>
<td>9</td>
<td>Wholesellers selling price</td>
<td>4180 (92.68)</td>
<td>4195 (95.99)</td>
<td>4225 (94.60)</td>
<td>4200 (94.41)</td>
</tr>
<tr>
<td>10</td>
<td>Profit of wholesalers</td>
<td>94.95 (2.10)</td>
<td>99.65 (2.28)</td>
<td>54.55 (1.22)</td>
<td>83.05 (1.86)</td>
</tr>
<tr>
<td>11</td>
<td>Cost incurred by retailers</td>
<td>46.80 (1.03)</td>
<td>44.20 (1.01)</td>
<td>47.20 (1.05)</td>
<td>30.34 (0.68)</td>
</tr>
<tr>
<td>12</td>
<td>Consumer price*</td>
<td>4510 (100.00)</td>
<td>4370 (100.00)</td>
<td>4466 (100.00)</td>
<td>4448.66 (100.00)</td>
</tr>
<tr>
<td>13</td>
<td>Profit retailer</td>
<td>283.20</td>
<td>130.80</td>
<td>193.8</td>
<td>202.60</td>
</tr>
<tr>
<td>14</td>
<td>Producers share in consumer price (%)</td>
<td>81.84</td>
<td>84.98</td>
<td>84.95</td>
<td>83.92</td>
</tr>
<tr>
<td>15</td>
<td>Price spread</td>
<td>818.92</td>
<td>655.80</td>
<td>671.72</td>
<td>715.48</td>
</tr>
</tbody>
</table>

*Consumer price considered as 100 per cent

Note: Figures in parentheses indicate percentage to the consumer price
Table 4.18: Marketing costs and margins and price spread in channel II in the study area

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Rs./qtl)</td>
<td>(Rs./qtl)</td>
<td>(Rs./qtl)</td>
<td>(Rs./qtl)</td>
</tr>
<tr>
<td>1.</td>
<td>Producers price</td>
<td>3800</td>
<td>3750</td>
<td>3910</td>
<td>3820.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(84.25)</td>
<td>(85.81)</td>
<td>(87.55)</td>
<td>(85.86)</td>
</tr>
<tr>
<td>2.</td>
<td>Cost incurred by producer</td>
<td>103.80</td>
<td>112.65</td>
<td>110.07</td>
<td>108.82</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.30)</td>
<td>(2.57)</td>
<td>(2.46)</td>
<td>(2.44)</td>
</tr>
<tr>
<td>3.</td>
<td>Producer’s net price</td>
<td>3696.20</td>
<td>3637.35</td>
<td>3799.98</td>
<td>3711.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(81.95)</td>
<td>(83.23)</td>
<td>(85.08)</td>
<td>(83.42)</td>
</tr>
<tr>
<td>4.</td>
<td>Cost incurred by village merchant</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Purchase price of village merchant</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Wholesalers purchase price (sale</td>
<td>3955</td>
<td>3870</td>
<td>3940</td>
<td>3921.66</td>
</tr>
<tr>
<td></td>
<td>price by village merchant)</td>
<td>(87.69)</td>
<td>(88.55)</td>
<td>(88.22)</td>
<td>(88.15)</td>
</tr>
<tr>
<td>7.</td>
<td>Profit by village merchant</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8.</td>
<td>Cost incurred by wholesaler</td>
<td>145.05</td>
<td>140.35</td>
<td>140.45</td>
<td>141.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.21)</td>
<td>(3.21)</td>
<td>(3.14)</td>
<td>(3.19)</td>
</tr>
<tr>
<td>9.</td>
<td>Wholesalers selling price</td>
<td>4190</td>
<td>4085</td>
<td>4135</td>
<td>4136.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(92.90)</td>
<td>(93.47)</td>
<td>(92.58)</td>
<td>(92.98)</td>
</tr>
<tr>
<td>10.</td>
<td>Profit of wholesalers</td>
<td>84.65</td>
<td>74.65</td>
<td>54.55</td>
<td>71.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.87)</td>
<td>(1.70)</td>
<td>(1.22)</td>
<td>(1.60)</td>
</tr>
<tr>
<td>11.</td>
<td>Cost incurred by retailers</td>
<td>46.80</td>
<td>44.20</td>
<td>47.20</td>
<td>46.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.03)</td>
<td>(1.01)</td>
<td>(1.05)</td>
<td>(1.03)</td>
</tr>
<tr>
<td>12.</td>
<td>Consumer price*</td>
<td>4510</td>
<td>4370</td>
<td>4466</td>
<td>4448.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
</tr>
<tr>
<td>13.</td>
<td>Profit retailer</td>
<td>273.20</td>
<td>240.80</td>
<td>283.80</td>
<td>265.93</td>
</tr>
<tr>
<td>14.</td>
<td>Producers share in consumer rupee (%)</td>
<td>81.95</td>
<td>83.23</td>
<td>85.08</td>
<td>83.42</td>
</tr>
<tr>
<td>15.</td>
<td>Price spread</td>
<td>813.80</td>
<td>732.65</td>
<td>666.02</td>
<td>737.49</td>
</tr>
</tbody>
</table>

*Consumer price considered as 100 per cent
Note: Figures in parentheses indicate percentage to the consumer price
Marketing cost, margins and price spread in channel-II

The marketing cost and margins of intermediaries involved in the marketing of chilli are given in Table 4.18.

Gulbarga

In channel II, the producers' in Gulbarga market received price of Rs.3800.00 per quintal for chilli. The per quintal cost incurred by wholesaler was highest Rs.145.05, followed by producer Rs.103.80 and Rs. 46.80 by retailers. The consumer price in Gulbarga market was Rs.4510 per quintal. The profit earned by retailer from sale of one quintal chilli was more Rs.273.20, followed by wholesalers Rs.84.65. The producers share in consumer's rupee was 81.95% and price spread was 813.80 (18.05%).

Raichur

The producers price in Raichur district was Rs.3750.00 per quintal. The cost incurred by wholesaler was more Rs.140.35, followed by producer Rs.112.65 and Rs.44.20 by retailers. The consumer price in Raichur district wasRs.4370.00 per quintal. The profit earned by retailer was more Rs.240.80 followed by wholesaler Rs.74.65. The producers share in consumer rupee was 83.23 per cent and price spread was Rs. 732.65 (16.77%).

Bijapur

The producers' price in Bijapur was Rs.3910.00 per quintal of chilli. The cost incurred by wholesaler was Rs.140.45, followed by producer Rs.110.07 and Rs.47.20 by retailers. The price paid by the consumer in Bijapur market was Rs.4466.00 per quintal for chilli. The profit earned by retailer was more Rs.283.80, followed by wholesaler Rs.54.55. The producers share in consumer rupee was 85.08 per cent and price spread was Rs. 666.02 (14.92%).

Overall

The producers' price in overall districts was Rs.3820.00 per quintal. The cost incurred by wholesaler was highest i.e., Rs.141.95, followed by producer Rs.108.82 and Rs.46.06 by retailers. The consumer price in overall markets was Rs.4448.66. The profit earned by retailer was highest Rs.265.93, followed by wholesaler Rs.71.28. The producers share in consumer rupee was 83.42 per cent and price spread was Rs. 737.49 (16.58%).

The producers share in consumer rupee was found to be more in Bijapur market 85.08%, followed by Raichur 83.23% and lowest 81.95% in Gulbarga market. The maximum price spread was found in Gulbarga market Rs. 813.80 followed by Raichur Rs. 732.65 and lowest Rs. 666.02 in Bijapur market.

4.5 EXPORT PERFORMANCE OF CHILLI

4.5.1 Growth rates in exports of chilli

The exponential function was employed to arrive at the growth rate of quantity and value of exports of chilli in both periods and the adequacy of the model for the respective series was indicated by the coefficient of multiple determination (R²).

The compound growth rates of quantity and value of chilli exports from India (Table 4.19) clearly demonstrated that both quantity and value of exports of chilli increased significantly in both periods.

In general for the overall period, the growth in value of chilli exports (27.25%) was higher than quantity of exports (19.37%). The growth rates of unit value (Rs./kg) of chilli export (10.38%) was higher in period I than period II (2.88%). The R² value of quantity of chilli export, in overall period, was 0.81, while it was 0.87 in case of value of export. The overall R² value for unit value was 0.72. The F value for quantity was 78.40, while it was 22.50 in case of value of export. The F value in unit value of export was 48.37.

4.5.2 Trend in export of chilli

Table 4.20 and Fig. 4.8 to 4.10 depicts the results of the orthogonal polynomial regression analysis of quantity and value of trend in export of chilli.
An increasing pattern of trend in export of chilli in both quantity and value, were observed. In case of export in quantity, exhibited mild ups and downs in trend during the period 1986-87, while, an increasing trend over the period upto 2002-03.

The pattern of trend in value of exports of chilli showed mild fluctuations during 1986-87 and thereafter a gradual increasing trend was observed during the study period.

4.5.3 Export competitiveness of Indian dry chilli in world market

Foreign trade policies have given high importance in boosting our agricultural exports especially with WTO-Trade. With the establishment of world market organization, India has higher access to global market especially for dry chillies (Annon, 2005).

The estimated values of Nominal Protection Coefficient (NPC) in chilli are given in Table 4.21. The wholesale price of chilli in Karnataka varied over a period time from Rs.1935.00 in 1996-97 to Rs.4087.00 in 2004-05. The transport cost, packing and handling cost increased from Rs.144.00 in 1996-97 to Rs.240.00 in 2004-05. The FOB price varied from Rs.2175.75 in 1996-97 to Rs.4531.35 during 2004-05. The cost insurance freight price was 64.71$/qtl during 1996-97 and 104$/qtl in 2004-05. The New York reference price varied from 200.87$/qtl in 1996-97 to 167.77$/qtl in 2004-05. The Nominal protection co-efficient of dry chilli varied from 0.32 in 1996-97 to 0.62 in 2004-05. It indicates that there is a scope for export of chilli.

4.5.4 Direction of trade and changing pattern of exports

The dynamics of changes in the export trade of Indian dry chilli were studied through the estimation of a Markov chain transitional probability matrix. The probability of retaining the previous period market share (gain or loss) is interpreted by studying the diagonal and off diagonal elements of transitional probability matrix.

As evident from the Table 4.22, the probability matrix indicated that Indian dry chilli exports to Sri Lanka retains its share to a tune of 25.10 per cent. Bangladesh gained 24.10 per cent, Uganda 8.30 percent and Indonesia 3.10 per cent of Sri Lanka share. Sri Lanka however gained 39.4 per cent of USA and 40.10 per cent of others share.

India’s export to USA retained to the tune of 19.40 per cent, Sri Lanka and Malaysia captured 39.40 per cent and 4.10 per cent of India’s share of USA market, respectively. USA gained 100 per cent from both Malaysia and Indonesia, 5.8 per cent from others.

As evident from Table, the probability matrix indicated that Indian dry chilli exports to Bangladesh, Malaysia, Uganda and Indonesia could not retain its share. In the case of other countries, India could gain its share of exports to the extent of 34.7 per cent and Sri Lanka (40.10%), USA (5.80%), Malaysia (15.4%), Uganda (8%) and Indonesia (32%) gained by other countries.

4.6 VALUE ADDITION IN CHILLI

4.6.1 Labour utilization in dry chilli processing units

The utilization of labour for different types of operations in dry chilli processing units has been presented in Table 4.23.

In dry chilli processing activity, men and women labours were employed. In Gulbarga, total four labours were employed, while in Bijapur and Raichur three labours were employed.

In Gulbarga, out of total labours, one man and three women labours were utilized, while in Bijapur only one man labour and two women were employed, in these units, whereas, in Raichur one man and two women labour were used for processing of dry chilli.

From the table, it is seen that average one man labour and 2.33 women labour required for processing one quintal of dry chilli into finished products.

4.6.2 Cost and return structure in chilli processing units

Cost and returns from the one-quintal of dry chilli processing in selected units is presented in Table 4.24.
Table 4.19: Compound growth rates of quantity and values of chilli export from India

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Districts</th>
<th>Quantity</th>
<th>Value</th>
<th>Unit value (Rs./kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P-I</td>
<td>P-II</td>
<td>Overall</td>
</tr>
<tr>
<td>1.</td>
<td>CGR (%)</td>
<td>31.26**</td>
<td>11.07**</td>
<td>19.37**</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>44.89**</td>
<td>14.28**</td>
<td>27.57**</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>15.93</td>
<td>13.30</td>
<td>24.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>78.40</td>
<td>13.64</td>
<td>22.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.61</td>
<td>6.49</td>
<td>48.37</td>
</tr>
</tbody>
</table>

Note: Period-I: 1984-85 to 1993-94  
Period-II: 1994-95 to 2003-04  
Overall: 1984-85 to 2003-04  
** Significant at 1% level  
* Significant at 5% level
Table 4.20: Estimated trend functions for exports of chilli from India

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Markets</th>
<th>Intercept</th>
<th>X</th>
<th>X²</th>
<th>X³</th>
<th>X⁴</th>
<th>R²</th>
<th>‘F’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Quantity (tonnes)</td>
<td>8.98</td>
<td>-6.61**</td>
<td>8.18**</td>
<td>-3.15**</td>
<td>0.41*</td>
<td>0.95</td>
<td>74.46</td>
</tr>
<tr>
<td>2.</td>
<td>Values (Rs.)</td>
<td>6.85</td>
<td>-5.68**</td>
<td>6.62**</td>
<td>-2.21</td>
<td>0.25</td>
<td>0.97</td>
<td>135.60</td>
</tr>
<tr>
<td>3.</td>
<td>Unit value (Rs./kg)</td>
<td>2.48</td>
<td>0.93</td>
<td>-1.55</td>
<td>0.93</td>
<td>-0.16</td>
<td>0.78</td>
<td>13.85</td>
</tr>
</tbody>
</table>

** Significant at 1% level
* Significant at 5% level
Fig. 4.8: Trends in quantity of chilli exports from India
Fig. 4.9: Trends in value of chilli exports from India
Fig. 4.10: Trends in unit value of chilli exports from India

Trends in unit value of chilli exports from India

- Unit value (Rs/kg)
- Poly. (Unit value (Rs/kg))

Years

unit value (Rs/kg)
Table 4.21 Nominal protection coefficients (NPC) for dry chillies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wholesale price in Karnataka</td>
<td>Byadagi</td>
<td>Rs./qtl</td>
<td>1935</td>
<td>1519</td>
<td>2725</td>
<td>2687</td>
<td>2623</td>
<td>3034</td>
<td>3046</td>
<td>3726</td>
<td>4087</td>
</tr>
<tr>
<td>2.</td>
<td>Transport cost, packing and handling</td>
<td></td>
<td>Rs./qtl</td>
<td>144</td>
<td>152</td>
<td>164</td>
<td>173</td>
<td>181</td>
<td>187</td>
<td>198</td>
<td>215</td>
<td>240</td>
</tr>
<tr>
<td>3.</td>
<td>Marketing margins @ 5%</td>
<td></td>
<td>Rs./qtl</td>
<td>96.75</td>
<td>75.95</td>
<td>136.25</td>
<td>134.35</td>
<td>131.15</td>
<td>151.70</td>
<td>152.3</td>
<td>186.30</td>
<td>204.35</td>
</tr>
<tr>
<td>4.</td>
<td>Equals FOB price</td>
<td>Cochin</td>
<td>Rs./qtl</td>
<td>2175.75</td>
<td>1746.95</td>
<td>3025.25</td>
<td>2994.35</td>
<td>2935.15</td>
<td>3372.7</td>
<td>3396.3</td>
<td>4127.3</td>
<td>4531.35</td>
</tr>
<tr>
<td>5.</td>
<td>Plus freight from India to New York</td>
<td></td>
<td>Rs./qtl</td>
<td>99.63</td>
<td>94.60</td>
<td>92.80</td>
<td>94.68</td>
<td>102.00</td>
<td>96.36</td>
<td>97.48</td>
<td>99.50</td>
<td>104.75</td>
</tr>
<tr>
<td>6.</td>
<td>Plus insurance @ 1% of price</td>
<td></td>
<td>Rs./qtl</td>
<td>21.75</td>
<td>174.6</td>
<td>30.25</td>
<td>29.94</td>
<td>29.35</td>
<td>33.72</td>
<td>33.96</td>
<td>41.27</td>
<td>45.31</td>
</tr>
<tr>
<td>7.</td>
<td>Equals landed price</td>
<td>New York</td>
<td>Rs./qtl</td>
<td>2297.13</td>
<td>1859.01</td>
<td>3148.3</td>
<td>3118.97</td>
<td>3066.50</td>
<td>3502.78</td>
<td>3527.74</td>
<td>4268.07</td>
<td>4681.41</td>
</tr>
<tr>
<td>8.</td>
<td>Exchange rate</td>
<td>New York</td>
<td>$=Rs.</td>
<td>35.50</td>
<td>37.16</td>
<td>42.07</td>
<td>43.33</td>
<td>45.68</td>
<td>47.69</td>
<td>48.40</td>
<td>45.95</td>
<td>44.93</td>
</tr>
<tr>
<td>9.</td>
<td>Equals landed price (CIF price)</td>
<td></td>
<td>$/qtl</td>
<td>64.71</td>
<td>50.03</td>
<td>74.83</td>
<td>71.98</td>
<td>67.13</td>
<td>73.45</td>
<td>72.89</td>
<td>92.89</td>
<td>104.19</td>
</tr>
<tr>
<td>10.</td>
<td>Reference price</td>
<td>New York</td>
<td>Rs./qtl</td>
<td>7131</td>
<td>4430</td>
<td>7151</td>
<td>6887</td>
<td>6151</td>
<td>6211</td>
<td>6303</td>
<td>7100</td>
<td>7538</td>
</tr>
<tr>
<td>11.</td>
<td>Reference price</td>
<td>New York</td>
<td>$/qtl</td>
<td>200.87</td>
<td>119.21</td>
<td>169.98</td>
<td>158.94</td>
<td>134.65</td>
<td>130.24</td>
<td>130.23</td>
<td>154.52</td>
<td>167.77</td>
</tr>
</tbody>
</table>

Nominal protection coefficients (Row 9/11) 0.32 0.42 0.44 0.45 0.50 0.56 0.56 0.60 0.62

Note:  
FOB – Free on Board  
CIF – Cost Insurance Freight  
C&F Charges include empty container lift on charges, containery yard to CFS, container transportation, cargo container stuffing charges, customs and port sundries, documentation charges  
Wharfage charges – Ship landing charges
Table 4.22: Transitional probability matrix of dry chilli (1998-99 to 2003-04)

<table>
<thead>
<tr>
<th>Countries</th>
<th>Sri Lanka</th>
<th>USA</th>
<th>Bangladesh</th>
<th>Malaysia</th>
<th>Uganda</th>
<th>Indonesia</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sri Lanka</td>
<td>0.251</td>
<td>0.394</td>
<td>0.241</td>
<td>0.000</td>
<td>0.083</td>
<td>0.031</td>
<td>0.000</td>
</tr>
<tr>
<td>USA</td>
<td>0.394</td>
<td>0.194</td>
<td>0.000</td>
<td>0.041</td>
<td>0.059</td>
<td>0.029</td>
<td>0.284</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.123</td>
<td>0.000</td>
<td>0.000</td>
<td>0.877</td>
</tr>
<tr>
<td>Malaysia</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Uganda</td>
<td>0.000</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.000</td>
<td>1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Others</td>
<td>0.401</td>
<td>0.058</td>
<td>0.000</td>
<td>0.154</td>
<td>0.008</td>
<td>0.032</td>
<td>0.347</td>
</tr>
</tbody>
</table>
Table 4.23: Labour utilization by chilli processing units in study area

(Per quintal)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Gulbarga</th>
<th></th>
<th>Raichur</th>
<th></th>
<th>Bijapur</th>
<th></th>
<th>Average</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of labours</td>
<td>Wages (Rs.)</td>
<td>No. of labours</td>
<td>Wages (Rs.)</td>
<td>No. of labours</td>
<td>Wages (Rs.)</td>
<td>No. of labours</td>
<td>Wages (Rs.)</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Men labour</td>
<td>1</td>
<td>50</td>
<td>1</td>
<td>60</td>
<td>1</td>
<td>55</td>
<td>1</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>(25.00)</td>
<td>(29.41)</td>
<td>(33.33)</td>
<td>(40.00)</td>
<td>(33.33)</td>
<td>(40.74)</td>
<td>(30.03)</td>
<td>(36.26)</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Women labour</td>
<td>3</td>
<td>120</td>
<td>2</td>
<td>90</td>
<td>2</td>
<td>80</td>
<td>2.33</td>
<td>96.66</td>
</tr>
<tr>
<td></td>
<td>(75.00)</td>
<td>(70.58)</td>
<td>(66.66)</td>
<td>(60.00)</td>
<td>(66.66)</td>
<td>(59.25)</td>
<td>(69.96)</td>
<td>(63.73)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4</td>
<td>170</td>
<td>3</td>
<td>150</td>
<td>3</td>
<td>135</td>
<td>3.33</td>
<td>151.66</td>
</tr>
<tr>
<td></td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate percentage to the total
The cost and returns per quintal of product (chilli powder) manufactured by dry chilli processing units indicated that the sales realization on an average, accounted for Rs. 6445 per quintal and total cost accounted for Rs. 2758 per quintal.

The net returns, on an average, accounted for Rs. 3687 per quintal. On an average, it works out to 2.34 B: C ratio per quintal of powder processed by the processing unit.

4.7 CONSTRAINTS IN PRODUCTION, MARKETING AND PROCESSING OF CHILLI

4.7.1 Problems faced by producers in chilli production

It is observed from the Table 4.25 that the major problems faced by the producer in the production of chilli were; Lack of technical assistance, lack of availability of fertilizer, disease problem, lack of credit facilities, non-availability of suitable PPC and labour availability problem.

The disease problem was the major problem expressed by 85 per cent of farmers in Raichur district, followed by 82.50 per cent in Bijapur and 75 per cent in Gulbarga district. The problem of not getting technical assistance was expressed by 57.50 per cent farmers in Bijapur district, followed by Raichur (55.00%) and 52.50 per cent in Gulbarga district. The lack of credit facilities was expressed by 62.50 per cent of farmers in Bijapur district followed by Gulbarga (60.00%) and Raichur (55.00%) district. About 45 per cent of farmers opined the problem of labour availability in Gulbarga district followed by 42.50 per cent in Raichur and 35.00 per cent in Bijapur district.

In the study area, overall 81 per cent of the farmers expressed disease problem which was the major problem in chilli production. About 55 per cent of farmers were not getting technical assistance. The lack of credit facilities was expressed by 59 per cent farmers. On the whole, 41.65 per cent of farmers expressed non-availability of PPC and fertilizers. About 41 per cent of the farmers expressed the problem of labour availability.

4.7.2 Problems faced by the producer in chilli marketing

The problems faced by producer in chilli marketing is presented in Table 4.26. It is observed that about 52.50 per cent of the farmers in Gulbarga district expressed regulated markets are far away from the village expressed by 45.00 per cent farmers in Bijapur and 40.00% in Raichur district. About 45.00 per cent of the farmers opined the problem of non availability of grading facilities in Gulbarga district, followed by 42.50% in Raichur and 35.00% in Bijapur district. The malpractices in weighment was expressed by 72.50% in both Gulbarga and Raichur districts. Inadequate storage problem was expressed by 92.50% farmers of Gulbarga district, followed by Raichur (82.50%) and in Bijapur (72.50%) district. About 42.50% of farmers opined of not getting remunerative prices in Bijapur district, followed by 40.00% in Raichur and 32.50% in Gulbarga district.

Overall 50% of the farmers expressed the non-availability of grading facilities; the prevalence of malpractices in weighment was expressed by 71 per cent of farmers. Only 45.82 per cent of farmers expressed that regulated markets are not located nearer to their villages. Commission charges collected were not reasonable, as it was expressed by 80 per cent of farmers. Inadequate storage facility was expressed by 67.50 per cent of the farmers. About 42 per cent of the farmers opined that they were facing the problem of not getting remunerative prices.

4.7.3 Opinion of traders as market intermediaries in marketing of chilli

Problems faced by the traders are presented in Table 4.27. Lack of grading facility was the major problem (92.50%) faced by the traders. Majority of traders (91.00 % of traders) expressed labour problem due to its pungency, 80% of traders opined higher cost was incurred on sorting due to lack of grading at production level, 72 per cent of the traders expressed that producers bring adulterated produce by sprinkling water. The majority of the sample traders (98.60%) faced the problem of stiff competition among the buyers. About 65 per cent of the traders felt that there is a high risk involved in selling chillies at distant places.

On the whole, most of the traders expressed lack of grading facility, inadequate storage facilities and adulteration by the producer and labour problem.
Table 4.24: Cost and returns per quintal of chilli powder in the chilli processing units

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sales realization</td>
<td>6320</td>
<td>6215</td>
<td>6800</td>
<td>6445</td>
</tr>
<tr>
<td>2.</td>
<td>Cost of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Raw material inventory</td>
<td>2210</td>
<td>2450</td>
<td>2135</td>
<td>2265</td>
</tr>
<tr>
<td>b.</td>
<td>Processing</td>
<td>480</td>
<td>415</td>
<td>485</td>
<td>460</td>
</tr>
<tr>
<td>c.</td>
<td>Marketing</td>
<td>31.00</td>
<td>34.00</td>
<td>35.00</td>
<td>33.33</td>
</tr>
<tr>
<td>3.</td>
<td>Total cost</td>
<td>2720</td>
<td>2899</td>
<td>2655</td>
<td>2758</td>
</tr>
<tr>
<td>4.</td>
<td>Net return</td>
<td>3600</td>
<td>3316</td>
<td>4145</td>
<td>3687</td>
</tr>
<tr>
<td>5.</td>
<td>B: C ratio</td>
<td>2.32</td>
<td>2.14</td>
<td>2.56</td>
<td>2.34</td>
</tr>
</tbody>
</table>
Table 4.25: Problems faced by producer in chilli production (%)
(N=120)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lack of technical assistance</td>
<td>52.50</td>
<td>55.00</td>
<td>57.50</td>
<td>55.00</td>
</tr>
<tr>
<td>2.</td>
<td>Non-availability of fertilizers</td>
<td>35.00</td>
<td>42.50</td>
<td>47.50</td>
<td>41.65</td>
</tr>
<tr>
<td>3.</td>
<td>Non-availability of suitable plant</td>
<td>37.50</td>
<td>42.50</td>
<td>45.00</td>
<td>41.65</td>
</tr>
<tr>
<td></td>
<td>protection chemicals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Lack of credit facilities</td>
<td>60.00</td>
<td>55.00</td>
<td>62.50</td>
<td>59.15</td>
</tr>
<tr>
<td>5.</td>
<td>Labour availability problem</td>
<td>45.00</td>
<td>42.50</td>
<td>35.00</td>
<td>40.82</td>
</tr>
<tr>
<td>6.</td>
<td>Disease problem</td>
<td>75.00</td>
<td>85.00</td>
<td>82.50</td>
<td>80.82</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate percentage to the total
Table 4.26: Problems faced by producer in chilli marketing (%)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Gulbarga</th>
<th>Raichur</th>
<th>Bijapur</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Regulated markets are not near to village</td>
<td>52.50</td>
<td>40.00</td>
<td>45.00</td>
<td>45.82</td>
</tr>
<tr>
<td>2.</td>
<td>Non-availability of grading facilities</td>
<td>45.00</td>
<td>42.50</td>
<td>35.00</td>
<td>50.82</td>
</tr>
<tr>
<td>3.</td>
<td>Commission charges are not reasonable</td>
<td>75.00</td>
<td>70.00</td>
<td>95.00</td>
<td>80.00</td>
</tr>
<tr>
<td>4.</td>
<td>Malpractice in weighment</td>
<td>72.50</td>
<td>67.50</td>
<td>72.50</td>
<td>70.82</td>
</tr>
<tr>
<td>5.</td>
<td>Inadequate storage facilities</td>
<td>92.50</td>
<td>82.50</td>
<td>22.50</td>
<td>67.50</td>
</tr>
<tr>
<td>6.</td>
<td>Not getting remunerative prices</td>
<td>32.50</td>
<td>40.00</td>
<td>42.50</td>
<td>41.65</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate percentage to total
Table 4.27 Problems faced by chilli traders

(N=90)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Problems</th>
<th>Percentage of traders to total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lack of grading facility</td>
<td>92.50</td>
</tr>
<tr>
<td>2.</td>
<td>Lack of storage facilities</td>
<td>60.00</td>
</tr>
<tr>
<td>3.</td>
<td>Sprinkling of water by producer</td>
<td>71.50</td>
</tr>
<tr>
<td>4.</td>
<td>Not grading at production level</td>
<td>79.50</td>
</tr>
<tr>
<td>5.</td>
<td>Labour problem due to pungency</td>
<td>91.10</td>
</tr>
<tr>
<td>6.</td>
<td>High risk is involved in selling of chillies distant places</td>
<td>65.40</td>
</tr>
<tr>
<td>7.</td>
<td>Stiff competition among buyers</td>
<td>98.60</td>
</tr>
</tbody>
</table>

Table 4.28: Problems faced by processors

(N=10)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Problems</th>
<th>Percentage to total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Inadequate power supply</td>
<td>98.00</td>
</tr>
<tr>
<td>2.</td>
<td>Procurement of raw material</td>
<td>44.50</td>
</tr>
<tr>
<td>3.</td>
<td>Processing problem</td>
<td>55.10</td>
</tr>
<tr>
<td>4.</td>
<td>Marketing problem</td>
<td>68.75</td>
</tr>
<tr>
<td>5.</td>
<td>Pungency problem to the labour</td>
<td>90.00</td>
</tr>
<tr>
<td>6.</td>
<td>Lack of finance</td>
<td>55.00</td>
</tr>
</tbody>
</table>

4.7.4 Problems of processors in chilli processing

Table 4.28 reveals that almost all processor (98.00 %) expressed the problem of inadequate power supply. Pungency problem to the labour was expressed by 90 per cent, the processors due to which they faced problem of labour. The marketing problem faced by the processing units was 68.75 per cent. About 55 per cent of processors expressed lack of institutional finance.
V. DISCUSSION

The results of the investigation are discussed in the present chapter with the main focus to throw light on some of the causes responsible for the important results noted in the previous chapter. It also attempts at an evaluation of the results and their policy implications and conclusions, which could be adopted to overcome some of the drawbacks or weaknesses in production and marketing of chillies in major chilli growing areas of Karnataka.

The results of the study are discussed under the following heads.

5.1 Growth performance of chilli
5.2 Production performance
5.3 Pattern of market arrivals and prices
5.4 Marketing performance
5.5 Export performance
5.6 Value addition in chilli
5.7 Constraints in production, marketing and processing of chilli

5.1 GROWTH PERFORMANCE

5.1.1 Growth rates in chilli production

In general, a significant growth in area, yield and production of chilli was observed during the study period both at district level and state as a whole.

Better prices, higher income with improved varieties and production technology and export opportunities along with low interest rate credit facilities in recent years might have encouraged the growth in chilli production. In Karnataka state, the growth in production of chilli increased significantly in period I mainly due to considerable increase in the area during period I.

A district-wise study of growth rates of chilli showed that area and production registered high growth in all the selected districts in general except Bijapur. The findings of the study are in line with the results obtained by Veena (1996), Gulbarga and Raichur districts are the chilli growing districts of the state while Bijapur district picked up chilli cultivation in recent years.

The growth rate in yield in chilli increased at all locations in period I as well as for overall study period from negative growth in period II. Their growth in general found to be lower due to sudden outbreak of pest and diseases indicating the scope for improving the productivity of chilli.

5.1.2 Instability in chilli production

Agriculture is inherently unstable and more so in a state like Karnataka where hardly about 20 per cent of the net sown area is irrigated and remaining proportion of area depends on the monsoon. In this study, an attempt was made to examine the extent and sources of instability in chilli between two sub periods i.e., 1991-97 to 1998-2004.

5.1.2.1 Temporal variation in area, production and productivity

It could be observed from the Table 4.2 that average area under chilli was more in Gulbarga district (2856.64 ha) followed by Raichur (2196.64 ha) and Bijapur district (1642.35 ha). The average area under chilli in Karnataka was worked out to be 2,04,925.6 ha. While production of chilli was highest in Gulbarga district (4319.80 tonnes) followed by Raichur and Bijapur districts. Average production of chilli worked out to be 276490.74 tonnes for the state as a whole. The mean productivity of chilli worked out to be higher in Raichur district (3.26 t/ha) as compared to Bijapur (1.57 t/ha) and Gulbarga district (1.40 t/ha). The mean productivity of chilli in Karnataka was (1.57 t/ha). The coefficient of variation was found to be higher for the state (69.18%) than for the sample districts namely Raichur (48.07%) followed by Gulbarga (42.16%) and Bijapur (32.49 %) district. In case of production, it was higher for
Raichur district (90.55%) compared to Bijapur (81.36%) and Gulbarga district (76.96%). While for the whole state, it was less compared to all the three districts. As far as the productivity of chilli is concerned, the coefficient of variation was little higher in Raichur district (73.12%) as compared to Bijapur (61.24%), Gulbarga (53.08%) and even Karnataka state as a whole (68.18%).

5.1.2.2 Components of change in average production

This section examines the sources of instability by decomposing the changes in average production between the sub periods. The average production for the sample districts was predominantly due to change in mean yield (2136.22%) in Gulbarga district followed by Raichur district (93.94%). The change in mean area accounted for 433.57 per cent in case of Bijapur district and was negative in Gulbarga and Raichur districts. The positive contribution was observed from interaction between area and mean yield in Gulbarga (199.22%) and Bijapur (77.54%) districts.

The average production for the state as a whole was predominantly due to change in mean yield (84.90%) followed by change in mean area (5.16%). The interaction effect between change in mean area and mean yield was positive (2.02%) and that of change in covariance between area yield was also positive (7.93%).

The high yielding varieties of chilli cover every areas in the state and study area. The lower adoption of such technology could have contributed additionally to instability of chilli production. Hazell (1982) indicated that increase in yield variability had been an important source of increased instability in chilli production. Whereas, results obtained by Tripathy (1996) were in contrast to the findings of the present study, who reported that increase in yield led to a remarkable increase in the production with stability on groundnut in Orissa.

5.1.2.3 Components of change in variance of production

The change in variance of production of chilli was decomposed into ten components using the analyzed procedure developed by Hazell (1982). Results on the sources of change in the production variance of chilli production between the sub periods (Table 4.4) showed that negative change in mean yield in Gulbarga (-31.02%) and (-46.69%) in Bijapur districts. The negative change in area covariance (-24.62%) in Gulbarga district and (-9.43%) in Raichur district. However for Bijapur district, change in area variance (28.47%) was positive. Interaction between change in mean area and yield variance in Gulbarga (24.57%) and in Bijapur (18.67%) districts. Change in yield variance (125.87%) in Gulbarga district and (53.63%) in Raichur district has contributed positively to the stability of chilli production. The major negative contribution for the stability of chilli production in the Bijapur district was observed from change in yield variance (-30.84%). The change in residual was observed positive contribution in Gulbarga (33.73%), Raichur (13.53%) and Bijapur (69.13%) districts.

The change in variance of chilli production at state level was the result of change in yield variance (-266.98%), change in mean yield (135.78%) and change in area yield covariance (106.31%). The interaction between change in area and yield and change in area yield covariance (48.03%) has positively contributed to the stability of chilli production at the state level.

Hazell (1982) noted that changes in area variance and change in mean area to some extent contributed to instability of the total chilli production in India in contrast to the present study observations.

5.1.3 Cropping pattern of sample farmers

It is clear that all the three districts have variety of crops in both the seasons. The proportion of area accounted by each crop varied from 10.52 per cent up to 19.62 per cent in kharif season. There is not much variation in the type of crops grown, but it is clear that the farmers had the facility of irrigation; their tendency might be towards commercial crops like cotton and annual crops like sugarcane. The average area of sugarcane grown in Bijapur district was 14.89 per cent followed by 10.57 per cent in Raichur district. It is to be noted that growing variety of crops was an indication of protective measure against risk and uncertainties. Cropping intensity is one of the indices of measuring land use efficiency. The cropping intensity depends on many factors viz., natural conditions and also socio economic
factors. However, in all the districts cropping intensity was more than 150 per cent indicating efficient utilization of land. Among the districts there was a variation in the cropping intensity which reiterated the inter regional and intra regional variation, social and economic factors.

5.1.4 Trends in area, production and productivity of chilli

The results given in the 4.6 and Fig.4.1 to 4.3 indicated that area under chilli varied over space and time. A districtwise study of trend of chilli and state as a whole showed that area registered an increasing trend in all the selected districts in general except Bijapur. The findings of the study are in line with the result obtained by Veena (1996), Gulbarga and Raichur districts are the chilli growing districts of the state while Bijapur district picked up chilli cultivation in recent years. As far as production of chilli is concerned, the production trend followed more or less the pattern of trend in area except in Bijapur district wherein an increasing trend was observed up to 1998-99 and thereafter it showed decreasing trend. This might be attributed due to scanty rainfall. The pattern of yield in chilli showed an increasing trend in all the districts and state as a whole and thereafter steep fall up to 2001-02. In case of Gulbarga district again upward trend was observed during 2002-03. From the foregoing results, it showed that chilli production in the study area was mainly governed by area while the contribution of yield was limited. The emphasis should be directed towards improving quality as well as quantity of chilli productivity in coming years to meet the increasing demand in view of limitation of cultivable land.

5.2 PRODUCTION PERFORMANCE OF CHILLI

5.2.1 Cost of inputs in cultivation of chilli

For the sake of convenience in the present study, the entire cost of cultivation of chilli has been divided into three parts viz., material cost, labour cost and cost for raising seedling from transplanting to harvesting the crop.

Table 4.7 reveals that material cost accounted for 64.31 per cent, labour cost for raising seedling 3.3 per cent and labour cost on main field accounted for 32.34 per cent of the total cost incurred by Gulbarga farmers. But the material cost incurred by Raichur and Bijapur farmers was slightly lower than in the case of Gulbarga farmers (62.00%) and also the labour cost of raising seedling was 3.35 per cent in Raichur and 3.41 per cent in Bijapur districts. Labour cost incurred in the main field operations by the Raichur farmers was relatively high 34.43 and in Bijapur farmers was 33.91 per cent. But in case of labour cost incurred in raising seedling and in main field due to economics of scale, Raichur and Bijapur farmers incurred lower material cost in relation to that by Gulbarga farmers.

Among the material cost incurred, on an average overall farmer, cost of fertilizer was the major item that accounted for 26.8 per cent of the total cost followed by that of PPC, which accounted for 20.53 per cent. Among the labour cost incurred in the main field, land preparation (ploughing and harrowing) formed nearly 14 per cent of the total cost. Cost involved in transportation of FYM was another major cost (2.76% of the total cost).

From the above mentioned results, it is clear that due to considerable increase in the prices, mainly of fertilizer, seeds and plant protection chemicals (PPC), material cost incurred by farmers in raising commercial crops was raised considerably. Most of the farmers felt that due to the reduction in the subsidies on fertilizer as the main reason for rise in fertilizer prices. Added to this, due to the entry of many seed companies, labour charges in the seed production has become a costly affair leading to rise in the prices of seeds. Now, unlike during previous decades, most of the farmers have been taking up plant protection measures, which in turn due to improper use of chemicals, many of the crop pests have become resistant, necessitating the application of more and more chemicals. This ultimately has led to rise in the material cost.

Now-a-days, due to increase in irrigated area and introduction of high yielding varieties of commercial crops, most of the farmer in the study area has been using FYM on larger scale. This higher rate of FYM has further created demand for it, resulting in an increase in its price, rising material cost upwards.

In command area, where irrigation facilities are almost assured the cropping intensity is high. In such areas, there is a heavy demand for skilled agricultural labours. Due to many
other socio-economic factors, the cost of living even in rural areas was also been raising steadily. All these factors have resulted in considerable rise in the labour wage rates. Therefore, in raising commercial crops like chilli, cotton etc. which are labour intensive. Labour cost incurred is nearly 37 per cent of the total cost of production.

5.2.2 Costs and returns in chilli production

It is evident from the methodology used in the study that total cost incurred has been classified into cost A2, cost B2 and Cost C3 for the purpose of better analysis. Similarly, returns have also been classified into returns over cost A2 returns over cost B2 and returns over cost C3. Finally the benefit-cost ratio has been worked out to arrive at the conclusion.

As per the results presented in Table 4.8 reveals that cost A2 accounted for 30.70 per cent in Gulbarga, 28.81 per cent in Raichur and 32.30 per cent in Bijapur district.

Cost B2 that includes cumulative effect of cost A2 was observed to be higher for Bijapur district than in case of Raichur and Gulbarga districts, which could be attributed to the effective management of various factors of production at various level of crop production (Hiremath 1994). Cost B2 accounted for 50.25 per cent in Bijapur, 44.54 per cent in Raichur and 47.09 per cent in Gulbarga district. However, on an average cost B2 accounted for 47 per cent of the total cost.

It is obvious from the cost C3 that use of family labour was more in case of Bijapur district than in case of Gulbarga and Raichur districts due to non availability of hired labour during peak period. Because of the effective use of factors of production, productivity of chilli crop was observed to be minimum. These factors had an impact on the total returns and B: C ratio. Because of these factors, only return over cost A2 was higher in Raichur district (Rs.22593.12) per hectare i.e., 72.63 per cent of the total returns than Gulbarga (69.28%) and 67.69 per cent in Bijapur districts. Similarly, returns over cost B2 were much higher in Raichur district (Rs. 42504.40). Whereas, it was Rs. 41673.70 in Gulbarga and Rs. 36781.20 in Bijapur districts. However, overall returns over cost B2 was Rs. 40319.69 (i.e., 52.73% of the total returns).

However, returns over cost C3 was highest in Raichur district Rs. 34955.50 followed by Gulbarga Rs. 33870.40 and Rs. 28836.26 in Bijapur districts. It was due to the total cost of chilli production was lower in Raichur district compared to Bijapur and Gulbarga districts.

The losses experienced by the farmers were mainly on an account of two factors viz., untimely rains received during harvesting season and higher incidence of pest and diseases. Untimely rain during harvesting season resulted in loss in quality of dry chillies. Chilli became white, fetching considerably lower price in the market (Hiremath 1994).

Higher incidence of pest and diseases, especially leaf curl and powdery mildew disease affected the crop considerably. Leaf curly disease resulted in the stunted growth of both plants and fruits to the greater extent, rate of flower drop and fruit rotting was more due to fungal disease like powdery mildew. Fruit borer insects also caused considerable damage to fruit yield through secondary infection, after boring the fruit (Hiremath 1994).

5.2.3 Input requirement for chili cultivation

It was seen from the results that the practices like spacing, seed rate, and fertilizer application were not according to recommended packages of practice. It was due to the reason that farmers felt that recommended seed rate with a view to plant two seedlings per spot, whereas farmers planted one seedling per spot and filled the gap of plant, which dies. Fertilizer application was not according to the recommendation. However, there was an excess application of fertilizer with respect to phosphorus as farmers had an apprehension that it improves the keeping quality.

On the whole, farmers reported to their convenience and local conditions. In this context, there is a need to conduct research in the aforesaid aspects to revise the recommendation to suit the field level condition.

5.2.4 Labour utilization pattern

Table 4.10 gives an idea about the labour utilization pattern of the production in chilli production.
Among the different field operations, harvesting of chilli fruits, which was spread well over one month, requires maximum labour force. Bijapur district farmers required 40.65 per cent of the total labour cost for harvesting followed by 40.39 per cent out of Raichur and 39.55 per cent in Gulbarga districts. Next major operation, which required more of human labour was transplanting the seedlings in the main field. It requires nearly 18.16 per cent in Raichur district, 17.48 per cent in Gulbarga and 17.01 per cent in Bijapur districts. The other major operations, which required more of human labour, were land preparation, fertilizer application, FYM application and spraying of plant protection chemicals.

In total, Gulbarga farmers required 63.13 man days to raise chilli crop in one hectare followed by 61.97 man days in Bijapur and 61.42 man days in Raichur district. However, on an average 62.16 man days were required for raising chilli crop in one hectare.

5.3 PATTERN OF MARKET ARRIVALS AND PRICES

5.3.1 Trends and variations in arrivals and prices of chilli

A critical analysis of trend in arrivals and prices of chilli by orthogonal polynomial regression analysis, in general showed that there was a marginal increasing trend in arrivals and prices over the years with mild ups and downs in all the selected markets. Mundinamani (1993) reported similar trends in arrivals and prices in case of oilseeds. However, considerable variations both in prices and arrivals were observed in chilli in all the selected markets as evident from higher coefficients of variation. This clearly indicates that although there was a steady increase in arrivals and prices over a period of time, these fluctuations from year to year were high. Similar results were observed by Mouli et al. (1999) and Nawadkar et al. (1999). The fluctuations in arrivals might have resulted in wide variations in prices of chilli. This may be explained in terms of fluctuations in area and yield of chilli in the study area. The differential prices may also be due to frequent movement of produce from the selected markets to neighbouring markets namely Sangli, Kolhapur, Hyderabad etc. Therefore, introducing a fairly high degree of competition among the wholesale functionaries and traders should stabilize prices. Fixing minimum and maximum prices for chilli can also narrow the range of price fluctuations down.

5.3.2 Variations in arrivals and prices

The co-efficient of variation in prices of chilli was found to be higher in Byadagi market as compared to Bijapur and Hubli markets, indicating higher variations in Byadagi markets and lower in Gulbarga and Raichur markets. In case of arrivals, co-efficient of variation was found to be highest in Hubli followed by Raichur, Gulbarga, Bijapur and Byadagi markets. The considerable variations both in prices and arrivals were observed in chilli in all the selected markets as evident from higher co-efficient of variation. This clearly indicates that although there was a steady increase in arrivals and prices over a period of time, these fluctuations from year to year were high. Similar results were observed by Mali et al. (1999) and Nawadkar et al. (1999). The fluctuations in arrivals might have resulted in wide variations in prices of chilli. The differential prices may also be due to frequent movement of produce from the selected markets to neighbouring markets. Therefore, introducing a fairly high degree of competition among the wholesale functionaries and traders should stabilize prices.

5.3.3 Co-integration

Co-integration is the technique to assess the market integration. Co-integration between chilli prices of selected markets was assessed. This co-integration analysis can be regarded as an empirical manifestation of a long-run relationship between the variables.

Determining the order of integration of price series is the first step and is presented in Table 4.14, which revealed that all the markets achieved stationarity. The ADF values were negative and significant indicating that there was co-integration between all the selected markets.

Nawadkar et al. (2003) also found similar findings. This clearly indicated that price of dry chillies were governed not only by arrivals but by other factors in the given markets also. This might be due to the movement of produce from one market area to another depending upon price prevailed in the markets. The competitive conditions prevailing in the selected
market might have also influenced the movement of price in the same direction. The individual buyer had practically little influence over the market price. Thus, it can be concluded that prices of dry chillies were stable across the selected markets in the study area.

Therefore, in order to continue the present system of market integration, there is a need to establish special cells for dry chillies to generate market information and market intelligence, which would provide a better platform for guiding the farmers in marketing their produce.

5.4 MARKETING PERFORMANCE OF CHILLIES

A systemic analysis of costs and returns of various market functionaries involved in marketing of chillies would help to know the various services rendered by these intermediaries and their economic performances in the marketing of dry chillies. The price spread is one of the measures of market efficiency as it indicates the increase in the price of a commodity as it changes hands from one intermediaries to another in the marketing set up. The price spread includes marketing costs incurred and margins obtained by various market intermediaries and producers. Apart from this, market integration was studied to understand the performance of marketing of dry chillies and the findings are discussed under the following sections.

5.4.1 Marketing costs incurred by farmers in marketing of chilli

Channel-I

In all the selected markets, the producers incur cost on marketing only on one operation i.e., sorting. Hence, the markets did not come into the picture as local traders purchased produce from the producer at village level only.

Channel-II

The marketing costs incurred by the producers/farmers were found to be highest in Raichur market (Rs. 112.65/quintal) followed by Bijapur market (Rs. 110.02/quintal) and Rs. 103.80 per quintal in Gulbarga district.

On an average, marketing cost incurred by farmers in this channel was about Rs. 108.82 per quintal.

The magnitude of marketing costs incurred by farmers in chilli was found to be higher mainly due to higher cost paid on packing by them compared to sorting, transportation including loading and unloading and commission charges.

An appraisal of component of marketing costs clearly revealed that the cost on packing formed the most significant constituent of total marketing cost incurred by farmers in chillies in the study area. This is in line with the results obtained by Chatha et al. (1982) in marketing of dry chillies. However, the magnitude of packing cost in dry chillies was considerably higher in Bijapur (31.86%), Raichur (29.04%) and 28.53 per cent in Gulbarga markets. This may be attributed to the fact that the farmers were required to sell their produce along with their own gunny bags (packing material) costing Rs. 12 to Rs. 15 per bag.

The commission charge formed the significant constituent of the total marketing cost incurred by the farmers. Similar results were obtained for chillies in different locations by Subrahamanyam (1988). This was mainly due to abnormally high rate of commission charged by the commission agents, which varied from 2 to 10 per cent of the value of the produce sold.

The cost of transportation also formed a major component of the total marketing cost incurred by the farmer in dry chillies. The dry chilli growers in all the districts under study area sold their produce in distant markets in the state as well as outside the state for better price resulting higher cost on transportation. Further, lack of cheap and timely transportation cost as expressed by majority of the farmers in the opinion survey. Therefore, it is suggested that transportation cost could be substantially reduced through the device of pooling small, scattered and isolated individual lots/packings at specially sponsored collection centers, wherefrom they could be lifted to the market.
In order to regulate the expenditure on commission transportation and packing efforts should be made to develop the necessary infrastructure for the marketing of dry chillies in the state. Alternatively, it is suggested to develop the farmers market for dry chillies.

5.4.2 Marketing costs, margins and price spread

5.4.2.1 Marketing costs incurred by different intermediaries in chilli marketing in the study area

Village merchants in all the selected markets incurred (Table 4.16) marketing cost around Rs.102.70 in Raichur market, Rs. 104.00 in Bijapur and Rs. 106.10 per quintal in Gulbarga market. The factors responsible for this variation were high amount of commission charge and market fee paid by village merchant.

Commission agent is another market intermediary who incurred more cost in Raichur marker (Rs. 34.75/quintal) than other market. It was mainly due to the variation in tax paid (Rs. 21.90 in Raichur market, Rs. 20.30 in Gulbarga and Rs. 19.50 in Bijapur markets).

Wholesaler also incurred more cost in Gulbarga market than in Raichur and Bijapur markets. The transportation cost was high in Gulbarga market as wholesaler dispatched his produce to distant place than the market yard. Other factors responsible for higher cost were tax and market fee as the wholesaler paid proportionately higher amount corresponding to the higher price received for dry chilli.

5.4.2.2 Marketing costs, margins and price spread in marketing of chilli

Marketing margins measure the gap between the net price received by producer and the price paid by the consumer. From the point of view of marketing efficiency, this gap has to be reduced to the minimum. Broadly, two factors contributed towards widening of the gap. First, cost incurred by the producer and the margin at profit taken over by village merchant, wholesaler, commission agents and retailers.

It is worth noting that the percentage of margins realized by the different intermediaries was higher than their cost incurred in the marketing of dry chillies. Among the market intermediaries, the share of retailers in the marketing margin was higher than other intermediaries. This may be attributed to the fact that retailers often incurred loss due to wastage in handling, spoilage with passage of time, price fluctuations etc. resulting in higher cost of marketing and risk in handling. Similar results were reported by Jotish et al. (2003).

Among the wholesaler-cum-commission agent, it is interesting to note that the commission agents getting higher net margin to their cost incurred in the marketing process mainly due to higher commission charged.

In the case of wholesalers, even though the net margins realized was maximum, their costs in marketing process was also higher.

The village merchant played a very important role in moving the produce from village to the market particularly smaller cost of produce by the farmers. However, the net margins accrued to the village merchants were considerably lower than that of other intermediaries even though the proportion of cost incurred was higher. Further, the producer's share in consumer's rupee realized in dry chillies in channel I was almost equal to that of channel II. In channel I, even though an additional intermediary of village merchant was involved in the chain of marketing system, the producer's share in consumer's rupee was not changed indicating the favourable role of village merchants in the marketing of dry chillies. Therefore, considering the role of village merchants especially in handling small lots of small and marginal chilli growers, it is important to encourage the village merchants in linking production centers with the wholesale markets of dry chillies. It is also important to bring the transactions under regulation to a proper system of licensing. Alternatively, farmers markets may be developed in line with Ryath Bazar to bring the farmers in direct transactions with the consumer's so as to benefit both producers and consumers.

Table 4.17 and 4.18 revealed that the average producer share in consumer rupee was Rs. 83.92 per cent in channel I, which was almost similar for all the selected markets. While, the producer's share in consumer's rupee was less in channel II (Rs. 83.42%). It was mainly due to the absence of village merchant, the profit taken over by him was reduced.
In channel II, between the intermediaries, the producers’ share in consumer’s rupee varied. It was high in Bijapur market followed by Raichur and Gulbarga market. The profit margin taken over by different intermediaries in Gulbarga market was high but at the same time, the consumer price was also high in Gulbarga market. Similar findings were observed by Hiremath (1994) in his study on marketing costs, margins and price spread of chillies.

5.5 EXPORT PERFORMANCE

In this section, attempt was made to discuss the findings on growth rates in export and its trend, export competitiveness and trade directions in chilli.

5.5.1 Growth in exports of chilli

The growth rates of both quantity and value of exports in chilli increased significantly (Table 4.19) over a period from 1984-85 to 2003-04. The increasing pattern of growth and trend in export of chilli may be attributed to the increase in the production of chilli. The area and production of chilli are on the increase, perhaps because they generate higher farm income and thereby better living standards to the farming community. Thus, considering the country’s varied agro-climatic conditions and large manpower, there exist vast potential for production and export of chilli, which needs to be harnessed effectively in coming years.

Growth in value of exports was higher than its quantity of exports mainly due to growth in unit value realization as a result of higher demand for chilli in the world market.

It is worth noting that the value of exports of chilli varies either higher or lower than their quantity of exports. Therefore in order to stabilize the value of exports and to increase the unit value realization, it is necessary to develop and produce exportable quality chilli, improve the post-harvest technology and packing. This would help to compete with other countries for gaining wider scope for Indian chilli.

5.5.2 Trend in export of dry chillies

An increasing pattern of trend in export of chilli in both quantity and value were observed. In case of trend in quantity export exhibited mild ups and downs during the period 1986-87 while an increasing trend over the period up to 2002-03. The pattern of trend in value of exports of chilli showed mild fluctuations during 1986-87 and thereafter-gradual increasing trend was observed during the study period. Similar pattern of trend was observed by Pal (1992). It is worth noting that the value of exports of chilli varied either higher or lower than their quantity of exports. Therefore, in order to stabilize the value of export and to increase the unit value realization. It is necessary to develop post harvest technology and packing. This would help to compete with other countries.

5.5.3 Export competitiveness of chilli

A product has to be competitive in the international market to sustain and to increase its exports. Apart from competitive pricing, factors like quality, timely shipment, honouring export commitments, regularity of supply etc. play an important role in capturing international markets. In the present study, an attempt was made to ascertain whether chilli was competitive as an exportable commodity and to find out whether it was an import substitute, if found non-competitive as an exportable commodity.

The analysis of export competitiveness in general showed that chilli was found to be competitive for their export to other countries as evident from nominal protection coefficients (NPCs) of less than unity. Therefore, the advantage of export competitiveness of chilli needs to be exploited by our country by proper planning and development of suitable infrastructure.

In chilli, the nominal protection coefficient (Table 4.21) was less than one from 1996-97 to 2004-05 indicating its high export competitiveness. In other words, higher prices of chilli in the international market than the domestic price showed distinct comparative price advantage in favour of India.

It is worth noting that the growth rates in export of chilli increasing over a period on one hand and export competitive on the other. Thus, country has a comparative advantage in the export of chili and this can be achieved with the concerted efforts of government by developing transport facilities to export the chilli.
5.5.4 Change in direction of trade

The dynamics of change in the export trade of Indian chilli was analyzed through the estimation of Markov transitional matrix. The probability of retaining the previous market share and gain or loss is interpreted by studying the diagonal and off-diagonal elements of the matrix (Table 4.22).

As indicated by diagonal element of 0.251, the Sri Lanka found highly loyal market for export of Indian chilli. In other words, this market retained about 25 per cent of the share on the previous period. However, it lost 39 per cent of its share to USA. Similarly, USA retained about 19 per cent of its previous share of chilli exports from India. Whereas, USA lost about 28.4 per cent of its previous share to other countries like Singapore, UAE and Nepal.

Bangladesh lost 87 per cent of its previous share to other countries. This shows that exports of Indian chilli do not have any strong preference in any of the export market except Sri Lanka. This is perhaps because of adhocism followed by the Government of India in the export policy.

Thus, even though Indian dry chillies are export competitive, there is large instability in their export in the International market. Therefore, in order to overcome this bottle neck and to capture higher share in the world trade, much emphasis needs to be laid on quality improvement of dry chillies apart from cost efficiency in their production, use of standard packing and simplification in export producers particularly for chilli.

5.6 VALUE ADDITION IN CHILLI

5.6.1 Labour utilization by dry chilli processing units

It can be observed from the Table 4.23 that both male and female labours were employed. This clearly reveals that in dry chilli processing units are both male and female labour are required. The labour requirement is for various operations like grading/sorting, removing of stem packing and feeding the dry chillies to the machine etc. The units in Gulbarga district required more labour than Raichur and Bijapur unit.

5.6.2 Cost and returns structure in dry chilli processing

Table 4.24 showed that per quintal processing cost incurred by processing units in Bijapur district was highest (Rs. 485/qtl) for dry chilli processing. This may be because of higher processing cost incurred by these unit when compared to other units. However, it is less on Raichur district (Rs. 415) mainly due to the low processing cost. The net returns per quintal of dry chilli processed were highest in processing units in Bijapur district (Rs. 4145) and least in Raichur (Rs. 3316).

The higher net return in Bijapur unit compared to other units was mainly due to least cost of production due to the economies of scale. However, marginal net return in Raichur unit may be due to less sales realization. Hence, the benefit cost ratio per quintal of dry chilli used was higher in Bijapur (2.56) and least in Raichur unit (2.14).

5.7 CONSTRAINTS IN PRODUCTION, MARKETING AND PROCESSING OF CHILLI

5.7.1 Problems faced by the producers in chilli production

The study reveals that there were no serious problems encountered by the chilli growers. However, certain problems like availability of fertilizers, suitable plant protection chemicals, credit etc. at the village farmers or nearby places are considered by them as problems.

The farmer who faced some technical problems like seed rate, fertilizer dose, plant protection measures to be taken up etc. were assisted and advised by the local Officers of the Agricultural Department, Agricultural University and even by some progressive farmers of the locality. Among these 55 per cent of farmers facing the problem of getting technical assistance (Table 4.25). About 81 per cent of the farmers expressed the problem of pest and disease were the major problem in chilli production.
Non-availability of suitable plant protection chemicals in local places were the major problem faced by the farmers. It did not mean that plant protection chemicals were not made available. For instance for controlling leaf curly disease farmers needed systematic chemicals but only contact chemicals were available as opined by nearly 58 per cent of farmers. Both the illegal and legal traders having little or no knowledge of the impact of systematic and contact insecticides in crop pests further compounded this situation.

About 59 per cent of the sample farmer opined the problem of non-availability of credit at appropriate time.

5.7.2 Problems faced by producer in marketing of chilli

Chilli producers faced many problems in marketing of their produce. However, six major problems faced by the farmers were identified and the results are presented in the Table 4.26, which reveals that Non-availability of sophisticated grading facilities in the regulated market was the problems faced by the farmers. They felt that establishment of grading laboratories for grading agricultural produce mainly for chilli is necessary to obtain maximum possible price for their produce. According to them, this could also avoid most of the malpractices taking place in the markets.

Inadequate storage facility was the other major problem faced by farmers and 42 per cent of farmers opined that they are not getting remunerative price for chilli. Dry chilli loses its quality whenever it is exposed to rain. Apart from this, farmers complained that there was no proper watch and ward for the produce. There was no adequate storage facility to store their produce in expectation of better market price. Therefore, farmers felt that more storage facilities should be created in the market yards.

Prices of dry chillies fluctuate considerably over a period. During the glut period, prices touched their lowest mark and during off season especially during monsoon season prices rose considerably, whenever there is export of dry chilli, prices shoot up.

But, unfortunately, wholesale traders, who have considerable money power, better market knowledge and large storage and transportation facilities, mostly exploit at the occasion of spurting price rise.

About 70 per cent of the farmers complained that some of malpractices on weighment, which could be avoided by implementing the existing rules and regulations strictly.

5.7.3 Opinion of traders of market intermediaries in marketing of chilli

As farmers faced some production related problems, chilli traders also encountered some trade related problems, which have been mentioned in Table 4.27 which revealed that the majority of the sample traders faced the problems of stiff competition among the buyers due to entry of a large number of new traders and grading facilities. It was observed that many big companies are undertaking processing and sale of spices, pickles and other food items and they have started meeting their raw materials requirement through purchasing (dry chilli) directly from the producers. This has posed many problems to the existing traders. Then again due to attraction of making easy money, now-a-days many large farmers and other wealthy people have opened Dalali shops and have become commission agents. Even some farmers themselves purchased dry chilli and other agricultural produce from other farmers, thus acting as traders in local areas. This has even restricted the operation of traditional traders in some areas. Therefore, stiff competition among the traders was very much evident.

Lack of storage and grading facility problem were faced by 60 and 92 per cent of the traders, respectively. Because of this problem, watch and ward became problematic during occasional rain, hence many traders have suffered heavy losses. Majority of the traders (71%) complained that the farmer’s are sprinkling/spraying water on dry chilli, to increase the weight of chilli at the time of selling. But, after sometime, when fruits are dried, there would be a considerable reduction in the weight of dried chilli. This resulted in loss to traders.

Another major problem faced by the traders (91%) was that of pungency of dry chilli. This not only caused some health hazards, but also resulted in labours demand for higher wages.
Majority of traders (65%) also pointed out that buying and selling dry chilli in different markets involved great risk, because of fluctuations in prices.

5.7.4 Problems faced by processors of chilli

Problems faced by processing units were few, but seriously affected their business (Table 4.28).

Inadequate power supply was the main problem faced by processors (98%) in all the districts. Frequent load shedding and cut in power supply reduced the capacity utilization to the maximum possible extent, thus resulted in reduction in the overall efficiency of human labour and that of machinery. This lower efficiency in turn increased the per unit cost of production, leading to rise in price of the commodity, which would ultimately result in decrease in demand for their products.

Another main problem faced by these processor (90%) was that of pungency of dry chilli, which was very problematic for the labours to work for long hours in the units. This also affected their health. Hence, the processor opined that labour not only worked for short period, but claimed higher wage rates than that prevailing in other industries.

Lack of availability of institutional credit was another problem faced by 55 per cent of the processor. This could be attributed to the fact that in recent years lot of industrial activities including both processing and manufacturing activities were coming up everywhere in the country, which necessitated the increased financial assistance for their activities. But, most of the financial institutions were over burdened and were facing serious financial crises mainly due to non-recovery of loan advanced. The recycling of funds has been slowed down. Therefore, 55 per cent of the processor faced the problems of lack of institutional finance, to expand their processing activities.
VI. SUMMARY AND POLICY IMPLICATIONS

Chilli is one of the most important commercial crops of India; it is a crop of tropical and sub-tropical regions and requires a warm humid climate. Number of varieties of chillies are grown, which can be used as vegetable, condiments and pickles. Chilli occupies an important place in Indian diet and it is an indispensable item in the kitchen, as it is consumed daily as a condiment in one or other form. Chilli is rich in vitamin A and C and has many medicinal properties.

In India, chilli is grown in almost all states. The important states growing chilli in terms of production are Andhra Pradesh (49%), Karnataka (15%), Orissa (8%), Maharashtra (6%), West Bengal (5%), Rajasthan (4%) and Tamil Nadu (3%). The total production is around 8.46 lakh tonnes from 8.31 lakh ha in 2002-03. In Karnataka, the production of chilli is 0.949 lakh MT with an area of 1.61 lakh ha (2002-03).

India exports chilli oleoresins, which increased from Rs. 741 lakhs (2000-01) to Rs. 2313.10 lakhs (2001-02) and chilli powder exports increased from Rs. 62.76 crores (2000-01) to Rs. 89 crores (2001-02). The world demand is expected to go up to 11.3 lakh tonnes by end of 2010 A.D., therefore it is predicted that there is a great scope for export of chillies. Demand is increasing for value added products using chillies such as chilli paste, curry, powder and other sauces for the convenience of food industry. In the extraction industry, there is always demand for high capsaicin content (over 1%) in chillies. This offers a direct saving on unit cost of extraction.

The process of liberalization, in India under WTO regime is moving towards exposing Indian economy to the world economy. In recent years, export to areas gaining importance, therefore the need for concentrated action to increase exports, particularly a spice export, has been actively felt (Annon 2005).

The present study was undertaken with an overall objective of analyzing the economics of production and marketing of dry chillies. The study will help the planners and policy makers to frame appropriate policies relating to the chilli production, marketing and export.

METHODOLOGY

The study was confined to UKP command area with top three districts viz., Gulbarga, Raichur and Bijapur were selected based on highest area under chillies. Similarly, five important markets (Gulbarga, Raichur, Bijapur, Hubli and Byadagi) were selected based on transaction and arrivals to the market of dry chillies. The primary data from sample farmers and market intermediaries were collected by using pre-tested questionnaires. The time series data on area, production, productivity, arrivals, prices, exports etc. were collected from different secondary sources.

To get representative sample, the multi-stage random sampling design was used. The first stage, UKP command area was selected purposively. In the second stage, top three districts with respect to area were selected. In the third stage, two taluks were selected in each district based on potentiality and highest area under chilli. In fourth stage, 20 farmers each from selected taluks of the districts were selected at random. Thus, the sample size constituted of 120 for the study. Further, five markets were chosen based on the size of the market, from the each of the selected market, 10 wholesalers, 10 commission agents-cum-wholesalers and 10 retailers constituting total of 90 markets intermediaries were chosen. For studying processing aspect, 10 processing units were randomly selected.

The primary data on cultivation and marketing of chilli pertained to the agricultural year 2005-06. In view of the limitation of secondary data, area, yield and production data were collected for the period from 1990-91 to 2003-04, while in case of exports, it was from 1984-85 to 2003-04. However, the data on exports pertained to the periods from 1996-97 to 2004-05 to compute export competitiveness and from 1998-99 to 2003-04 to work out trade direction was used.
To study the growth rates of area, production, yield and export, the exponential function and orthogonal polynomial regression analysis were employed. Instability in chilli production was measured using Hazell’s (1982) decomposition model.

Tabular presentation technique was used for estimating the costs, returns and margins. In order to examine the trend on arrivals and prices of chilli on selected markets, the orthogonal polynomial regression analysis was adopted.

To study the export competitiveness, trade direction, nominal protection coefficient and Markov chain analysis techniques were used. The production and marketing constraints were prioritized using percentages and the data were rigorously analyzed and the following important results were obtained.

RESULTS

1. The growth on area, production and productivity of chilli increased significantly over the study period (1990-2004) both at district level and state level similar trend was observed in all the selected districts except Bijapur. At the state level, the magnitude of growth rates in area and production were higher compared to other districts. However, Raichur district registered higher growth in yield among all selected districts and state as a whole.

2. The coefficient of variation for chilli area was found to be higher for the state than for the sample districts. In case of production, it was higher for Raichur district compared to Bijapur and Gulbarga district. As far as productivity of chilli is concerned the coefficient of variation was little higher in Raichur district as compared to Gulbarga, Bijapur and even Karnataka state as a whole.

3. The change on mean area was positive on Bijapur and was negative in both Gulbarga and Raichur districts. The important positive contribution was observed on change in mean yield in Gulbarga and Raichur districts. The positive contribution was observed from interaction between area and mean yield in Gulbarga and Bijapur districts.

4. Gulbarga and Bijapur districts showed the negative change in mean yield while Raichur district and state as a whole showed positive change in mean yield. Change in area variance was negative in Gulbarga and Raichur district, while it was positive in Bijapur district. The interaction between change in area and yield and change in area yield covariance was positively contributed to the stability of chilli production at the state level.

5. The total material cost was more in Gulbarga district followed by Bijapur and Raichur districts. The labour cost for nursery was more (Rs. 895.64) on Gulbarga followed by Bijapur and Raichur districts. The total cost of inputs in cultivation of chilli was highest in Gulbarga district (Rs. 26823.60) followed by Bijapur (Rs. 26453.00) and Raichur (Rs. 24629.80) districts.

6. The total cost of cultivation per hectare was higher in Bijapur district (Rs. 45109.80) followed by Gulbarga (Rs. 44902.70) and Raichur (Rs. 41686.60) districts. The overall cost of cultivation per hectare of chilli was Rs. 43899.71.

7. The total return obtained per hectare of chilli was more (Rs. 78778.10) in Gulbarga district followed by Raichur (Rs. 76642.10) and Bijapur (Rs. 73945.87) district. The magnitude of benefit cost ratio was higher in Raichur district (1.83) followed by Gulbarga (1.75) and in Bijapur district (1.63) mainly because of lower level of inputs use and cost incurred on major inputs such as human labour, fertilizers and plant protection chemicals.

8. The pattern of trend in arrivals of chilli observed in Byadagi market was increasing whereas in Hubli it was increasing trend during initial period then showed declining trend up to 2002-03. Gulbarga market showed an increasing trend while Bijapur market showed declining trend in arrivals of chilli. Raichur market showed declining trend during initial period than increasing trend upto 1998-99 and therefore declining trend was observed up to 2003-04.
9. The pattern of trend in prices at chilli was observed to be similar as in case of arrivals in all the markets except Hubli and Byadagi markets. There was marginal change in prices over the period with mild fluctuations in all the markets except in Raichur market, whereas it was increasing trend over the years. In case of Hubli and Byadagi markets, there was a marginal increase in trend over the period with mild fluctuations over the period.

10. The price series of chilli in all the selected markets attain stationary at same orders of differencing except in Byadagi market, which was found to be negative and significant at first order of integration. The Dickey fuller value for the differenced series on all the markets found to be negative and significant at same level of differencing. This indicates the price series of all the selected markets attains its stationary at zero order of integration, but the Byadagi market the price series attain stationary at first order of integration.

11. There was marginal difference in marketing costs incurred by the farmers among the various districts and overall. The per quintal cost of marketing incurred by farmers in Raichur district (Rs. 112.65) was comparatively higher than that of Bijapur (Rs. 110.02) and Gulbarga (Rs. 103.80) districts.

12. The sorting and packing costs made by the farmers were the most significant constituents of total marketing cost incurred by the farmers in all the districts.

13. The total cost incurred by village merchant was more than Gulbarga district (Rs. 106.10) followed by Bijapur (Rs. 104.00) and Raichur (Rs. 102.70). The total cost incurred by commission agent was more in Raichur market followed by Gulbarga and Bijapur, the total cost incurred by wholesaler was more in Gulbarga compared to Bijapur and Raichur. The total cost incurred by retailers was highest in Bijapur (Rs. 47.20) followed by Gulbarga (Rs. 46.80) and Raichur (44.20).

14. The magnitude of price spread in channel I was more in Gulbarga district (Rs. 818.92) followed by Bijapur and Raichur, while in channel II the price spread was also more in Gulbarga followed by Raichur and Bijapur.

15. Retailer’s share was the major constituent of the total marketing margin. In channel I the retailers share was more in Gulbarga, while it was more in Bijapur (283.80) in channel II.

16. The compound growth rates of quantity and value of chilli exports from India clearly demonstrated that both quantity and value of exports in chilli increased significantly in both the periods. The growth in value of chilli exports (27.57%) was higher than quantity of exports (19.37%). The growth rates of unit value of chilli export (10.38%) was higher in period I than period II (2.88%).

17. The Nominal Protection Coefficients (NPCs) indicated that the chilli crop was competitive for exports to other countries.

18. The Sri Lanka was found to be highly loyal market for export of Indian chilli as indicated by the retention of their previous shares of chilli exports from India by 25 per cent. USA retained about 19 per cent of its previous share of chilli exports from India.

19. The cost and returns per quintal of chilli powder manufactured by dry chilli processing indicated that the sales realization on an average accounted for Rs. 6445 per quintal and total cost accounted for Rs. 2758 per quintal. The net returns on an average accounted to Rs. 3687 per quintal. The average benefit cost ratio per quintal of powder processed was 2.34.

20. Lack of technical assistance, lack of availability of fertilizer, disease problem, lack of credit facility, non-availability of suitable PPC and labour availability problem were the major constraints in chilli cultivation as perceived by the farmers. Among the marketing problems, non-availability of grading facility, malpractice facilities were the major constraints opined by farmers. Lack of grading facility, labour problem due to pungency was the major problem faced by chilli traders. The most striking
problems faced by processors were inadequacy of power supply and of the refusal of labour work due to pungency.

**POLICY IMPLICATIONS**

1. The outbreak of pest and disease was the major cause for the reduction in productivity of chilli and the profit margin. Therefore it is necessary to develop pest and disease resistant varieties of chilli by research agencies. Government should also think of establishing disease forecasting centers in major chilli growing areas so that outbreak of disease can be controlled.

2. The village merchant was exploiting the farmers by way of taking more profit. This could be eliminated by the producers who could sell their produce in the regulated market through co-operative marketing society. Hence, the primary co-operative societies should be encouraged to arrange for sale of produce of its members in the regulated market through Taluka Agricultural Produce Co-operative Marketing Society (TAPCMS) through a system of pooling.

3. In the study area, most of the farmers had expressed high commission charges recovered by commission agents. The producer need not pay commission charges to the commission agent. Only the buyer or purchaser has to pay commission, but the commission agents collect from both. Hence, regulated market may take up campaign to enlighten the farmers about the act and provision that commission shall be collected from buyers and not from sellers.

4. The wide variations in arrivals and prices affected the returns to the chilli growers. In order to encourage chilli growers to continue its production, price needs to be stabilized and hence Government should announce minimum support price for the chilli.

5. Indian chilli is export competitive; there is a higher instability in its export in the international market. Therefore, to capture the higher share in the world trade, much emphasis need to be given on sanitary measures and standardization of packing and simplification in export procedure so that gain of export to the countries like Bangladesh, Malaysia, Uganda and Indonesia.

6. About 80 per cent of the farmers expressed the lack of technical knowledge in chilli cultivation. Therefore, Agriculture department should arrange periodically training programmes and technical know-how of recently developed research in chilli for the sake of farmers to improve the technical knowledge.

7. About 60.00 per cent of the traders expressed the problem of inadequate storage facility for chilli produce. Government should look into the matter of strengthening storage and other infrastructural development along with credit support in chilli growing areas.

8. About 98.00 per cent of the processors expressed a serious problem of inadequate power supply. Government may think of adequate and regular power supply which certainly will help in profitability of processors.

9. About 90.00 per cent of the processors expressed the pungency problem to the labour. Therefore, the scientific forum can be taken design an instrument, which could avoid the health problems.
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I. General Information:

1. Name of the respondent: ____________________ 6. Family size: ____________________
2. Village: ____________________ 7. Main occupation: ____________________
5. Level of education: ____________________ 10. Age: ________________

II. Land Holdings (Acres)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Owned land</th>
<th>Leased land</th>
<th>Total</th>
<th>Rent paid/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Irrigated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

III. Cropping pattern (2005-06)

<table>
<thead>
<tr>
<th>Season</th>
<th>Crop</th>
<th>Variety</th>
<th>Area (acres)</th>
<th>Yield/acre</th>
<th>Total yield</th>
<th>Dry/Irrigated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kharif</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Rabi</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3. Summer</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

IV. Cost of cultivation of chilli (per acre)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Unit</th>
<th>Quantity</th>
<th>Cost/unit</th>
<th>Total value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Owned</td>
<td>Purchased</td>
<td>Total</td>
</tr>
</tbody>
</table>

Material cost
1. Seeds
2. Seed treatment
3. Manuers
4. Fertilizers
5. P.P. Chemicals
6. Irrigation
II. Labour cost for nursery
   1. Seed bed preparation and sowing
   2. Fertilizer application
   3. Hand weeding
   Sub Total

III. Labour Cost
   1. Ploughing
   2. Harrowing
   3. Manuring
   4. Marking
   5. Fertilizer Appln.
   6. Hand weeding
   7. Intercultivation
   8. Irrigation
   9. P.P. Chemicals
   10. Harvesting
   11. Marketing cost
   IV. Any other cost
   Total cost of cultivation

V. Returns

Main Product

V. Any institutional support in chilli production and marketing. If yes, give details:

1. Production
   a. Supply of seeds
   b. Supply of fertilizers
   c. Supply of PP chemicals
   d. Financial support
   e. Technical support
   f. Any others (Specify)

2. Marketing:
   a. Price arrival information
   b. Financial support
   c. Supply of bags
   d. Demand and supply situation
   e. Transport situation
   f. Storage facilities
   g. Any other facilities

VII. Expenses incurred in post harvest operations

1. Do you undertake any special operations to improve quality after harvest
2. If yes, indicate the operations undertaken and give details of cost incurred
   a. Cleaning
   b. Drying
   c. Sorting
d. Packing
e. Any other

VIII.

1. Do you collect information on prices, If yes, whether daily, more than once in a week, weekly or fortnightly.

2. Sources of price information, personal visit / neighbours / Newspapers / Radio / Telephone / any other sources

3. Do you compare the price with that in other markets while selling the produce: If yes, with how many markets.

IX. Reasons for selling your produce to a particular agency

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Reason</th>
<th>Village trader</th>
<th>Whole seller</th>
<th>Commission agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Previous agreement with intermediaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Better reasonable price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Immediate cash payment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Small quantity of produce for sale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lack of information about market situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Low market cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Social ties with intermediaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Getting information on the market situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Advance loan for chilli production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Getting storage facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Getting transport facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Payments are made in advance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Any other reasons</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X. At present what are the problems you are facing the marketing of chilli

a. Transportation facilities
b. Storage facilities
c. Facilities at market

1. Space for keeping the produce is enough, Not enough
2. System of weighing is correct or incorrect
3. Deductions while selling: legal or illegal
4. Payment of sale proceeds: delayed or undelayed
5. Method of bidding is satisfactory or unsatisfactory
6. Grading facility available or non available
7. Physical facilities adequate or inadequate
8. Commission charges are reasonable: Yes or No
9. Transactions: immediate or prolonged
10. Any mal-practices prevailing, if yes (specify)
   a.
   b.
   c.
11. Any other problems faced
    a.
    b.
    c.

XI. Do you feel that regulation of chilli marketing by Government agency will solve your marketing problems, yes or No, Give reasons
    a.
    b.
    c.

XII. Particulars of chilli sold

<table>
<thead>
<tr>
<th>Time of sale</th>
<th>To through whom sold VT/CA/WS</th>
<th>Place of sale</th>
<th>Method of sale</th>
<th>No. of bidders</th>
<th>Quantity sold</th>
<th>Price per unit</th>
<th>Total value</th>
</tr>
</thead>
</table>

XIII. Marketing costs:

A) Mode of package and its cost

<table>
<thead>
<tr>
<th>Mode of package</th>
<th>No. of units</th>
<th>Qty. Packed per unit</th>
<th>Cost per unit (Rs.)</th>
<th>Total cost (Rs.)</th>
</tr>
</thead>
</table>

B) Mode of transportation costs

<table>
<thead>
<tr>
<th>Mode of transport</th>
<th>Distance covered</th>
<th>Time taken</th>
<th>Cost per unit</th>
<th>Qty. Transported</th>
<th>Total cost of transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Loading/Unloading</td>
<td>Hire charges</td>
<td>Other costs</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
C) Storage of chilli

1. Do you store chilli for sale later in the marketing season: Yes or No
2. If not, why you dispose of immediately after harvest
3. If yes, give details

D) Marketing charges borne by producer-Sellers (Rs.)

<table>
<thead>
<tr>
<th>Market fee</th>
<th>Commission</th>
<th>Cleaning/grading</th>
<th>Reduction in weight</th>
<th>Weighment charges</th>
<th>Other charges</th>
<th>Total charges</th>
</tr>
</thead>
</table>

E) Any other costs incurred in selling

<table>
<thead>
<tr>
<th>Items of costs</th>
<th>Amount (Rs)</th>
<th>Basis</th>
<th>Remarks</th>
</tr>
</thead>
</table>
MARKET FUNCTIONARIES  
(Retailers/Commission Agents/wholesalers)

No. __________ Date: ________________

I. GENERAL INFORMATION
1. Name of the respondent: ____________________________
2. Location: ____________________________
3. Age: ____________________________

II A. Vegetables handled

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Quantity</th>
<th>Price per qtl.</th>
<th>Total value (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry chilli</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Are you dealing in commodities other than chilli? Yes/No
C. Do you make outright purchase in the field and transport it on your own? yes/No

III. What facilities do you provide to the producer who brings produce for sale?
Loan / Storage / Accommodation / Transportation / Advance payment / Seed/ Fertilizers /Pesticides etc.

IV. Do you give any credit facilities to the farmers who bring produce to your shop? Yes/No
If Yes,
a. To how many farmers
b. Maximum duration for which amount is advanced
c. Amount advanced per farmer
d. Total amount advanced
e. Conditions for advancing loan (Security etc.)
f. Mode of recovery followed
g. Interest rate charged

V. Investment made in the business
A. 1. Owned (Rs.) : _____________________________ 2. Borrowed : _______________
   3. Interest rate charged :_______________________
B. Investment on
   i. Godowns (No. of godowns) : ____________________ Amount (Rs. ______________)
   ii. Shops (No. of shops) : ____________________ Amount (Rs. ______________)
   iii. Equipments (Rs.) : ____________________ iv. If any : _______________  

VI. 1. Do you have the knowledge of different qualities/grades/standards of different varieties of dry chilli : little/average/perfect
2. Do you grade the dry chilli? Yes/No. If yes, on what basis ?
3. How do you grade the dry chilli?
4. Do you make payment according to the grades? Yes/No
5. Methods used in fixing the prices for different grades :
6. Do you make any deductions for more moisture content/any other foreign matter? Yes/No

VII. 1. Are you aware of the market prices, costs, nature of commodity, arrivals in
   i. Local market : yes/No  ii. Other markets : Yes/No
2. If yes, source of information about market situation : Personal visit/ neighbours/newspapers/radio/Telephone/any other source
VIII. Do you have shop owned/rented?
1. If rented, what is the rent per year: ___________
2. License fee
3. Tax paid: __________ (basis of taxes: ______________________)
4. Maintenance cost: __________
5. Insurance: __________
6. Any other costs (specify): ______________________

IX. 1. Distance of your shop from the market place: ________________
2. Place of arrivals of dry chilli: ________________
3. Distance of the village: ______________________

X. Do you sell the dry chilli to the wholesaler/retailer?
If yes, to how many wholesalers/retailers? ________________

XI. At present what problems (or inconveniences) you are facing in dry chilli marketing?
1. ________________
2. ________________
3. ________________
4. ________________

XII. What is your opinion regarding regulation in dry chilli trading:
Necessary/Unnecessary? (State reasons)

XV Dry Chilli transactions

A. Purchase activity

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>From whom purchased</th>
<th>From where</th>
<th>When purchased</th>
<th>No. of sellers buyers present</th>
<th>Method of purchased</th>
<th>Quantity purchased</th>
<th>Price Per unit</th>
<th>Total value</th>
<th>Market fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry chilli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Selling activity

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>To whom sold</th>
<th>Method of sale</th>
<th>Qty sold</th>
<th>Sale price Per unit</th>
<th>Commission Total value Rate Total</th>
<th>Qty sold</th>
<th>Value (Rs.)</th>
<th>Wastage Qty Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry chilli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

XVI. Trade directions

A. Quantity purchased from different places

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Place</th>
<th>Qty purchased</th>
<th>Price per qtl.</th>
<th>Distance kms</th>
<th>Transportation cost Per km</th>
<th>Total value</th>
<th>Handling charges</th>
<th>Other charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry chilli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B. Quantity sold to different places

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Place</th>
<th>Qty purchased</th>
<th>Price per qtl.</th>
<th>Distance kms</th>
<th>Transportation cost</th>
<th>Handling charges</th>
<th>Other charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry chilli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

XVII. Retail transactions
1. Quantity purchased : ___________________________
2. Average purchase price : _______________________
3. Quantity sold : ______________________________
4. Average sale price : __________________________
5. Quantity wastage : ____________________________
6. Wastage value : _______________________________
7. Cost incurred : _______________________________
8. License fee : _________________________________
   a. Transportation cost : _______________________
   b. Bagging cost : ______________________________
   c. Labour cost : _______________________________
   d. Any other cost : _____________________________
9. Capital invested : ____________________________
APPENDIX I : INTERVIEW SCHEDULE
PROCESSING UNITS

No. ______________       Date: ______________

I. GENERAL INFORMATION
1. Name of the respondent:
2. Location:
3. Year of establishment:
4. Products manufactured:
5. Labours employed:
   a. Skilled
   b. Semi-skilled
   c. Unskilled
6. Installed capacity
7. Capacity utilization
8. Total investment

II. INVESTMENT PATTERN

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Value (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Building</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Machinery and equipments</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Infrastructure facility</td>
<td></td>
</tr>
</tbody>
</table>

III. Procurement and management of processing unit:

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Particulars</th>
<th>Quantity</th>
<th>Price</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IV. PROCESSING CAPACITY

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Installed capacity (Annually)</td>
</tr>
<tr>
<td>2</td>
<td>Capacity utilization (monthly)</td>
</tr>
</tbody>
</table>

V. Product mix

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Products</th>
<th>Quantity (Kgs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chili powder</td>
<td></td>
</tr>
</tbody>
</table>
2. Chilli seeds
3. Others
4.
5.

VI. Cost and returns:

A. Material cost:

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Particulars</th>
<th>Value (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry Chilli</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machinery and labour cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Packing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Handling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marketing cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Sub Total cost</strong></td>
<td></td>
</tr>
</tbody>
</table>

B. Returns:

<table>
<thead>
<tr>
<th>No</th>
<th>Particulars</th>
<th>Value (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Products</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Others</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Sub Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

Total A+B

VII. Extent of value addition

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Quantity procurement</th>
<th>Quantity of value addition</th>
<th>% of value addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VIII. Problems faced by the processing units

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description</th>
<th>Scored by the units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>More severe (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderately sever (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less severe (1)</td>
</tr>
</tbody>
</table>

A. Infra structure Facility
   a. Location
   b. Availability of land
   c. Electricity
   d. Water
   e. Approach roads
   Total

B. Procurement of raw material
   a) Availability Dry chillies
   b) Price of Dry chillies
   c) Quality
<table>
<thead>
<tr>
<th>C.</th>
<th>Processing</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Cost of effective</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Availability of Labour</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Maintenance of machinery</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td>Marketing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Availability of Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Transportation cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Commission/Taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PRODUCTION AND MARKETING PERFORMANCE OF CHILLI IN KARNATAKA-AN ECONOMIC ANALYSIS

B. C. RAJUR 2007 B. L. PATIL
Major advisor

ABSTRACT

Chilli (Capsicum annuum L.) is one of the important commercial crops of India. It is a crop of tropical and sub-tropical regions and requires a warm humid climate. Chilli is an indispensable condiment of every Indian household.

The growth on area, production and productivity of chilli increased significantly over the study period (1990-2004) both at district level and state level similar trend was observed in all the selected districts except Bijapur. At the state level, the magnitude of growth rates in area and production were higher compared to other districts. However, Raichur district registered higher growth in yield among all selected districts and state as a whole. The change on mean area was positive on Bijapur and was negative in both Gulbarga and Raichur districts.

The total cost of cultivation per hectare was higher in Bijapur district (Rs. 45109.80) followed by Gulbarga (Rs. 44902.70) and Raichur (Rs. 41686.60) districts. The overall cost of cultivation per hectare of chilli was Rs. 43899.71. The total return obtained per hectare of chilli was more (Rs. 78778.10) in Gulbarga district followed by Raichur (Rs. 76642.10) and Bijapur (Rs. 73945.87) district. The magnitude of price spread in channel I was more in Gulbarga (818.92) followed by Bijapur and Raichur, while it channel II the price spread was also more in Gulbarga followed by Raichur and Bijapur. The nominal protection coefficients (NPCs) indicated that the chilli crop was competitive for exports to other countries. The Sri Lanka was found to be highly loyal market for export of Indian chilli as indicated by the retention of their previous shares of chilli exports from India by 25 per cent. USA retained about 19 per cent of its previous share of chilli exports from India.