MARKET INTEGRATION FOR MAJOR AGRICULTURAL COMMODITIES IN KOLAR DISTRICT

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By

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I. INTRODUCTION

Market integration concept explains the relationship between two markets that are spatially or temporally separated. The study on integration can suggest to the producer's as to where, when and how much to sell, which in turn will have bearing on their production strategies and hence resource allocation. Spatial price relationships have been widely used to indicate overall market performance. Integrated markets are those where prices are determined interdependently.

Efficient functioning of markets provides remunerative prices for the produce of the farmer-sellers as well as provide goods at reasonable prices to the innumerable consumers. One of the common indicators of an efficient functioning of the markets is the existence of high degree of integration among them. In an integrated market, price of a commodity is responsive to price changes of the same quality products in other markets, as such price differences for a particular variety of product in the different markets of the area as a rule should not exceed the cost involved in the transportation and handling of the produce. The analysis of price movements for variety of the commodity in the corresponding and linked markets helps in judging the extent of efficiency of the marketing system in the region for the selected crops. The trend in arrivals and price changes over years observed in the long run. The trend in arrivals are associated with development in technology of production input, supply and infrastructure.

The trends of farm product prices are associated with the increase in population, money supply, production variation, purchasing power and generally with inflation and deflation observed in the economy. The study of trends enables us to indicate the general directions of changes in arrivals and prices in different markets over the periods.

The seasonal variation is a regularly recurring pattern that is completed once in twelve months. Such as seasonality is seen in the arrivals as well as in the prices of farm products. It arises from the nature of production, the supply to the markets and the demand and price formations. For crops, the seasonal variations arise from climatic factors and biological growth procedure of plants. Following the seasonality in production and arrivals, the prices also exhibit seasonal variations. Normally the prices of storable produce are lower at harvest time and then rise as the season progresses, reaching their peak just prior to the next harvest. The study of seasonal variations is considered to be important as a guide to the producer to market his products and to the consumer to purchase his needs at the right time. It also serves as a guide to the Government to operate its policy measures (procurement and buffer release) at the appropriate time.

Cyclical variations in arrivals and prices are widely accepted norms in farm products. The cycle is more likely to be initiated by some external events but once it begins it may occur on account of farmers responses to changes in prices. The knowledge of such cycles helps us in securing protection against violent fluctuations in the economy.

The variation in the market arrivals and prices can be classified, as temporal variation and spatial variation. Temporal variations are the results of complex mixture of changes associated with cyclical, seasonal and irregular components. Among these the seasonal component is considered the most important. Spatial price variation refers to the variation in the prices observed in different markets and they occur due to the difference in the location of production and consumption centers. The inter relationship between the prices movements in different markets mostly depends upon the nature and extent of competition, dissemination of market information and the attitude of market functionaries. The efficiency of any marketing system is determined by the degree to which the wholesale prices of a commodity in different markets are related to one another. Analysis of such inter-relationship helps us in understanding the efficiency of the marketing system.

The spatial price variations in prices are observed over different markets. They occur due to differences in location of production and consumption of commodities. In theory in a perfect market, the price of a commodity at one market is not expected to exceed the prices at another market by more than the transport cost and handling costs. The degree to which wholesale prices of a commodity in different market are related to one another is an important consideration in determining the efficiency of the marketing system. The inter relationship
between the price movements in different markets mostly depends upon the nature and extent of competition. An analysis of such inter-relationship helps us in understanding the efficiency of the marketing systems.

Indian agriculture has made a smart recovery in 2003-04. It is after the worst drought in the recent decades that pulled down the country’s food grains production to 174.19 million tonnes in 2002-03, the lowest in the last ten years, that the Indian agriculture has shored up its strengths to record a production of 212.505 million tonnes in 2003-04. This is the second highest production in the country has witnessed. The highest production was 212.85 million tonnes in 2001-02. Agriculture is the main occupation of more than 65 per cent of the population living in the country contributes 23 per cent to the Gross National Product. The total production from nine major oil seeds stood at a record high of 25.143 million tonnes. The total groundnut production in 2003-04 was 8.332 million tonnes as against target of 8.1 million tonnes.

The total production of potato in 2003-04 was 250 lakhs tonnes.

Karnataka ranks 3rd in the production of Vegetables and Fruits. Total area under the food grains in the state is 7.17 million hectares contributing 8.77 million tonnes of production. In case of oil seeds, the area occupied by the oilseed crops is 1.74 million hectares contributing 1.06 million tonnes.

Kolar is one of the important district in Karnataka contributes proportional share in the production of vegetables, fruits, cereals and pulses. The area under the food grains, oil seeds, fruits and vegetables are 103,149 hectares, 36,878 hectares, 49,424 hectares and 23,171 hectares respectively. The important crops grown in Kolar district are potato, onion, ragi and groundnut.

Potato

Potato is an edible starchy tuber produced by certain plants of the genus Solanum and family Solanaceae. The common white potato (Solanum tuberosum L.) is a plant native of the Peru-Bolivian region in the high lands of South America. Where it has been consumed for more than 8000 years. It is noticed that potato was existing in India even during 10th century as mentioned by Pickering (18th per cent) in “Chronological History of Plant”, pp: 60-692. Today, potato is the 4th most important food crop in the world exceeded only by wheat, rice and maize for human consumption.

The world trade for potato is dominated by Europe, which accounts for 80 per cent exports of fresh potatoes. India’s share in world potato export is miniscule at 0.45 per cent only, although its share in world potato production has been between 3.6 per cent in 1986 to 8.50 per cent in 2000.

Karnataka is one of the important potato growing states in peninsular India. Potato is one of the main in six of its twenty-seven districts. The states agroecology favours its cultivation during two seasons a year. Karnataka is having 0.51 lakh hectares of land under potato yields 1.49 lakh tonnes with an average yield of 3103 kgs/ha. Potato is predominantly grown in Bangalore, Belgaum, Chikamagalur, Dharwad, Hassan and Kolar district. It is mainly grown as kharif crop in Belgaum, Chikamagalur, Dharwad, Hassan districts, whereas its grown as a rabi crop in Kolar and Bangalore district. The Rabi crop is irrigated whereas the Kharif is flatty rainfed, Potatoes produced in kharif account for the major proportion (70 per cent) of the potatoes produced in Karnataka. Hassan District stands first in a followed by Belgaum and kolar districts. Kolar occupies 3rd position with respect to production next to Hassan and Belgaum. The area under production of potato is 5550 hectares produces 48,176 tonnes and the average yield is 9137 kgs/ha.

Onion

Onion is an important crop in all continents and is commercially cultivated in a little over hundred countries of the world. India is the largest producer of onion in the world next to China accounting 16 per cent of the world area (2.69 million hectare) and 10 per cent of the world production (46.06 million tonnes) [The Hindu, Survey Indian Agriculture 2004-05]. Karnataka occupies an area of 1.5 lakh hectares with a production of 5.36 lakh tonnes and the average productivity is 4905 kgs/ha. The area under production in Kolar district is 1,565 hectares with a production of 8,929 tonnes and the average yield is 5,994 kgs/hectare.
Ragi

Ragi (*Eleusine coracana*), an important member of the millets group, is distributed all over the Indian subcontinent and Central Africa. However, it has gained major agricultural importance only in the southern parts of India and western part of Africa.

Karnataka ranks first in area, as well as production of Ragi. Andhra Pradesh, Maharashtra, Orissa, Tamil Nadu and Uttar Pradesh are the states contributing substantially to its production. In Karnataka Ragi is grown particularly in Southern districts like Bangalore, Chitradurga, Hassan, Kolar, Mandya, Mysore, Shimoga and Tumkur.

Karnataka occupies an area of 7.67 lakh hectares with the production of 7.4 lakh tonnes and the average yield is 980 kg/ha (Karnataka at glance 2003-04). The area under production of ragi in Kolar district is 51,253 hectares contributing 10,672 tonnes of production and the average yield is 708 kg/hectare (Kolar district at glance 2003-04).

Groundnut

The cultivated groundnut is an annual legume and native of America which is now grown throughout the tropical and subtropical regions of the world. It is one of the important oilseeds crop in the world, known for its global economic significance in wider areas of processing and consumption. Edible oil economy of India is primarily dependent in Groundnut, which occupies approximately 29 per cent of total cropped area and nearly 33 per cent of total oil seed production. Among the groundnut producing states Karnataka ranks third in area i.e., 8.44 lakh hectares (16 per cent) as well as in total production i.e., 5.39 lakh tonnes (13 per cent) with an average yield of 672 kgs/hectare (Karnataka at glance 2003-04). In Kolar district the area under production of groundnut is 33,490 hectares contributing 10,672 tonnes of production and the average yield is 335 kgs/ha (Kolar district at glance 2003-04).

The following are the objectives considered for the study

1. To study the trends in arrivals and prices of selected commodities

2. To examine the seasonal and cyclical variations in arrivals and prices of selected commodities.

3. To examine the degree of association between arrivals and prices of major agricultural commodities in the selected markets

4. To study the extent of spatial integration in the arrivals and prices of major agricultural commodities in the selected markets

5. To suggest the appropriate policy measure based on the findings of the study.
II. REVIEW OF LITERATURE

Review of literature provides information to the researchers regarding the previous works done in their area and there by helps them in identifying the theoretical framework and methodological issues relevant to the study. It provides the researchers a proper direction to carry out their research work and enables them to arrive at meaningful results. Keeping these facts in view, the available literature relevant to the objectives of the present study was reviewed and they are presented here in the following headings,

2.1 Trend in arrivals and prices
2.2 Variations in arrivals and prices
2.3 Market arrivals, prices and their relationship
2.4 Market integration

2.1 Trend in arrivals and prices

Singh et al. (1993) concluded that stable prices play an important role in determining farm income, in particular for perishable products such as potatoes, where farmers cannot retain produce. The seasonal nature of agricultural production results in price fluctuations. This paper analyses trends in arrivals and prices of potatoes; examines the seasonal patterns of arrivals and potato prices; and suggests measures to help minimize price fluctuations. The study was undertaken in Jalandhar district of Punjab state during 1975-76 to 1989-90. The results indicate a rising trend. During the post harvest period, the indices of prices remained high and fluctuated widely. These fluctuations may be attributed to the seasonal and perishable nature of the crops. The government needs to take some initiatives such as, announcing some support price programmes for potatoes; purchasing the produce at the support price directly from the producers; increasing cold storage facilities in the state; increasing the retention power of the producers by providing adequate credit facilities; and establishing more potato processing units in the potato growing areas, thus providing employment to the rural community.

Pagire (1998) made analysis on arrivals and prices of grapes in Maharashtra. The study noticed that the arrivals of grapes in Pune market were observed at its peak in March and lowest in June. The arrivals were observed to drastically increase from December to March. In Nasik market the arrivals were the highest in February. In case of prices, the declining trend was noticed from January. Till March and thereafter began to increase from April onwards in Pune market. In Nasik market, the prices were observed to be in general stable. Variations were observed in arrivals and prices during the period of twelve years. Definite trends in prices and arrivals were noticed but for very limited periods, during the period of twelve years in both the markets.

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 coefficient of variation of arrivals (56 to 80 per cent) and prices (40 to 80 per cent) of tomato were higher than the variation in arrivals (27 to 60 per cent) and prices (49 to 75 per cent) of lady’s finger. The compound growth rate of arrivals (2.11 per cent) and prices (1.02 per cent) and 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.

Mundinamani et al. (1999) studied trends and seasonality in market arrivals and prices of groundnut in Karnataka. They employed orthogonal polynomial regression to analyse the trends in arrivals and prices of groundnut in selected markets. The trend pattern of arrivals of Groundnut in the study markets was mixed one and that of prices was almost identical.

As far the price trend pattern was concerned a continuous upward movement was seen in all the markets without any exception. This was mainly caused by increase in population leading to an increase in demand for edible oils, general inflationary pleasure and failure of production of groundnut to keep pace with the expanding demand for their products.
In case of seasonality in arrivals and prices higher indices of market arrivals of Groundnut were noticed immediately after harvest in almost all the study markets. Thus high indices were found during October to January in respect of rainfed crop and April to September in respect of Rabi / Summer crop.

In respect of prices indices of groundnut lower values were observed during peak arrival months and higher values during lean arrival months of March and August in Bijapur, Talikoti and Gadag markets. However in Raichur, Ranebennur and Gangavati markets, such pattern was not noticed.

Shelke and Kalyankar (2000) analysed price spreads in Marketing of selected vegetables in new Mondha Market, Parabhani. Outcome of the study resulted, increased trends in arrivals of brinjal during the period from March to May, while it was less than the average from June of February. It was maximum from November to March and much lower from June to October in case of cauliflower. Potatoes showed maximum arrivals from March to May and less than the average from June to January.

Trend in the wholesale and retail prices for the period of study indicated that maximum wholesale and retail prices prevailed from June to February in case of Brinjal. This period corresponds with the period in which arrivals were much lowered. In case of cauliflower the lower prices prevailed during the months from November to May and for the rest of period of the year the prices were slightly increased depending upon the arrivals. In case of potato the wholesale and retail prices were much lower in the months from January to May. The reason for this was that this period was peak period as for as the supply is concerned.

Ausepharampel Joson Jose (2002) studied trends in arrivals and prices of potato. The study reveals a positive trend in all the markets under study. The arrivals have increased in all the markets but the quantum of increased in arrivals varied from market to market. The highest annual increase in potato arrivals was noticed in Kolar market which may be because of increased potato production in Kolar. All the other markets indicating the increased arrivals of the total potato production of the state in to the regulated markets for sale.

An increased trend in prices was noticed in all the markets which may be due to increased population which inturn increases the demand for potato coupled with influencing trend in prices of agricultural commodities.

Dayakar Rao et al., (2003) studied trends in production, prices and market arrivals of sorghum v/s competing crops. The results concluded that the trends in arrivals of sorghum was largest in Maharashtra followed by Madhya Pradesh, Karnataka and then Andhra Pradesh in 1980's. The same trend in market arrivals in Maharashtra continued to outstrip those of every other state during 1990's.

In case of prices, analysis has been done in order to trace the trends and inter and intra year fluctuation in the wholesale price of sorghum during the period 1980-81 to 1988-99. The study revealed that the prices of sorghum shown an increasing trend in all the states under study. The average increase in prices of sorghum per quintal varies from Rs. 29.94 in Gujarat to Rs. 17.35 in Maharashtra.

Chahal et al., (2004) studied trends in market arrivals and prices of green peas. They observed that the coefficients of arrivals were 7081.75 in Ludhiana market that was significant statistically, whereas in Hoshiarpur market the co-efficient was found to be negative and non significant. This shows that the market arrivals have increased by around 7082 quintal for annum in Ludhiana market.

Co-efficient of prices were estimated to be 60.12 and 74.08 in Ludhiana and Hoshiarpur markets respectively and were found to be significant statistically. It shows that there was an increase of price by Rs. 60.12 and Rs.74.08 per quintal per annum in the above said markets respectively.

2.2 Variations in arrivals and prices

Kainth and Mehra (1988) examined the trends and seasonal fluctuations in arrivals and prices of potatoes in Amritsar district, Punjab, together with the price spread of potatoes. The study covers the period 1980/81-1987/88. Seasonal variations may be primarily due to
seasonal production, poor cold storage facilities and lack of retention power of the potato growers. Price variations play a predominant role in creating uncertainty in the income levels of potato growers. The main reason for the variation in prices was the pattern of market arrivals. Producers received only about 59 per cent of the consumer price.

Sangwan (1989) examined seasonal variation in potato price in important markets of the country. He found that the level of seasonal variation in the prices of potato was considerably less in Delhi market than Kanpur, Farrukhabad, Meerut and Patna markets. It was largely due to lower harvest price in producing area that consuming center like Delhi. All the five markets did not show similar trend over the entire period i.e., 1963 to 1985. The direction of trend changes was largely in keeping with respect to trends in production of potato and establishment of cold storage.

Mundinamani et al. (1991) used monthly time series data on market arrivals and prices of groundnuts for the period 1960/61-1983/84 collected from the regulated markets of Gadag and Hubli to estimate indices, trend equations and coefficients of variation. The pattern of market arrivals of groundnuts indicates a seasonal character. The prices of groundnuts were found to be a function of market arrivals only in the short run. The seasonal pattern of market arrivals and the resulting short run instability in groundnut prices could be eliminated by using a package of measures. In the long run, prices are influenced not only by market arrivals but also by other factors such as the general rise in prices and the steady rise in demand for groundnut products.

Kasar et al. (1996) studied behaviour of prices and arrivals of red chillies in Maharashtra. Seasonal indices of arrivals of red wet chillies begin in October and end in April. While that of red dry chillies start in May and end in September. The arrivals of red wet chillies were maximum during December to March when the corresponding prices were relatively low. The arrivals of red wet chillies were low during October, November and April. During these months prices were relatively at higher level. By and large, it appears that when the seasonal index of arrivals of red wet chillies was more during December to March, the seasonal index of prices was at a low level. On the other hand, when the seasonal index of arrivals of red dry chillies was low (May to September) the price index of chillies was at a very high level.

Keith et al. (1997) examined seasonal potato price indices for two major wholesale potato markets of Delhi and Kolkata. It was cleared that potato prices typically double between the end of harvest in March and the onset of summer in July and August. The most rapid increase in potato prices occurs in April and May. There was a slight dip in price in the Delhi market in mid summer which may reflect the arrival of a summer crop. Prices then continue to rise until peaking in September or October when existing stocks are lowest, and just prior to the arrivals on the market of early potatoes in months of November and December.

Mipramavar and Gummagolmath (1998) studied seasonal indices of arrivals and prices of potato in regulated markets of Northern Karnataka. They revealed that the arrivals were maximum in the month of November in both Belgaum and Dharwar the markets indicating glut during harvesting season. This situation prevailed mainly due to lack of storage facilities in the area. However, price did not decrease during glut season as majority of the traders purchased potato at that time in Belgaum Market. The seasonal index of arrivals and prices revealed that the seasonal fluctuations in arrivals of potato were more than that of price in Belgaum market. So Belgaum market clearly represents the characteristic feature of wholesale assembly market. That means the seasonal index of arrivals reached its maximum during the harvest season and post harvest period. From the above reviews, it is clear that the market arrivals were higher in the months of March and April, and price also had shown decrease at peak period, whereas, price was higher from September to December in the lean period. The arrivals had shown increasing trend form 1989 to 1999 in Belgaum market because of increase in the production of potato. The seasonal fluctuations were more in both price and arrivals due to lack of storage facility and lack of market information.

Chahal et al., 2004 studied seasonal indices of market arrivals and prices of green peas in selected markets of Punjab. They observed that the main season for marketing of green peas in Ludhiana market was December to March while it was from November to February in Hoshiarpur market. The seasonal indices of arrivals of green peas were the
lowest during the month of September (16.91) and were the highest during the month of January (253.08) in Ludhiana market. Similarly, the seasonal indices of market arrivals were less than 10.00 from April to October with lowest during the month of June (1.85) in Hoshiarpur market and the highest in the month of December (560.65). So, wide variation in case of Hoshiarpur market. In case of prices lowest indices were during the months of February (38.13) and March (27.65). The same was the highest during the month of September (167.81) and October (163.78) in Ludhiana market. But in Hoshiarpur market, the seasonal indices for prices were the lowest during the month of January (47.16) and February (37.48) and the highest seasonal indices were recorded during September (143.71) and October (147.95). So it can be concluded from above discussion that the prices indices ruled low when the market arrivals were higher and vice versa.

Rajashekar (2004) studied the cyclical variation in arrivals and prices of tomatoes in comparison of the monthly arrivals of tomatoes. K R Market cycle was smoothen with maximum cycles effects in case of 156 markets. The slump was observed with 35 months indicating that the high arrivals observed in every 30 months. The cyclical components were observed only in weekly prices for K R market. Since the recurrence of cycle was not established the similar results were obtained by Satish 1990. The graph of cyclical indices was shown repetition of cycle for every 45 weeks. The slump was observed in every 42 to 50 weeks. The boom was noticed in the week of 10 to 15 and 50 to 55 weeks indicating that the high prices were prevailed for every 45 weeks.

2.3 Market arrivals, prices and their relationships

Jain and Kaul (1980) analyzed the seasonal fluctuations in the potato market and the existence of cycles and worked out their periodicity, using time-series data relating to arrivals and prices collected from four major potato markets in the Punjab, India. In the case of two markets (Ludhiana and Pathankot) the data related to the years 1961/62 to 1975/76 while in the case of Jallandar and Hoshiarpur markets, the data related to the years 1963/64 to 1975/76. A multiplicative model of time-series was used to analyze the trend, seasonal and cyclical variations in prices and arrivals of potatoes. The analysis of all the objectives showed the instability of price. There is an upward trend in prices but with large fluctuations in a year. Analysis of cyclical variations confirms the fluctuations in prices as it gave a three-year cycle period in potato prices.

Balakrishnan et al. (1981) studied the arrivals and prices of potatoes at Mettupalayam market in Tamil Nadu, and the specific relations between them, using time-series data for 16 years, 1962-1977. The study showed that potato price fluctuations in the selected market are governed not only by the supply of potatoes from Nilgiris, but also by the arrivals from the upcountry markets and their price. Warehousing and cold storage facilities need to be expanded to store the produce when the price is not attractive.

Findings of a study by Kalyankar and Rajmane (1987) on arrivals and prices of potato in Jalna market (Maharashtra) for 1973-82 showed that March was the peak month for arrivals while minimum arrivals were recorded in November. Seasonal price indices showed that the increase in the off season price compared with the immediate post harvest price was around 30per cent. The producer's share in consumer's rupee was 65.71per cent, i.e., Rs110.40 in Rs167.99 per quintal paid by the consumer, the remaining 34.29per cent being spread over different marketing agencies. The study emphasized the need to stabilize prices during peak harvesting periods by providing cold storage facilities in the producing centres and establishing wholesale and retail markets in the potato producing area to minimize the marketing costs of potatoes.

Selvaraj and Krishnamoorthy (1991) examined the pattern of price behaviour, the existence of market channels, nature of price spread and the relationship between market arrivals and price of potato based on data collected from a sample of 10 commission agents, 10 wholesalers and 10 retailers in Nilgiris district of Tamil Nadu. The role of cooperatives in marketing is investigated using the case of the Nilgiris Cooperative Marketing Society (NCMS) at Mettupalayam Market Centre. Two important channels for potato marketing were found: channel I (producer-NCMS- wholesaler-retailer-consumer) and channel II (producer-mandies-wholesaler-retailer-consumer). It was observed that channel I is efficient. The price behaviour analysis showed wide annual and seasonal fluctuation in prices.
Agarwal and Dhaka (1998) studied the relationship between the arrivals and prices of spice crops in Rajasthan. The study reveals that arrivals of chillies were maximum in February and the wholesale prices of dry chillies were also higher in February when the first lots of new chillies arrived in the market. Prices reached the peak level in September when arrivals were low. The pattern of market arrivals of cumin and coriander in seed also revealed the existence of seasonality. The correlation coefficient analysis indicated that there did not exist any definite relationship between arrivals and price of coriander seed in Baran market. In case of chillies the correlation between arrivals and price of subsequent months was negative and significant indicating thereby that prices affected the arrivals more in subsequent months that in corresponding months.

Ravi Kumar et al. (2001) concluded that, in general, arrivals showed mixed trend, whereas, prices showed an increasing trend for the selected commodities in Anakapalle regulated market of Andhra Pradesh. There exists an inverse relationship between seasonal indices of arrivals and prices of selected commodities. Therefore the policy implication lies in encouraging the farmers to dispose their produce at the opportune time to get good remunerative prices. It requires providing finance to farmers and better storage facilities either at village level or at market level so as to spread the arrivals reasonably in the lean months of the year.

Shivaraya and Hugar (2002) inferred that the prices of onion and potato increased as there is increase in arrivals in Belgaum, Hubli, Raichur and Gulbarga markets. However, reverse trend was observed in other markets. The correlation co-efficient between arrivals and prices of onion showed negative association in storage cost Dharwad, Bijapur and Raichur markets and potato in Dharwad market. This clearly indicated that the prices of onion and potato were mainly influenced by their arrivals in these markets in accordance with the law of demand and supply. The substantial quantity of arrivals during post harvest months of the year led to decline in prices. The development of warehousing facilities and provision of credit to the farmers against warehouse receipts would go a long way in reducing the variation in arrivals and prices. This also calls for dissemination of market information relating to arrivals, prices, etc, by the respective Agricultural Produce Market Committees.

2.4 Market integration

The market integration concept explains the relationship between two markets that are spatially or temporally separated. A study on integration of different markets can suggest to the producers as to where, when and how much to sell, which in turn will have a bearing on their production strategies and hence resource allocation.

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 no higher correlation between the residuals.

Brorsen et al. (1984) illustrated the use of univariate and multivariate time series analysis in the investigation of dynamic relationship among selected weekly import prices of rice of the European community. EC imported rice from the United States, Thailand and Argentina. The results showed that Argentinean and United States prices moved together. These two prices were influenced by the European market and react quickly to changes in Thai prices. Thailand prices responded slowly to US and Argentinean prices.

Bhatta and Bhat (1988) analyzed the extent of price relationship for arecanut between selected markets of Sirsi and Mangalore using the correlation coefficient method. The results revealed that Mangalore market was more efficient than Sirsi market. The commercial nature of the crop and its varied market behaviour was clear from the fact that there was a direct relationship between supply and price.

Indira (1988) estimated the extent of price relationship for coffee between three wholesale centers- Bangalore, Coimbatore, and Vijayawada. The results revealed that prices have shown positive relationship with both Coimbatore and Vijayawada prices. Coimbatore and Vijayawada prices have also shown positive relationship with each other. However, there was relatively lower influence of Bangalore prices on Coimbatore prices than on Vijayawada prices.
Prabhakar (1988) studied the market integration of silk cocoon markets of Ramanagaram and Vijayapura in Karnataka. The association between the two markets was studied using the bivariate correlation analysis. The correlation coefficient was found to be 0.947 and was highly significant at 1 per cent level of significance, indicating that the two markets were highly correlated.

Gemtessa (1991) analyzed the integration of Ethiopian coffee prices with world prices using the correlation co-efficient. The correlation co-efficient of the monthly average prices secured at domestic and world markets for 12 months lag were calculated. The bivariate correlation co-efficient between the two market prices of coffee revealed that they moved together in the same direction. The lagged cross correlations of domestic prices and world prices of coffee also revealed that they moved together in the same direction. The lagged cross correlations of domestic prices and world prices of coffee for the period 1979-80 to 1987-88 indicated that the world prices of coffee had a stronger influence on the domestic prices, than that of domestic price influence on world prices of coffee.

Vishnugupta and Arora (1991) examined the various quantitative relationships between the prices of oil and oilseeds. This has been achieved by estimating the degree of Horizontal integration between oils and oilseeds prices, degree of vertical integration of oilseed prices to the prices of oils and cake and the magnitude of adjustment between and prices of oil and oilseeds.

The Koyck's distributed Lag model has been used to analyses the data observed from Kanpur market of Uttar Pradesh. The study gives detailed account of vertical and horizontal integration of prices of oils and oilseeds, co-efficient of short run and long run adjustments and the time required for 90per cent adjustment of in price formation. The results give a clear identification of oil seeds and oils where in bisectional unidirectional or no interaction exists in price formation.

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 1986 to 1991. The results revealed that the regional pepper markets in Sarawak were highly integrated. Price changes are fully and immediately passed on the other markets. The low transportation costs and risk associated with transportation may explain the degree of co-integration observed.

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.

Mamatha (1995) used the co-integration analysis for examining the market integration of selected species of India and New York prices. The results indicated that the co-efficients were found to be negative and significantly different from zero in case of Indian and New York prices of pepper, chillies, turmeric and ginger confirming the stationarity of the series. It also indicated that both the Indian and New York price series for selected spices had the same order of integration.

Nasrudeen and Subramanian (1995) studied price integration of oil and oilseeds. The analysis of oils and oilseeds in Bombay market revealed the nature of price integration between oilseeds and oils. The assumption of complete oil price integration could not be fully accepted in castor oil. The contemporary belief of influence of groundnut oil prices on all edible oil prices was also established. The results of vertical integration confirmed the hypothesis that changes in oilseed price is linked to changes in its oil and cake prices. The vertical integration in oilseed price was much quicker as compared to Horizontal Integration. The Bombay oilseed markets showed the characteristics of perfect market condition by its quick adjustments to price changes.

Debdutt Behura and Durga Charan Pradhan (1998) analyzed the relationship between prices of marine fishes for six markets in Orissa by using co integration model. The
results revealed that out of all the six markets, the price series between Cuttack and Paradip were co-integrated due to good communication facilities.

Hudson (1998) analyzed the changes in the price behaviour in US catfish industry. Using monthly catfish price data, a co-integration analysis of subsets of prices showed that price behaviour has changed through time with catfish prices becoming integrated as the number of processors has increased. The results may have implications for the examination of market price behaviour in developing or emerging markets.

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.

Vani and Krishnaiah (1998) studied the price integration in marketing of chillies in Guntur market (AP). This study was taken up in Guntur district of Andhra Pradesh during 1996-97 to assess the price integration between two regulated markets viz., Guntur and Tadikonda. Here they selected Guntur and Tadikonda as control and local markets respectively. Ravillion model was adopted to studying the price integration. The index of market connection was 0.82 indicating high degree of market integration. The value of $B_{00}$ is 0.30 which implies that one rupee change in Guntur market price between the current and last year brings about Rs. 0.30 increase in Tadikonda market price during same time period. Guntur market price will influence Tadikonda price with an increase of Rs. 0.63 during the same time period. While it would increase the difference by Rs. 0.63 in Tadikonda market price during last year.

Bassolet and Lutz (1999) analysed the integration of cereals markets in Burkina Faso which were liberalized in 1992. At the same time a market information service (SIM) was created to collect and disseminate weekly cereal prices of regional markets by radio. The study evaluated up to what extent the existence of this service contributed to the integration of the market using co-integration analysis. A comparison of results of the whole period under study (1990 to 1995) showed that the impact of the diffusion of prices on market integration is moderate.

Khedhiri (1999) in his study on the agricultural market integration in Tunisia found that the degree of wholesale market integration is low, particularly for the strategic products. It also showed that the distance between markets and the volume of transactions cannot explain this lack of linkage between the markets.

Olani Wirtu Wakjira (1999) studied the long run relationship between international price (New York) and producers’ price of coffee in Rwanda. The results indicated that both the price series were stationary and were integrated due to better infrastructural facilities.

Samarajeeva and Gunatilake (1999) studied the demand function for coconut using co-integration analysis. The study make use of 20 years Sri Lankan time series data (1978 to 1997) to estimate the demand function for coconut oil incorporating own price, 3 substitute prices and income. The results of Dickey Fuller and augmented Dickey Fuller tests 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.

Zanias (1999) analysed the seasonality and spatial integration in agricultural (product) markets especially the soft wheat market of five European Union member states (France, Italy, Belgium, Germany and UK). Co-integration analysis was made use of by incorporating the seasonal components of the agricultural price series in testing procedure. The results showed that some of the markets turn out to be integrated while in some cases a unified market cannot be assumed. These results differ in some cases from those obtained by co integration tests which ignore seasonal unit roots.

Balappa shivaraya (2000) used zero order correlation matrix to study the potato and onion markets in North Karnataka. He observed a strong integration among all the selected markets both in onion and potato except Bijapur in onion. In case of potato, the correlation coefficient between wholesale prices of selected markets was found to be higher than 0.93 indicating greater integration among Belgaum, Dharwad and Hubli markets.
Mahesh (2000) studied the relationship between domestic (Calcutta) and international (London) market prices series of tea using the co-integration analysis. The results revealed that the tendency of the price series of both domestic and international market for tea move in-unison in the long-run confirming the law of one price (LOP).

Jayesh (2001) studied market integration for spices using correlation coefficient. The zero order correlation matrix of prices showed a strong integration among the selected markets of Kerala, Karnataka and Tamil Nadu for both pepper and cardamom.

Amitkar et al., (2004), studied marketing infrastructure in Himachal Pradesh and integration of the Indian apple markets. The data was collected from various secondary sources. Exponential growth model and cuddy Delia valls method and co-integrated methods were employed. The study revealed that the Chennai, Delhi and Mumbai markets were well integrated indicating existence of price diplomacy among various markets were well integrated indicating existence of price dependency among various markets.

Alka Singh et al. (2004) made an assessment of market infrastructure and integration in Orissa state. The study revealed that, the importance of Bankura market for price formation of rice in local market of Orissa. Out of 8 hypothesized trading market pair $B_{ij}$ turned out to be significant only for four pairs that to with Bankura reference market only. The $B_{ij}$ Co-efficient was found to be highest for Jeypore-Bankura (0.618), indicating that 1 rupee charge in rice in Bankura market will have 0.618 rupee charge in Jeypore market. Out of all 8 trading pair only 4 pairs having reference market Bankura turned out to be significant. Hence, it can be concluded that impact of price changes in Bunkura market is influencing changes in selected local rice markets. However, the extent of long run integration is highest in Joypore and lowest in Balasore as compared with Bunkura market.
III. METHODOLOGY

In this chapter, a comprehensive view of the methodology adopted for the investigation viz., the study area, source of data and analytical techniques used are presented.

3.1 Description of the study area

Kolar district is purposely selected for the study, which contributes major share in the production of vegetables, cereals, oilseeds and commercial crops to the state. Kolar district falls under Eastern dry zone.

Kolar is one of the important district in Karnataka contributes proportional share in the production of vegetables, fruits cereals and pulses. The area under the food grains, oil seeds, fruits and vegetables are 1,03,149 hectare, 36,878 hectare, 49,424 hectare and 23,171 hectare respectively. The important crops grown in Kolar district are potato, onion, ragi and groundnut.

3.2 Selection of the Crops

The crops grown in the study area are ragi, maize, cowpea, aware, tomato, potato, brinjal, radish, groundnut, commercial crops etc., The major crops grown are ragi, groundnut, potato and onion were selected for the purpose of a detailed study based on the importance of the crop in the study area.

3.3 Selection of the Markets

Based on the maximum arrivals of agricultural commodities in the year 2004-05 four markets were selected for the study. They are Chikkaballapur, Chintamani, Kolar, and Srinivasapur. For each market time taken to reflect changes in prices is compared with Bangalore market prices for the same commodities. Table 3.1 shows the average distance between selected markets (Fig. 3.1 & 3.2).

Table 3.1: Average distance between selected markets

Fig. 3.1: Map of the study area
Fig. 3.2: Map showing demarcation of markets in Kolar districts

3.4 Data:

The data pertaining to the arrivals and prices of selected crops viz., potato, onion, ragi and ground nut was collected over the period of 1994-95 to 2004-05. The data on various aspects under study were collected from the following sources.

1. Agriculture Produce Marketing Committees (APMC,s)
2. HOPCOMS
3. Horticulture department
4. District statistical office
5. Karnataka State Agricultural Marketing Board (KSAMB)

3.5 Analytical Techniques

The details of methods of analysis followed are presented as under

3.5.1 Simple tabular analysis
3.5.2 Averages, percentages
3.5.3 Time series analysis
3.5.4 Regression analysis
3.5.5 Distributed Lag Model
Fig.3.3: MAP OF THE STUDY AREA
Fig. 3.2: MAP SHOWING DEMARCATION OF MARKETS IN KOLAR DISTRICT
### Table 3.1: Average distances between selected markets

(Distance in kms)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Bangalore</th>
<th>Chikkaballapur</th>
<th>Chintamani</th>
<th>Kolar</th>
<th>Srinivaspur</th>
</tr>
</thead>
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<td>0</td>
<td>60</td>
<td>75</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>Chikkaballapur</td>
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<td>0</td>
<td>55</td>
<td>80</td>
<td>85</td>
</tr>
<tr>
<td>Chintamani</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Kolar</td>
<td>0</td>
<td></td>
<td>0</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
3.5.1 Simple tabular analysis
The data would be analysed and interpreted in tabular form.

3.5.2 Averages and percentages
The analysed data would be expressed in averages and percentages for the better understanding.

3.5.3 Time series analysis
The techniques employed for analysis of time series data were:

3.5.3.1 Analysis of seasonal factors by 12 (twelve months centered moving average)

3.5.3.2 Analysis of trend factor by regression analysis

3.5.3.3 Analysis of cyclical fluctuations

3.5.3.1 Twelve months centered moving average
This is one of the widely accepted methods of analysis of time series data for seasonal variations in prices and arrivals. To analyse the time series components, namely, trend, seasonal variations and cyclical fluctuations, a twelve month centered moving average comprises the trend and cyclical components. The seasonal index is then computed by dividing the original series by the twelve month centered moving average. For this purpose the following multiplicative model was used.

\[ 0 = T \times C \times S \times I \quad (1) \]

Where, 

\[ 0 = \text{Original time series data} \]
\[ T = \text{Trend factor} \]
\[ C = \text{Cyclical factor} \]
\[ S = \text{Seasonal factor} \]
\[ I = \text{Irregular factor} \]

The seasonal factor is isolated as,

\[ S = \frac{0}{M} \quad (2) \]

Where, \( M = \text{Twelve month centered moving average} \).

Using equations (1) and (2), the seasonal index may be defined as
\[ S = \frac{0}{M} \times 100 \]

Where, \( S = \text{Seasonal index} \).

3.5.3.2 Regression analysis
The arrivals and prices are subjected to change over a period of time due to new innovations, supply of more inputs, increase in money supply and increase in population. The estimation of time trend on the growth of these variables may be helpful in studying the directions of change and in guiding policy formulations. The econometric model used for the purpose can be stated as:

\[ Y_t = a + b_t + E_t \]

Where, \( Y_t = \text{Time series yearly data of arrivals or prices} \)
\[ a = \text{Intercept} \]
\[ b = \text{Regression coefficient} \]
\[ t = \text{Time period in years 1, 2, ... , 20} \]
\[ E_t = \text{Random error} \]
3.5.3.3 Cyclical fluctuations

The cyclical movements of arrivals and prices were analysed by tabulation as well as graphical techniques using the data on arrivals and prices, as follows.

Since the model considered was multiplicative model, by dividing the original data by the seasonal factor and trend factor, the cyclical factor was determined.

That is, Cyclical factor = \( \frac{0}{T \times S} \)

The irregular factor was ignored since its occurrence itself is irregular.

3.5.4 Analysis of degree of association between arrivals and prices

The degree of association between arrivals and prices of the agricultural commodities selected were evaluated by employing correlation analysis technique. The correlation analysis was done by computing correlation coefficients for each sample market and for each crop separately. The correlation coefficient was worked out by using the following formula.

\[
 r = \frac{\sum (X_t - \bar{X})(Y_t - \bar{Y})}{\sqrt{\sum (X_t - \bar{X})^2 \sum (Y_t - \bar{Y})^2}}
\]

Where, \( r \) = Correlation coefficient
\( X_t \) = Market arrivals in month \( t \)
\( Y_t \) = Price of the commodity in month \( t \)

3.5.5 Distributed lag model

Market integration is a relationship that exists between two markets for a particular commodity. Two markets are said to be closely integrated if price variations in one are reflected in the price prevailing in the other and vice versa.

Here to study the time gap that exists between two markets koyck’s distributed lag model was employed due to its superiority over correlation analysis. Koyck’s basic model is explained below.

\[
P_{it} = \alpha + \beta_0 P_{jt} + \beta_1 P_{jt-1} + \ldots + \beta_K P_{jt-K} + U_t \quad (1)
\]

Where \( P_{it} \) is the price in \( i^{th} \) market in \( t^{th} \) period. \( \alpha \) and \( \beta \) are parameters. Assuming that the \( \beta_s \) are of same sign and declining geometrically, then it follows as,

\[
\beta_k = \beta_0 \lambda^k \quad (2)
\]

Where \( \lambda \) is such that \( 0 < \lambda < 1 \) as the rate of decline of distributed lag and \( (1 - \lambda) \) is the speed adjustment. Equation two explains that each successive \( \beta \) is numerically less than each preceeding \( \beta \), implying that as one goes back into distant past the effect of lag on \( P_{it} \) becomes progressively smaller. If \( \lambda \) is close to one the slower is the rate of decline in \( \beta_k \). If \( \lambda = 0 \), the more rapid is the decline in \( \beta_k \).

With the assumption of non-negative values for \( \lambda \), Koyck rules out the \( \beta_s \) from ranging sign and \( \lambda < 1 \), lesser weight has been assigned to the distant \( \beta_s \) which gives the current ones and the sum of the \( \beta_s \) which gives the long-run multiplier finitely namely,

\[
\sum_{n=0}^{\infty} \beta_n = \beta_0 \frac{1}{1 - \lambda}
\]

As a result of equation (2) the infinite lag model (1) can be written as

\[
P_{it} = \alpha + \beta_0 P_{jt} + \beta_1 \lambda P_{jt-1} + \ldots + \beta_2 \lambda^2 P_{jt-2} + \ldots + \mu_i \quad (3)
\]

Where \( P_{it} \) is the price in \( i^{th} \) market in \( t^{th} \) month
\( P_{i,t-1} \) is the price in \( i^{th} \) market in \( t-1^{th} \) month

\[
\sum_{n=0}^{\infty} \beta_n = \beta_0 \frac{1}{1 - \lambda}
\]

\[
P_{it} = \alpha + \beta_0 P_{jt} + \beta_1 \lambda P_{jt-1} + \mu_i
\]

\[
P_{it} = \alpha + \beta_0 P_{jt} + \beta_1 \lambda P_{jt-1} + v_i
\]

\[
P_{it} = \alpha + \beta_0 P_{jt} + \lambda P_{jt-1} + v_i
\]

\[
P_{i,t-1} = \alpha + \beta_0 P_{jt} + \lambda P_{jt-1} + v_i
\]

\[
\sum_{n=0}^{\infty} \beta_n = \beta_0 \frac{1}{1 - \lambda}
\]

\[
P_{it} = \alpha + \beta_0 P_{jt} + \lambda P_{jt-1} + v_i
\]

\[
P_{it} = \alpha + \beta_0 P_{jt} + \lambda P_{jt-1} + v_i
\]

\[
P_{it} = \alpha + \beta_0 P_{jt} + \lambda P_{jt-1} + v_i
\]
$P_t$ is the price of the $j$th commodity on $t$th day.

The $\beta$ gives the short run price adjustment corresponding to a unit change in $j$th market price. The long-run adjustment is measured through equation $\beta_k = \frac{\beta_0}{(1-\lambda)}$. Similarly, the number of days required to realize 90 per cent adjustment was estimated by

$$N = \frac{\ln [0.9 \beta_k (\lambda-1)+1]}{\ln \lambda} \times 30$$

Where $N$ is the number of days required to realize the 90 per cent long-term adjustments.

The equation 3 was estimated by ordinary least square method.
IV. RESULTS

This chapter presents results in line with the objectives of the study under following headings.

4.1 Trend in arrivals and prices of major agricultural commodities in selected markets
4.2 Seasonal and cyclical pattern of arrivals and prices
4.3 Degree of association between arrivals and prices
4.4 Extent of market integration among the selected markets
4.5 Appropriate policy measures

4.1 Trend in arrivals and prices of major agricultural commodities in selected markets

4.1.1 Trend in arrivals of potato

To assess the trends in arrivals potato in the selected markets, the data over the period from 1994-95 to 2004-05 was considered. The results obtained using cubic function are presented in Table 4.1

Table 4.1 : Trend in arrivals of potato in selected markets

It could be seen from the table that in the initial years potato arrivals was increasing and in the mid period it started decreasing while in the later period the arrivals again increased except Srinivaspur, where arrivals was decreasing significantly in the initial period and in the mid period it started increasing significantly while in the later period the arrivals again decreasing significantly and it found to be significant at 5 per cent level.

4.1.2. Trend in prices of potato

From the Table 4.2 it is clear that an increasing prices in the initial period followed by decreasing prices in the later period. Increasing price trend was found in case of Bangalore and Chintamani. Chikkaballapur and Srinivaspur showed exactly reverse of the above where in the initial periods prices was decreasing and in the mid period it started increasing while in the later period the prices was decreasing. Kolar showed increasing trend in initial period later it found to be decreasing.

Table 4.2 : Trend in prices of potato in selected markets

4.1.3. Trend in arrivals of onion

It could be seen from the Table 4.3 that Chintamani and Kolar showed increasing arrivals of onion in the initial years followed by decreasing arrivals in the mid period and again increasing arrivals was found in the later period. Bangalore noticed increasing and significant trend in arrivals in mid period but it found decreasing trend in initial and later period. Chikkaballapur noticed increasing trend in arrivals in initial and later period but it found decreasing in the mid period. In case of Kolar increasing and significant trend in arrivals of onion was found during initial and later periods, but it was decreasing and significant in mid period.

Table 4.3 : Trend in arrivals of onion in selected markets

4.1.4 Trend in prices of onion

From the Table 4.4 it is clear that all the market have shown increasing trend in initial and later periods. Increasing and significant trend in prices of onion in initial period was found in Kolar and it was in later period at Bangalore market. Decreasing trend in arrivals was noticed in mid period in all the markets.

Table 4.4 : Trend in prices of onion in selected markets
Table 4.1: Trend in arrivals of potato in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>$T^2$</th>
<th>$T^3$</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>122344.2</td>
<td>32860.3</td>
<td>-4528.1</td>
<td>194.94</td>
<td>0.060</td>
<td>0.15</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>-3829.7</td>
<td>5030.15</td>
<td>-622.25</td>
<td>19.831</td>
<td>.650</td>
<td>4.34</td>
</tr>
<tr>
<td>Chintamani</td>
<td>-871.94</td>
<td>2149.9</td>
<td>-243.44</td>
<td>7.0510</td>
<td>0.879</td>
<td>17</td>
</tr>
<tr>
<td>Kolar</td>
<td>-1073.3</td>
<td>3889.2</td>
<td>-431.29</td>
<td>11.3372</td>
<td>0.60</td>
<td>3.46</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>594.08</td>
<td>-126.07**</td>
<td>41.76**</td>
<td>-2.68**</td>
<td>0.369</td>
<td>1.36</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error
Table 4.2: Trend in prices of potato in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T²</th>
<th>T³</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>153.83</td>
<td>147.192</td>
<td>-23.612</td>
<td>1.2411</td>
<td>0.272</td>
<td>0.87</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>310.24</td>
<td>-22.93</td>
<td>9.47</td>
<td>-0.5686</td>
<td>0.456</td>
<td>1.96</td>
</tr>
<tr>
<td>Chintamani</td>
<td>207.24</td>
<td>93.49</td>
<td>-11.41</td>
<td>0.4398</td>
<td>0.153</td>
<td>0.42</td>
</tr>
<tr>
<td>Kolar</td>
<td>231.39</td>
<td>46.31</td>
<td>-2.19</td>
<td>-0.306</td>
<td>0.276</td>
<td>0.89</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>503.28</td>
<td>-189.56</td>
<td>40.91</td>
<td>-2.203</td>
<td>0.783</td>
<td>8.44</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error.
### Table 4.3: Trend in arrivals of onion in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T²</th>
<th>T³</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>234306</td>
<td>-39787</td>
<td>12334.6**</td>
<td>-652.35</td>
<td>0.538</td>
<td>2.72</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>-3450.2</td>
<td>3331.65</td>
<td>-493.45</td>
<td>20.37</td>
<td>0.663</td>
<td>4.60</td>
</tr>
<tr>
<td>Chintamani</td>
<td>580.36</td>
<td>290.13</td>
<td>-37.34</td>
<td>2.09</td>
<td>0.309</td>
<td>1.04</td>
</tr>
<tr>
<td>Kolar</td>
<td>151.97</td>
<td>210.12*</td>
<td>-50.64**</td>
<td>3.095**</td>
<td>0.652</td>
<td>4.37</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>434.80</td>
<td>-113.58</td>
<td>35.11</td>
<td>-2.68</td>
<td>0.980</td>
<td>12.23</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%
** Significant @ 5%
*** Significant @ 10%
NS - Non significant
Figures in the parenthesis indicates standard error
### Table 4.4: Trend in prices of onion in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T²</th>
<th>T³</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>-334.50</td>
<td>627.53</td>
<td>-110.43*</td>
<td>5.493*</td>
<td>0.435</td>
<td>1.80</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>335.78</td>
<td>45.55</td>
<td>-8.735</td>
<td>0.4862</td>
<td>0.011</td>
<td>0.03</td>
</tr>
<tr>
<td>Chintamani</td>
<td>100.03</td>
<td>208.76</td>
<td>-39.275</td>
<td>2.09</td>
<td>0.142</td>
<td>0.38</td>
</tr>
<tr>
<td>Kolar</td>
<td>629.66</td>
<td>270.96*</td>
<td>-48.32**</td>
<td>2.7487</td>
<td>0.772</td>
<td>7.90</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>306.76</td>
<td>0.7844</td>
<td>-0.236</td>
<td>0.1285</td>
<td>0.475</td>
<td>2.11</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error
## Table 4.5: Trend in arrivals of ragi in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T²</th>
<th>T³</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>14907.2</td>
<td>-383.87</td>
<td>366.20</td>
<td>-33.85</td>
<td>0.858</td>
<td>14.07</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>200.65</td>
<td>9.42***</td>
<td>-2.133</td>
<td>0.069</td>
<td>0.182</td>
<td>0.52</td>
</tr>
<tr>
<td>Chintamani</td>
<td>-789.1</td>
<td>1012.94</td>
<td>-168.97</td>
<td>8.399</td>
<td>0.435</td>
<td>1.79</td>
</tr>
<tr>
<td>Kolar</td>
<td>-151.75</td>
<td>299.65</td>
<td>-26.01</td>
<td>0.330</td>
<td>0.218</td>
<td>0.65</td>
</tr>
<tr>
<td>Srinivasapur</td>
<td>37.81</td>
<td>-20.91</td>
<td>5.045</td>
<td>-2.877</td>
<td>0.44</td>
<td>1.86</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error
4.1.5. Trend in arrivals of ragi

Table 4.5 witness the increasing trend in arrivals of ragi in initial and later period in case of Chikkaballapur, Chintamani and Kolar while decreasing trend was noticed during mid period. Increasing and significant trend in arrivals was found in initial period in case of Chikkaballapur.

Table 4.5 : Trend in arrivals of ragi in selected markets

4.1.6 Trend in prices of ragi

Table 4.6 noticed an increasing trend in prices of ragi in initial and later period with respective Bangalore, Chikkaballapur and Srinivaspur. It was decreasing trend in mid period in the above said markets. Chintamani was noticed decreasing trend in prices during initial period but it was increasing in mid and later periods. Kolar witnessed and an increasing and significant trend in prices during initial and later periods. But it was decreasing and significant in the mid period.

Table 4.6 : Trend in prices of ragi in selected markets

4.1.7 Trend in arrivals of groundnut

It could be seen from Table 4.7 that Bangalore and Chintamani markets have shown decrease in trend of arrivals and it was found increasing and significant trend during mid period. Chikkaballapur, Kolar and Srinivaspur showed increasing trend in the arrivals in the initial and later periods but it was decreasing in the mid period in the above mentioned markets significant and increasing trend in arrivals was noticed in initial period at Kolar and Srinivaspur markets.

Table 4.7: Trend in arrivals of groundnut in selected markets

4.1.8 Trend in prices of groundnut

From the Table 4.8 it is evident that all the market have shown increasing trend in prices during mid and later periods and decreasing trend in prices was noticed during mid period. Significant and increasing trend was noticed in Bangalore market in the later periods. It was increasing and significant in Chikkaballapur during mid period. A significant and decreasing trend was noticed in the mid periods in case of Chikkaballapur.

Table 4.8: Trend in prices of groundnut in selected markets
### Table 4.6: Trend in prices of ragi in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T²</th>
<th>T³</th>
<th>R² square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>285.27</td>
<td>94.56</td>
<td>-14.13</td>
<td>0.756</td>
<td>0.669</td>
<td>4.72</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>235.41</td>
<td>73.9</td>
<td>-10.267</td>
<td>0.5246</td>
<td>0.627</td>
<td>3.92</td>
</tr>
<tr>
<td>Chintamani</td>
<td>339.83</td>
<td>-25.94</td>
<td>7.713</td>
<td>0.366</td>
<td>0.85</td>
<td>13.18</td>
</tr>
<tr>
<td>Kolar</td>
<td>262.32</td>
<td>64.67***</td>
<td>-7.623**</td>
<td>0.3799**</td>
<td>0.793</td>
<td>8.95</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>270.79</td>
<td>54.66</td>
<td>-5.44</td>
<td>0.250</td>
<td>0.931</td>
<td>31.37</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error
Table 4.7: Trend in arrivals of groundnut in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T^2</th>
<th>T^3</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>1971.81</td>
<td>-1402.6</td>
<td>390.721*</td>
<td>-23.78*</td>
<td>0.736</td>
<td>6.51</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>280.71</td>
<td>96.55</td>
<td>-18.59</td>
<td>0.8868</td>
<td>0.219</td>
<td>0.65</td>
</tr>
<tr>
<td>Chintamani</td>
<td>465.01</td>
<td>-150.7</td>
<td>43.13</td>
<td>-2.381</td>
<td>0.816</td>
<td>10.38</td>
</tr>
<tr>
<td>Kolar</td>
<td>151.973</td>
<td>210.12**</td>
<td>-50.64*</td>
<td>3.095**</td>
<td>0.652</td>
<td>4.37</td>
</tr>
<tr>
<td>Srinivasapur</td>
<td>5.4773</td>
<td>301.39**</td>
<td>-58.60</td>
<td>3.061</td>
<td>0.644**</td>
<td>4.22</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error
### Table 4.8: Trend in prices of groundnut in selected markets

<table>
<thead>
<tr>
<th>Markets</th>
<th>Intercept</th>
<th>T</th>
<th>T²</th>
<th>T³</th>
<th>R square</th>
<th>F value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>795.57</td>
<td>45.76</td>
<td>-23.13</td>
<td>2.272**</td>
<td>0.95</td>
<td>43.89</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>758.11</td>
<td>128.41**</td>
<td>-16.15***</td>
<td>0.894</td>
<td>0.829</td>
<td>11.31</td>
</tr>
<tr>
<td>Chintamani</td>
<td>682.82</td>
<td>183.82</td>
<td>-25.09</td>
<td>1.33</td>
<td>0.906</td>
<td>22.36</td>
</tr>
<tr>
<td>Kolar</td>
<td>629.66</td>
<td>270.96</td>
<td>-48.32</td>
<td>2.748</td>
<td>0.772</td>
<td>7.9</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td>780.85</td>
<td>126.17</td>
<td>-18.13</td>
<td>1.046</td>
<td>0.847</td>
<td>12.91</td>
</tr>
</tbody>
</table>

Note: * Significant @ 1%  
** Significant @ 5%  
*** Significant @ 10%  
NS - Non significant  
Figures in the parenthesis indicates standard error
4.2 Seasonal and cyclical pattern of arrivals and prices

The seasonal and cyclical pattern of arrivals and prices are presented in Table 4.9 to 4.16 and Fig. 4.1 to 4.40.

Fig. 4.1: Seasonal variations in arrivals and prices of potato in Bangalore market
Fig. 4.2: Seasonal variations in arrivals and prices of potato in Chikkaballapur market
Fig. 4.3: Seasonal variations in arrivals and prices of potato in Chintamani market
Fig. 4.4: Seasonal variations in arrivals and prices of potato in Kolar market
Fig. 4.5: Seasonal variations in arrivals and prices of potato in Srinivaspur market
Fig. 4.6: Seasonal variations in arrivals and prices of onion in Bangalore market
Fig. 4.7: Seasonal variations in arrivals and prices of onion in Chikkaballapur market
Fig. 4.8: Seasonal variations in arrivals and prices of onion in Chintamani market
Fig. 4.9: Seasonal variations in arrivals and prices of onion in Kolar market
Fig. 4.10: Seasonal variations in arrivals and prices of onion in Srinivaspur market
Fig. 4.11: Seasonal variations in arrivals and prices of ragi in Bangalore market
Fig. 4.12: Seasonal variations in arrivals and prices of ragi in Chikkaballapur market
Fig. 4.13: Seasonal variations in arrivals and prices of ragi in Chintamani market
Fig. 4.14: Seasonal variations in arrivals and prices of ragi in Kolar market
Fig. 4.15: Seasonal variations in arrivals and prices of ragi in Srinivaspur market
Fig. 4.16: Seasonal variations in arrivals and prices of groundnut in Bangalore market
Fig. 4.17: Seasonal variations in arrivals and prices of groundnut in Chikkaballapur market
Fig. 4.18: Seasonal variations in arrivals and prices of groundnut in Chintamani market
Fig. 4.19: Seasonal variations in arrivals and prices of groundnut in Kolar market
Fig. 4.20: Seasonal variations in arrivals and prices of groundnut in Srinivaspur market
Fig. 4.21: Cyclical variations in arrivals and prices of potato in Bangalore market
Fig. 4.22: Cyclical variations in arrivals and prices of potato in Chikkaballapur market
Fig. 4.23: Cyclical variations in arrivals and prices of potato in Chintamani market
Fig. 4.24: Cyclical variations in arrivals and prices of potato in Kolar market
Fig. 4.25: Cyclical variations in arrivals and prices of potato in Srinivaspur market
Fig. 4.26: Cyclical variations in arrivals and prices of onion in Bangalore market
Fig. 4.27: Cyclical variations in arrivals and prices of onion in Chikkaballapur market
Fig. 4.28: Cyclical variations in arrivals and prices of onion in Chintamani market
Fig. 4.29: Cyclical variations in arrivals and prices of onion in Kolar market
Fig. 4.30: Cyclical variations in arrivals and prices of onion in Srinivaspur market
Fig. 4.31: Cyclical variations in arrivals and prices of ragi in Bangalore market
Fig. 4.32: Cyclical variations in arrivals and prices of ragi in Chikkaballapur market
Fig. 4.33: Cyclical variations in arrivals and prices of ragi in Chintamani market
Fig. 4.34: Cyclical variations in arrivals and prices of ragi in Kolar market
Fig. 4.35: Cyclical variations in arrivals and prices of ragi in Srinivaspur market
Fig. 4.36: Cyclical variations in arrivals and prices of groundnut in Bangalore market
Fig. 4.37: Cyclical variations in arrivals and prices of groundnut in Chikkaballapur market
Fig. 4.38: Cyclical variations in arrivals and prices of groundnut in Chintamani market
Fig. 4.39: Cyclical variations in arrivals and prices of groundnut in Kolar market
Fig. 4.40: Cyclical variations in arrivals and prices of groundnut in Srinivaspur market

4.2.1 Seasonal pattern of arrivals and prices of selected agricultural commodities

Table 4.9 to 4.12 and Fig. 4.1 to 4.20 presents the seasonal pattern of arrivals and prices of selected agricultural commodities. Monthly seasonal indices were calculated in order to know the long run seasonal variations in arrivals and prices.
4.2.1.1 Seasonal pattern of arrivals of Potato

The seasonal indices of market arrivals of potato in the selected markets are present in Table 4.9. Monthly seasonal indices were calculated in order to ascertain the long run seasonal variations in arrivals and prices of potato. The results revealed the existence of seasonality in all the markets. Arrivals reached peak during October (264.77) in Bangalore which decrease to 67.94 in November and relatively shoot up in March. In Chikkaballapur market the peak was found in March (368.96) followed by February (346.81). Chintamani market showed lowest arrivals in August (32.34) while it peaked during March (292.54). Kolar market witnessed the lowest arrivals in October (18.43) and highest during March (465.89). Arrivals reached a peak during February (278.80) in Srinivaspur market while they were the lowest in June (22.65). Successive peaks were observed in the selected markets viz., Chintamani, Chikkaballapur and Srinivaspur except Bangalore and Kolar.

The arrivals were found to be prominent in the months of September, October and March in Bangalore market. Chikkaballapur market noticed relatively higher arrivals during January, February and March. Chintamani market witnessed rush in arrivals of potato during January, February, March, April and May months. Kolar market showed relatively higher arrivals in the months of January, February, March and April. High arrivals observed during December to March in Srinivaspur market.

4.2.1.2 Seasonal pattern in prices of potato

The seasonal indices of prices of potato are presented in Table 4.9. The pattern of market prices showed slight differences among the selected markets. The price index in Bangalore market was the highest in the month of June (124.14) and relatively higher during the months of May, July, October and November. Chikkaballapur market witnessed peak price during June and relatively higher prices during the months of July, August, October and November. The indices in other months varied from 67.54 to 102.62.

A peak of 129.03 in index was observed during February in Chintamani market followed by August (118.25) and July (114.11). However, the price index of other months was between 64.68 to 110.30 Kolar market witnessed highest price index of 123.43 in November month. Majority of the months have price index between 110.12 to 119.53 and lower price index was noticed in February (67.33).

The market prices of potato in Srinivaspur found to be the highest in October (117.81). The lowest index was seen in March (87.21). In other months price index was between 87.81 to 112.97.

4.2.1.3 Seasonal pattern in arrivals of onion

Table 4.10 presents the seasonal indices in arrivals of onion. The result clearly indicates the existence of seasonality in arrivals of onion in all the markets.

Highest arrivals of onion in Bangalore market was observed during October month (170.23) and the second highest was observed during November (158.61) which decreased to 127.73 in December. Arrivals was between 58.14 to 121.08 during other months.

The higher market arrival indices in Chikkaballapur were observed (more than 100) during the months of December to April and highest was observed in March (242.16). In the remaining months it was between 33.20 to 87.43.

Arrivals reached peak during July (146.10) in Chintamani market and decreased to 136.62 in June. The higher market arrival indices were observed (more than 100) in the months of June, January, February and March lower arrival indices was found during September (61.00).
Table 4.9: Seasonal indices in arrivals and prices of potato (1994-95 to 2004-05)

<table>
<thead>
<tr>
<th>Months</th>
<th>Bangalore</th>
<th>Chikkaballapur</th>
<th>Chintamani</th>
<th>Kolar</th>
<th>Srinivasapur</th>
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<td>20.56</td>
<td>118.59</td>
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<tr>
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<td>Kolar</td>
<td>Srinivasapur</td>
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<td>Arrivals</td>
<td>Prices</td>
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</tr>
<tr>
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<td>29.49</td>
<td>110.46</td>
<td>89.11</td>
</tr>
<tr>
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<tr>
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<td>123.67</td>
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<td>106.80</td>
<td>105.40</td>
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<td>109.86</td>
<td>87.93</td>
<td>115.02</td>
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<tr>
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<td>200.28</td>
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<td>72.03</td>
<td>242.16</td>
<td>75.40</td>
<td>101.79</td>
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</table>
Kolar market reached highest market arrivals during March (330.04) and was decreased to 174.76 in April. The arrival indices range between 49.13 to 100.39 in the other months.

Srinivasapur witnessed higher arrival indices (more than 100) during the months of April to July and highest was observed in June (226.53). Lower arrival indices was observed in February (35.33).

### 4.2.1.4 Seasonal indices in prices of onion

Seasonal pattern in prices of onion is presented in Table 4.10. Similarly in the prices of onion among the selected markets was observed during June and July when compared to other months where the variation was observed.

The price indices in Bangalore market showed highest price (more than 100) during the months of August to January. The highest was observed in September (124.54). The lowest price index was observed during April month (65.80).

Chikkaballapur market witnessed peakness in price index during August. Prices remained stable from September to November. Lower price index was noticed in the month of March (75.40).

Prices of onion reached highest i.e., 125.38 in Chintamani during September and is decreased to 120.82 in the month of October. Lower price index was observed during May (83.67).

The increased price index of 118.12 was observed in September at Kolar market. Variation in the prices was minimum from October to December. 85.40 was the lowest price index noticed during April.

### 4.2.1.5 Seasonal indices in arrivals of Ragi

Seasonal pattern in arrivals of Ragi is presented in Table 4.11 variations with respect to arrivals between the selected markets was observed. Arrivals of ragi in Bangalore market was maximum in September (151.83). Gradual increase in the arrivals was noticed from April to August (106.75 to 129.43). Minimum arrivals was observed during January (44.85).

Arrivals reached peak during March (182.74) in Chikkaballapur. Gradual rise in the prices from October to March (73.25 to 182.74) was noticed . Arrivals was minimum during September (37.89).

Chintamani witnessed higher arrival indices of 131.03 in July. The arrivals was between 77.76 to 127.92 during other months. Kolar noticed higher arrival indices of 167.75 during august month. There was increased trend in arrivals from October (89.79) to March (137.95) was observed. Srinivasapur market reached peak during June (168.92). There was an irregular fall and rise of arrivals was noticed in Srinivasapur market.

### 4.2.1.6 Seasonal indices of prices of ragi

Table 4.11 depicts the prices of ragi in the selected markets. There was a stability in the prices of ragi was observed in all the markets with small fluctuations. Bangalore market showed higher price indices during September (105.90). Stability in the price indices was observed over the months with slight variations. Least price indices was observed in April, month (95.03).

Higher price indices of 106.39 during November month was observed in Chikkaballapur market and the lowest was in June month (97.24). The price indices was stable in case of Chintamani market with least fluctuations ranging from 93.73 to 105.04. Same as the case with Kolar market and Srinivaspur.

### 4.2.1.7 Seasonal indices of arrivals of groundnut

Seasonal indices of arrivals of groundnut is depicted in the Table 4.12. Bangalore market witnessed higher arrivals during October (250.77) and the lower arrival indices was
observed during April month (25.74). Arrival indices was more than 100 in the months of September, November, December and January. Chikkaballapur witnessed highest arrivals during March (208.37) and it was lowest in July month (48.55). Arrival indices in Chintamani market was more than 100 during the months of November to March. Higher arrival indices of 216.86 was observed during December month in and it was least in April (27.30).

Arrivals reached peak during December (227.91) in Kolar market and was least during April (26.64). During the months from October to February showed arrival indices of more than 100.

It was observed in the Srinivaspur market that the arrivals was maximum during September (172.72). Arrival indices was more than 100 during the months from September to January and in March. Lower indices was seen during April month (37.94).

### 4.2.1.8 Seasonal indices in prices of groundnut

Table 4.12 presents the seasonal indices of groundnut in the selected markets. Price index remained stable in all the markets with least variations.

Bangalore market witnessed higher price indices of 104.34 during August month. Price indices was more than 100 in the months of May, August, September, October, December , February and March. Lower indices was observed during January (90.30).

Price indices reached maximum during June months (108.87) in Chikkaballapur market and it was least in the month of October (92.80). Price indices was between 97.72 to 106.17 in other months.

Price indices was higher during June (106.71) and July (106.43) in Chintamani market. It was more or less remained same from August (99.39) to March (96.06) with least variations. Lower price indices was observed during October month (95.86).

Kolar witnessed higher price indices during March (106.31) and is decreased to 102.78 in April month. Least price indices was observed during October month (91.25). The price indices was between 95.73 to 104.52 in other months.

Price indices of groundnut in Srinivaspur market was ranging between 94.14 to 110.15 and maximum was noticed during July 110.15 and least was during November 94.14. Price indices was more than 100 during April, June, July and August.
Table 4.11: Seasonal indices in arrivals and prices of ragi (1994-95 to 2004-05)

<table>
<thead>
<tr>
<th>Months</th>
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<td>Prices</td>
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Table 4.12: Seasonal indices in arrivals and prices of groundnut (1994-95 to 2004-05)

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<th>Chintamani</th>
<th>Kolar</th>
<th>Srinivasapur</th>
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Fig 4.1: Seasonal variations in arrivals and prices of potato in Bangalore market

Fig 4.2: Seasonal variations in arrivals and prices of potato in Chikkaballapur market
**Fig 4.3:** Seasonal variations in arrivals and prices of potato in Chintamani market

**Fig 4.4:** Seasonal variations in arrivals and prices of potato in Kolar market
Fig 4.5: Seasonal variations in arrivals and prices of potato in Srinivasapur market

Fig 4.6: Seasonal variations in arrivals and prices of onion in Bangalore market
Fig 4.7: Seasonal variations in arrivals and prices of onion in Chikkaballapur market

Fig 4.8: Seasonal variations in arrivals and prices of onion in Chintamani market
Seasonal indices in arrivals and prices of onion at Kolar market

Fig 4.9: Seasonal variations in arrivals and prices of onion in Kolar market

Seasonal indices in arrivals and prices of onion in Srinivaspur market

Fig 4.10: Seasonal variations in arrivals and prices of onion in Srinivaspur market
Fig 4.11: Seasonal variations in arrivals and prices of ragi in Bangalore market

Fig 4.12: Seasonal variations in arrivals and prices of ragi in Chikkaballapur market
Fig 4.13: Seasonal variations in arrivals and prices of ragi in Chintamani market

Fig 4.14: Seasonal variations in arrivals and prices of ragi in Kolar market
Fig 4.15: Seasonal variations in arrivals and prices of ragi in Srinivaspur market

Fig 4.16: Seasonal variations in arrivals and prices of groundnut in Bangalore market
Fig 4.17: Seasonal variations in arrivals and prices of groundnut in Chikkaballapur market

Fig 4.18: Seasonal variations in arrivals and prices of groundnut in Chintamani market
Fig 4.19: Seasonal variations in arrivals and prices of groundnut in Kolar market

Fig 4.20: Seasonal variations in arrivals and prices of groundnut in Srinivaspur market
4.2.2. Cyclical variations in the arrivals and prices selected agricultural commodities

Cyclical variation in the arrivals and prices selected agricultural commodities are presented in the Table 4.13 to 4.16 and Fig. 4.21 to 4.40. The pattern of variation in arrivals and prices between the years is revealed by cyclical indices computed for each year. Uneven cycles were found in arrivals and prices of all the commodities in all the markets except in potato arrivals and prices in Chintamani market where five year arrival cycles and six year price cycles were found.

Table 4.13: Cyclical variations in arrivals and prices of potato in selected markets
Table 4.14: Cyclical variations in arrivals and prices of onion in selected markets
Table 4.15: Cyclical variations in arrivals and prices of ragi in selected markets
Table 4.16: Cyclical variations in arrivals and prices of groundnut in selected markets

4.3 Association between arrivals and prices

The results in the Table 4.17 contain the correlation coefficient. This was worked out to understand the long run relationship between prices and arrivals.

Table 4.17: Association between arrivals and prices of selected agricultural commodities at different markets

4.3.1 Association between arrivals and prices of potato

The results obtained using correlation analysis revealed the negative relationship between the arrivals and prices of potato in all the sample markets.

Significant correlation coefficients were found in Chikkaballapur and Kolar markets being – 0.337 and – 0.300, respectively. Negative co-efficient were found in Bangalore, Chintamani and Srinivaspur but were insignificant.

The table highlighted that prices responded moderately with arrivals in Chikkaballapur and Kolar markets.

4.3.2 Association between arrivals and prices of onion

Table 4.17 represents a negative correlation between arrivals and prices of onion in Bangalore (-0.136), Chikkaballapur (-0.250), Chintamani (-0.119) and Kolar (-0.0620) markets. However, positive correlation between arrivals and prices was found in Srinivaspur market with significant result, denoting correlation coefficient of 0.2030.

The table highlighted that price responded moderates with arrivals in Chikkaballapur, compared to other markets.

4.3.3 Association between arrivals and prices of ragi

Correlation coefficient values given in the Table 4.17 revealed negative relation between arrivals and prices of ragi in Bangalore (-0.2330), Chikkaballapur (-0.385), Chintamani (-0.120) and Kolar (-0.0820) markets. Positive significant correlation was found in Srinivaspur market (0.230).

The table highlighted that prices responded moderately with arrivals in Bangalore and Chikkaballapur markets.

4.3.4 Association between arrivals and prices of groundnut

It can be revealed from Table 4.17 that negative correlation was found between arrivals and prices of in Chintamani, Chikkaballapur and Srinivaspur markets. Positive correlation was found in Bangalore and Kolar markets being 0.1140 and 0.300 respectively but was insignificant.

However, correlation was negative and significant in Chintamani (-0.2640) and Srinivaspur (-0.3370) markets.
<table>
<thead>
<tr>
<th>Year</th>
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Fig. 4.21: Cyclical variations in arrivals and prices of potato in Bangalore market

Fig. 4.22: Cyclical variations in arrivals and prices of potato in Chikkaballapur market
Fig. 4.23: Cyclical variations in arrivals and prices of potato in Chintamani market

Fig. 4.24: Cyclical variations in arrivals and prices of potato in Kolar market
Fig. 4.25: Cyclical variations in arrivals and prices of potato in Srinivasapur market

Fig. 4.26: Cyclical variations in arrivals and prices of onion in Bangalore market
Fig. 4.27: Cyclical variations in arrivals and prices of onion in Chikkaballapur market

Fig. 4.28: Cyclical variations in arrivals and prices of onion in Chintamani market
Fig. 4.29: Cyclical variations in arrivals and prices of onion in Kolar market

Fig. 4.30: Cyclical variations in arrivals and prices of onion in Srinivasapur market
Fig. 4.31: Cyclical variations in arrivals and prices of ragi in Bangalore market

Fig. 4.32: Cyclical variations in arrivals and prices of ragi in Chikkaballapur market
Fig. 4.33: Cyclical variations in arrivals and prices of ragi in Chintamani market

Fig. 4.34: Cyclical variations in arrivals and prices of ragi in Kolar market
Fig. 4.35: Cyclical variations in arrivals and prices of ragi in Srinivasapur market

Fig. 4.36: Cyclical variations in arrivals and prices of groundnut in Bangalore market
Fig. 4.37: Cyclical variations in arrivals and prices of groundnut in Chikkaballapur market

Fig. 4.38: Cyclical variations in arrivals and prices of groundnut in Chintamani market
Fig. 4.39: Cyclical variations in arrivals and prices of groundnut in Kolar market

Fig. 4.40: Cyclical variations in arrivals and prices of groundnut in Srinivasapur market
Table 4.17: Association between arrivals and prices of selected agricultural commodities at different markets

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<tr>
<td>Groundnut</td>
<td>0.1140</td>
<td>0.1930</td>
<td>0.2640**</td>
<td>0.0020</td>
<td>-0.0030</td>
<td>0.9700</td>
<td>0.3000</td>
<td>0.7360</td>
<td>-0.3370**</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** * Correlation is Significant at 0.05 Level (2 tailed)
** Correlation is Significant at 0.01 Level (2 tailed)
Table 4.18: Distributed lag results of integration of potato prices

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Explanatory Variable</th>
<th>$\alpha$</th>
<th>$\beta$</th>
<th>t-value</th>
<th>$\lambda$ t-value</th>
<th>$R^2$</th>
<th>DW</th>
<th>SR</th>
<th>LR</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chikaballapur</td>
<td></td>
<td>56.109</td>
<td>-0.00416</td>
<td>-0.119</td>
<td>0.854</td>
<td>17.914***</td>
<td>0.728</td>
<td>1.950</td>
<td>-0.00416</td>
<td>-0.0284</td>
</tr>
<tr>
<td>Chintamani</td>
<td>Bangalore</td>
<td>67.685</td>
<td>0.350</td>
<td>6.434***</td>
<td>0.419</td>
<td>5.919***</td>
<td>0.630</td>
<td>2.003</td>
<td>0.350</td>
<td>0.603</td>
</tr>
<tr>
<td>Kolar</td>
<td></td>
<td>45.665</td>
<td>0.458</td>
<td>7.256**</td>
<td>0.373</td>
<td>5.247***</td>
<td>0.671</td>
<td>1.500</td>
<td>0.458</td>
<td>0.7304</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td></td>
<td>237.54</td>
<td>0.384</td>
<td>2.840</td>
<td>0.0259</td>
<td>0.291</td>
<td>0.069</td>
<td>2.005</td>
<td>0.384</td>
<td>0.3942</td>
</tr>
</tbody>
</table>

Note: *** Significant at 10%, ** Significant at 5%, * Significant at 1%

$\alpha$, $\beta$ Co-efficients

$\lambda$, $\lambda$ Durbin Watson value

SR: Short run adjustments
LR: Long run adjustments
N: Number of days taken to realize 90% long run adjustments
4.4 Spatial integration prices of selected agricultural commodities

In order to ascertain the integration of markets with respect to prices of selected agricultural commodities, distributed log model was employed. The time taken to reflect the Bangalore market price with each market for every commodity was worked out. They are presented in the Table 4.18 to 4.21.

Table 4.18 : Distributed lag results of integration of potato prices
Table 4.19: Distributed lag results of integration of onion prices
Table 4.20: Distributed lag results of integration of ragi prices
Table 4.21: Distributed lag results of integration of groundnut prices

4.4.1 Spatial integration of the prices of potato

Koyck’s distributed log model was used to test market integration of potato. The Table 4.18 presents the price adjustments between the prices of potato in different markets. Durbin Watson ‘d’ statistics estimated for each market and it was between 1.508 to 2.005. R² value ranged between 0.49 to 0.728. Short run and long run adjustment co-efficients and the average number of days required to reflect Bangalore market prices of potato was lowest in Chikkaballapur market (0.7224 days) followed by Srinivaspur (3.482 days), Chintamani (13.03 days) and Kolar (16.18 days).

4.4.2 Spatial integrated of price of onion

Table 4.19 represents the distributed lag results of prices of onion. From the table it is revealed that the Durbin Watson’d’ statistic values were between 1.173 to 1.904 and R² value was ranged from 0.278 to 0.635. Short run and long run price adjustment and number of days required to realize 90 per cent of long run adjustment was studied. Chikkaballapur took only 1.338 days to reflect the price of Bangalore market followed by Chintamani (4.384 days), Kolar (7.452 days) and Srinivaspur (7.93 days).

4.4.3 Spatial integration of prices of ragi

Koyck’s distributed lag values for price integration of ragi shown in Table 4.20. Durbin Watson values were ranged between 2.241 to 2.362. Short run and long run price adjustments co-efficient were worked out and number of days to realize the 90 per cent of the long run price adjustment. The results indicated that the Kolar took minimum number of days to reflect Bangalore market prices i.e. 8.339 days followed by Chikkaballapur (12.45 days), Chintamani (14.37 days) and Srinivaspur (15.85 days).

4.4.4 Spatial integration of the prices of groundnut

Table 4.21 presents the distributed lag results of price integration of groundnut. The Durbin Watson ‘d’ statistic values were ranged between 2.296 to 2.456. R² value was between 0.505 to 0.692 short run and long run price adjustment co-efficients and number of days required to realize 90 per cent of the long run price adjustment was carried out. Kolar witnessed a less number of days i.e. 5.276 days to reflect the Bangalore market prices followed by Chikkaballapur (5.88 days), Chintamani (10.334 days) and Srinivaspur (16.017 days).
### Table 4.19: Distributed lag results of integration of onion prices

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Dependent Variable</th>
<th>$\alpha$</th>
<th>$\beta$</th>
<th>t-value</th>
<th>$\lambda$</th>
<th>t-value</th>
<th>$R^2$</th>
<th>DW</th>
<th>SR</th>
<th>LR</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chikkaballapur</td>
<td>Bangalore</td>
<td>66.898</td>
<td>0.0117</td>
<td>0.839***</td>
<td>0.789</td>
<td>17.914***</td>
<td>0.728</td>
<td>1.825</td>
<td>0.0117</td>
<td>0.0554</td>
<td>1.338</td>
</tr>
<tr>
<td>Chintamani</td>
<td></td>
<td>159.73</td>
<td>0.158</td>
<td>2.991***</td>
<td>0.351</td>
<td>0.291</td>
<td>0.069</td>
<td>1.189</td>
<td>0.158</td>
<td>0.243</td>
<td>4.384</td>
</tr>
<tr>
<td>Kolar</td>
<td></td>
<td>116.56</td>
<td>0.142</td>
<td>3.272***</td>
<td>0.577</td>
<td>5.247***</td>
<td>0.671</td>
<td>1.730</td>
<td>0.142</td>
<td>0.3356</td>
<td>7.452</td>
</tr>
<tr>
<td>Srinivasapur</td>
<td></td>
<td>83.664</td>
<td>0.134</td>
<td>3.610***</td>
<td>0.615</td>
<td>5.919***</td>
<td>0.630</td>
<td>1.904</td>
<td>0.134</td>
<td>0.348</td>
<td>7.93</td>
</tr>
</tbody>
</table>

Note: *** Significant at 1%, ** Significant at 5%, * Significant at 10%

- $\alpha$: Co-efficients
- $\beta$: Co-efficients
- $\lambda$: Co-efficients
- DW: Durbin Watson value
- SR: Short run adjustments
- LR: Long run adjustments
- N: Number of days taken to realize 90% long run adjustments
### Table 4.20: Distributed lag results of integration of ragi prices

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Dependent Variable</th>
<th>α</th>
<th>β</th>
<th>t-value</th>
<th>λ</th>
<th>t-value</th>
<th>R²</th>
<th>DW</th>
<th>SR</th>
<th>LR</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chikabalapur</td>
<td>Bangalore</td>
<td>70.87</td>
<td>0.331</td>
<td>4.250***</td>
<td>0.427</td>
<td>5.285</td>
<td>0.479</td>
<td>2.241</td>
<td>0.331</td>
<td>0.577</td>
<td>12.45</td>
</tr>
<tr>
<td>Chintamani</td>
<td></td>
<td>34.425</td>
<td>0.223</td>
<td>3.455</td>
<td>0.626</td>
<td>8.675**</td>
<td>0.686</td>
<td>2.273</td>
<td>0.223</td>
<td>0.596</td>
<td>14.37</td>
</tr>
<tr>
<td>Kolar</td>
<td></td>
<td>23.26</td>
<td>0.275</td>
<td>4.337***</td>
<td>0.640</td>
<td>9.077***</td>
<td>0.821</td>
<td>2.362</td>
<td>0.275</td>
<td>0.7638</td>
<td>8.339</td>
</tr>
<tr>
<td>Srinivasapur</td>
<td></td>
<td>19.16</td>
<td>0.0918</td>
<td>2.542**</td>
<td>0.851</td>
<td>18.072**</td>
<td>0.892</td>
<td>2.317</td>
<td>0.0918</td>
<td>0.616</td>
<td>15.85</td>
</tr>
</tbody>
</table>

Note: *** Significant at 10%, ** Significant at 5%, * Significant at 1%

- α: Co-efficients
- β: Co-efficients
- DW: Durbin Watson value
- SR: Short run adjustments
- LR: Long run adjustments
- N: Number of days taken to realize 90 % long run adjustment
Table 4.21: Distributed lag results of integration of groundnut prices

Note: *** Significant at 10%, ** Significant at 5%, * Significant at 1%

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Dependent Variable</th>
<th>$\alpha$</th>
<th>$\beta$</th>
<th>t-value</th>
<th>$\lambda$</th>
<th>t-value</th>
<th>$R^2$</th>
<th>DW</th>
<th>SR</th>
<th>LR</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chikkaballapur</td>
<td></td>
<td>287.92</td>
<td>0.0739</td>
<td>1.516</td>
<td>0.688</td>
<td>10.367***</td>
<td>0.538</td>
<td>2.290</td>
<td>0.0739</td>
<td>0.2368</td>
<td>5.8812</td>
</tr>
<tr>
<td>Chintamani</td>
<td>Bangalore</td>
<td>189.30</td>
<td>0.103</td>
<td>2.651</td>
<td>0.754</td>
<td>13.59***</td>
<td>0.692</td>
<td>2.291</td>
<td>0.103</td>
<td>0.4186</td>
<td>10.33</td>
</tr>
<tr>
<td>Kolar</td>
<td></td>
<td>327.15</td>
<td>0.0848</td>
<td>1.875*</td>
<td>0.637</td>
<td>9.476</td>
<td>0.506</td>
<td>2.421</td>
<td>0.0848</td>
<td>0.2336</td>
<td>5.276</td>
</tr>
<tr>
<td>Srinivaspur</td>
<td></td>
<td>315.02</td>
<td>0.0779</td>
<td>1.821*</td>
<td>0.654</td>
<td>9.549</td>
<td>0.505</td>
<td>2.423</td>
<td>0.0779</td>
<td>0.6514</td>
<td>16.01</td>
</tr>
</tbody>
</table>

$\alpha$: Co-efficients
$\beta$: Co-efficients
$\lambda$: Durbin Watson value
SR: Short run adjustments
LR: Long run adjustments
N: Number of days taken to realize 90% Long run adjustments
V. DISCUSSION

The findings of the study which were presented in the previous chapter are discussed in this chapter under the major headings to arrive at a meaningful interpretation of the findings.

5.1 Trend in arrivals and prices of major agricultural commodities in selected markets
5.2 Seasonal and cyclical pattern of arrivals and prices
5.3 Degree of association between arrivals and prices
5.4 Market integration among selected markets of potato
5.5 Policy measures for better integration among the market.

5.1 Trend in arrivals and prices of selected agricultural commodities

Trend in arrivals and prices of selected agricultural commodities are presented in Table 4.1 to 4.8.

5.1.1 Trend in arrivals of potato

From the Table 4.1 it could be seen that increasing trend in arrivals was noticed in all the markets which may be due to increased production of potato in the study area. However mixed trend in arrivals was noticed in all the markets. Srinivaspur noticed a significant and decreasing trend in arrivals of potato which could be because of decrease in area under potato and increase in the area of other competitive crops like tomato hence, the decreased arrivals of potato was noticed in Srinivaspur market.

5.1.2 Trend in prices of potato

Table 4.2 witnesses that the decreased trend in the prices of potato in later period except Bangalore and Chintamani may be because of increased arrivals of potato to these markets which led to decreased demand for potato. However a mixed trend was noticed in all the markets increasing trend in prices of potato to the Bangalore and Chintamani in later period may be because of insufficient supply of potato to these markets and increased consumption.

5.1.3 Trend in arrivals of onion

Trend in arrivals of onion was seen increasing in the later period in chikkaballapur, Chintamani and Kolar (Table 4.3) may be because of improved cultivation practices, use of high yielding verities etc. decreased onion arrivals in Bangalore and in Srinivaspur in later period may be due to shift in production of other crops or increased movements to the other cities.

5.1.4 Trend in prices of onion

From the Table 4.4 it could be noticed that an increased trend in prices in later period may be because of general increase in price level and inflationary measures.

5.1.5 Trend in arrivals of ragi

From the Table 4.5 it could be seen that increased trend in arrivals in ragi in later periods in Chikkaballapur, Chintamani and Kolar which may be because of Kolar district contributes significantly to the production of cereals especially ragi is grown in large area in rainfed conditions. Decreasing trend in arrivals of ragi in Bangalore and Srinivaspur may be because of increased arrivals of other commodities to these market.
5.1.6 Trend in prices of ragi

Table 4.6 clearly explains increasing trend in prices of all the selected markets in the later periods which may be because of increase in general price level accompanied by inflationary trend and also because of increased demand for ragi in study area.

5.1.7 Trend in arrivals of groundnut

From the Table 4.7 it could be seen that an increasing trend in arrivals of groundnut in the later period in Chikkaballapur, Srinivaspur and Kolar may be because of increased production of groundnut due to increased area under production. Decreasing trend in arrivals of groundnut in Bangalore and Chintamani may be because of sale of groundnut at farm level to the traders, village merchants and sale of groundnut in unregulated markets.

5.1.8 Trend in prices of groundnut

From the Table 4.8 it could be concluded that an increasing trend in prices of groundnut in all the markets in the later periods may be because of increased demand from the oil mills of both large and small scale units and also increased demand for groundnut seeds.

5.2 Pattern of arrivals and prices

5.2.1. Seasonal pattern of arrivals and prices of selected agricultural commodities

Seasonal pattern of arrivals and prices of selected agricultural commodities are presented in Table 4.9 to 4.12 and Fig. 4.1 to 4.20.

5.2.1.1 Seasonal pattern of arrivals of potato

Table 4.9 clearly explains the seasonality of market arrivals which is the peculiar feature of any agricultural commodity, where the market arrivals are concentrated in particular months. This is mainly because the farmers rushed their produce immediately after harvest for sale.

The results from 4.9 revealed that seasonality in arrivals existed in all the selected markets. In Bangalore the arrivals reached peak during the months of September and October on account of arrivals of kharif season crop. While the increase in March to April is mainly due to rabi season potato from Kolar and Chikkaballapur region. In Chikkaballapur the peak arrivals was found during March is mainly due to early rabi season potato crop while the second peak was seen during December is due to arrivals of kharif crop from the surrounding districts.

5.2.1.2 Seasonal pattern in prices of potato

The pattern of market arrivals for potato presented in the Table 4.9 revealed differences among the selected markets. In Bangalore and Chikkaballapur market the price index was higher in June and July which corresponds to low arrivals of fresh potato crop in the area. The prices were relatively higher in the months of October, November and December on account of lower arrivals of potato from kharif season crop from within the state and other potato growing regions of the country.

In Chintamani market the highest prices were received during February which corresponds to the higher arrivals of potato which may be due to the inefficient availability of from potatoes in other markets. So that increased demand increases the prices in the market. The lowest price in Chintamani market was noticed during January which may be due to participation of only a few traders during this month. The peak prices during November in Kolar market is due to decreased arrivals of potato which may be because of lack of fresh potato crop from this region. In Srinivaspur market higher price indices were found from June to October which indicated that the early kharif potato crop from Srinivaspur and surrounding areas received high prices as there was low potato arrivals during that period. Lower price indices was observed during February and March which was because of increased arrivals of kharif potato crop to the market.

5.2.1.3 Seasonal indices in arrivals of onion

To ascertain the long run pattern of market arrivals of onion the seasonal indices were worked out for a period of eleven years. The seasonal character was observed in all the markets; each market exhibited different seasonal pattern of market arrivals. Table 4.10 presents the seasonal indices in arrivals of onion. The range market variation was more in
Chikkaballapur, Kolar and Srinivasapur market compared to other markets, which may be attributed to the scattered nature of production and variation in the producers’ marketable surpluses in this region. Arrivals reached peak during October in Bangalore market, which may be due to the increased production of onion in the study area. In Chikkaballapur market a higher arrivals was found in February and March corresponding arrivals from harvest of late kharif crop season. The peak arrivals was noticed during July and August in Chintamani market correspond to the rabi season. Kolar witnessed a maximum arrivals in March which is because of increased arrivals of early rabi season crop. Srinivapur witnessed maximum arrivals of onion during June month corresponds to the arrival of rabi season crop.

5.2.1.4 Seasonal indices in arrivals prices of onion

Table 4.10 presents the market price indices of onion in the selected markets. All the markets showed the increased price indices in the months of August to December which may be due to the increased demand for the onion. The other reason is that onion price in 1998-99 during the months of September to December was 1400 to 1600 Rs/quintal due to the higher demand for onion. Srnivasapur market noticed higher price of onion during January corresponds to the lower arrivals.

5.2.1.5 Seasonal indices in arrivals of ragi

Table 4.11 clearly explains the seasonality in the arrivals of ragi in the selected markets. The seasonal character was observed in all the markets, each markets exhibited different seasonal pattern of market arrivals. In Bangalore market arrivals reached peak during September month. A gradual increase in the arrivals from April to September was noticed which may be due to the coincidence of harvesting period disposal of stored ragi by the farmers. Chikkaballapur market noticed higher arrivals in the month of March which is because of coincidence of harvesting period of the corp. Same was noticed with the other markets liked Chintamani, Kolar and Srinivasapur.

5.2.1.6 Seasonal indices in prices of ragi

Seasonal indices in prices of ragi presented in Table 4.11 Bangalore market reached peak price index of 105.90 in the month of September even with the increased arrivals which may be due to higher demand because of increased population. Prices were low during March to May corresponds to the harvesting period where the market arrivals was increased.

Price indices of ragi more or less remained same from April to September but higher price indices was observed during November which was accompanied by higher arrivals. The increased price indices may be because of increased demand due to spurt in the population growth.

Chintamani witnessed stability in the prices from August to January, September month showed highest price indices. There was a positive relation between prices indices and arrivals was observed which may be because of higher production, use of improved varieties accompanied by increased population. Same observation was noticed with the Srinivasapur market also.

5.2.1.7 Seasonal indices in the arrivals of Groundnut

Table 4.12 clearly depicts the picture of arrivals of groundnut in the selected markets. Variation among the markets with respect to the arrivals of groundnut was noticed. Majority of the market arrivals of groundnut arrived from October to February in all the markets. The arrivals began to taper off after in all these markets. This seasonal pattern of market arrivals was the results of inadequacy of warehousing facilities and inability of the farmer to withold stocks and incur not only the addition cost on storage but also incur price risk losses. This indicated urgent need to develop storage and credit facilities to make producers relive them from financial stress which compelled them to dispose off their surplus, immediately after the harvest.

5.2.1.8 Seasonal indices in the prices of groundnut

The results in Table 4.12 revealed the seasonal character of prices of groundnut in the selected markets. The fewer amounts of fluctuations of market prices were due to the stabilized nature of production of groundnut and is less affected by yield fluctuations. The higher price indices observed form the months of February to August, was due to higher influence of arrivals on prices of groundnuts whereas the arrivals taper from February onwards hence, prices start increasing until August and start decreasing later on.
Bangalore market being more specialized nature of market for groundnut and greater participation of traders, groundnut prices remained stable hence, fluctuation in prices being affected to a lesser extent.

A comparative study of seasonal indices of arrivals and prices showed the existence of lower price indices at times of higher arrivals indices. Since groundnut is both an oilseed and commercial crop, the existence of such relationship is justifiable, as market arrivals and prices depend heavily on one another.

5.2.2 Cyclical variations in arrivals and prices of selected agricultural commodities

From the Table 4.13 to 4.16 and Fig. 4.21 to 4.40 it could be observed that there existed an incomplete cycles in all the selected market. This is mainly because cycle can be observed only if a time series data for 20 year and above are analysed as the current study was conducted for past 11 years, hence cycles were not that clear.

5.3 Association between arrivals and prices major agricultural commodities in selected markets

The results in the Table 4.17 contain correlation coefficient of selected markets. These were worked out to understand the long run association between prices and arrivals of selected agricultural commodities.

5.3.1 Association between arrivals and prices of potato

The correlation co efficient between arrivals and prices of potato is presented in Table 4.17 which revealed a negative association between arrivals and prices in all the markets.

The negative correlation co efficient revealed that any change in arrivals leads to change in prices in these markets and vice versa. This shows that arrivals have effect on the formation of prices in the markets.

So, there is an urgent need to bring about price stabilization through development of market infrastructure and introduction of grading compulsorily in these markets to bring about close association between arrivals and prices.

5.3.2 Association between arrivals and prices of onion

The results in the Table 4.17 indicate the degree of association between the market arrivals and market prices of onion. Positive correlation coefficients in Srinivaspur market revealed that arrivals responded to price change in the same direction though to a lower extent when compared to other markets. This may be attributed to the awareness of farmers in withholding their stock and quick respond to the movement of prices in selling their produce. Negative correlation coefficients in Bangalore, Chintamani and Kolar revealed that arrivals responded to the price change in the opposite direction but it was to a lower extent. Chikkaballapur market showed negative and significant correlation between arrivals and prices. This may be attributed to the seasonality in arrivals causing glut in the markets, leading to fall in the prices of onion. Hence, accelerated efforts towards the stabilization of market arrivals and prices through suitable policy measures directed towards suitable infrastructure facilities, market information, etc., may go a long way in the efficient marketing of onion.

5.3.3 Association between arrivals and prices of Ragi

Table 4.17 revealed the association between arrivals and prices of ragi in the selected markets.

Positive and significant correlation was found in Srinivaspur market, it denotes that as the arrivals increases prices also increases and vice versa. This may be because of awareness on market information regarding arrivals and prices and slide facilities for holding the commodities for a short period.

Negative and significant correlation results were found in arrivals and prices of ragi in Bangalore and Chikkaballapur markets. Negative correlation was found between arrivals and prices in Kolar and Chintamani markets though the results were non significant. This requires positive efforts in the dissemination of market information and suggestion regarding crops to be grown in the particular season and storage facilities for the farmers produce.

5.3.4 Association between arrivals and prices of Groundnut
Table 4.17 clearly indicates the association between arrivals and prices of groundnut in the selected markets.

Positive correlation was found between arrivals and prices of groundnut in Bangalore and Kolar markets though it is found statistically insignificant reveals there is demand for groundnut in this market, represented by the increase in arrivals to increase in prices. This could also be attributed to the availability of storage and other infrastructure facilities, which have influence on arrivals of groundnut in Bangalore and Kolar markets.

The negative correlation coefficients were found in Chintamani, Chikkaballapur and Srinivasapur markets. Chikkaballapur and Srinivasapur markets showed a negative and significant correlation compared to Chintamani market. Hence, there is a need for price stabilization through development of market infrastructure, grading procedures, information dissemination, etc., to bring about close association between arrivals and prices.

5.4 Spatial integration of price of selected agricultural commodities

Koyck’s distributed lag model was employed to study the integration of markets. The time taken to reflect the Bangalore market price with that of selected markets were worked out. They are presented in Table 4.18 to 4.21.

5.4.1 Spatial integration of prices of potato

Table 4.18 shows that the Chikkaballapur market noticed quick absorption of price signals from the Bangalore market, which may be due to the better transportation facilities, easy accessibility to the market, concentration of traders. In the case of other markets delay in absorption of price signals may be because of lack of dissemination of information regarding arrivals and prices, quantities to be produced etc.

5.4.2 Spatial integration of prices of onion

With respect to onion prices integration was found in all the markets (Table 4.19). Maximum number of days taken to reflect Bangalore onion price was only 8 days which was noticed in Srinivasapur, it may be because of lack of information and ignorance of the formers

5.4.3 Spatial integration of prices of ragi

Table 4.20 represents the distributed lag results of price integration of ragi. Chintamani and Srinivasapur showed the maximum number of days required to reflect the Bangalore ragi prices. Kolar noticed 8.339 days require to reflect the Bangalore prices followed by Chikkaballapur. It may be because of lack of sufficient information of prices at different market or irregular arrivals of ragi to the market led to this difference.

5.4.4 Spatial integration of prices of groundnut

Koyck’s distributed lag model results of integration are presented in Table 4.21. Chikkaballapur took only 5.273 days to realize 90 per cent of long run adjustment of prices, followed by Chikkaballapur, Chintamani and Srinivasapur.

Variations in the results may be because of data considered for the study. Use of daily prices for the distributed lag method holds appropriate. Due to non availability of daily prices, monthly prices were considered.
VI. SUMMARY AND POLICY IMPLICATIONS

Market integration concept explains the relationship between markets that are spatially or temporally separated. One of the common indicators of an efficient functioning of the markets is the existence of high degree of integration among them. In an integrated market, price of a commodity is responsive to price changes of the same quality products in other markets, as such indifference for a particular variety of product in the different markets of the area as a rule should not exceed the cost involved in the transportation and handling of the produce. The analysis of price movements for variety of the commodity in the corresponding and linked markets helps in judging the extent of efficiency of the marketing system in the region for the selected crops. The trend in arrivals and price change over the years are observed in the long run. The trend in arrivals are associated with development in technology of production, input supply and infrastructure facilities. The seasonal variation is regularly a recurring pattern that is completed once in twelve months. It arises from the nature of production, supply to the markets and the demand and price formation.

Cyclical variations in arrivals and prices are widely accepted norms in farm products. The cycle is more likely to be initiated by some external events but once it begins it may occur on account of farmers responses to changes in prices. The knowledge of such cycles helps us in securing protection against violent fluctuations in the economy.

The spatial price variations in prices are observed over different markets. They occur due to differences in location of production and consumption of commodities. The inter-relationship between the price movements in different markets mostly depend upon the nature and extent of competition. An analysis of such inter-relationship helps in understanding the efficiency of the market systems.

The total production of food grains in the country has increased from 174.19 million tonnes in 2002-03 to 212.85 million tonnes in 2003-04. The total production of potato during 2003-04 was 250 lakh tonnes and groundnut production in the country was 8.332 million tonnes as against the target of 8.1 million tonnes.

Kolar is one of the important district in Karnataka which contributes proportional share in the production of vegetables fruits, cereals and pulses. The area under the food grains, oilseeds, fruits and vegetables is 1,03,149 ha, 36,878 ha, 49,424 ha and 23,171 respectively.

Today, potato is the 4th most important food crop in the world exceeded only by wheat, rice and maize for human consumption. The area under production of potato is 5550 hectares which produces 48,176 tonnes and the average yield is 9137 kg/ha. Onion is an important crop in all continents and commercially cultivated in a little over hundred countries of the world. India is the largest producer of onion in the world next to China. accounting 16 per cent of the world’s area (2.69 million hectares) and 10 per cent of the world’s production (46.06 million tonnes). Karnataka has an area of 1.5 lakh hectares with production of 5.36 lakh tonnes. The area under production in Kolar district is 1,565 hectares with production of 8,929 tonnes.

Karnataka ranks first in area, as well as production of ragi. It is grown particularly in Southern districts like Bangalore, Chitradurga, Hassan, Kolar, Mandya, Mysore, Shimoga and Tumkur. The area under production of ragi in Kolar district is 51,253 hectare contributing 10,672 tonnes.

Groundnut is an annual legume and native of America which is now grown throughout the tropical and sub tropical regions of the world. Karnataka ranks third in groundnut production contributing about 13 per cent to the total production. In Kolar district, the area under production of groundnut is 33,490 hectare contributing 10,762 tonnes.

Objectives:

1. To study the trend in arrivals and prices of selected commodities
2. To examine the seasonal and cyclical variations in arrivals and price of selected markets
3. To examine the degree of association between arrivals and prices of major agricultural commodities in the selected markets
4. To study the extent of spatial integration in the arrivals and prices of major agricultural commodities in the selected markets
5. To suggest the appropriate policy measure based on the findings of the study.

Methodology

The study utilized secondary data to fulfill the objectives. The data pertaining to the study was collected from APMC’s, HOPCOMs, Directorate of Horticulture, Karnataka State Agricultural Marketing Board and District Statistical Office (Bangalore and Kolar).

The following analytical technique were used in the study.

1) Cubic function was used to estimate the trend in arrivals and prices.
2) TSCI technique was used to analyze the seasonal and cyclical pattern in arrivals and prices of selected agricultural commodities.
3) Correlation analysis was used to analyze the association between arrivals and prices of selected agricultural commodities.
4) Koyck’s distributed log model was used to find the integration between the markets.

Findings of the study

1) Trend in arrivals and prices of major agricultural commodities in the selected markets are presented in Table 4.1 to 4.8. Mixed trend was noticed in the arrivals and prices of the all the commodities all the markets. Majority of the markets shown increasing trend in arrivals and prices the later periods which may be because of increased population, increase in general price level etc.

2) Arrivals of selected commodities was maximum in case of all the markets. Price was low during peak arrivals and vise versa. But positive relation in arrivals and price was noticed in ragi at Chikkaballapur market. This increase in demand may be due to increased consumption. Uneven cycles were found in all the markets for all the commodities. Clear indication of cycles may be observed when it will be worked out for more than 20 years.

3) Association between arrivals and prices of selected agricultural commodities

Negative association was found in all commodities in the selected markets. Thus, it indicates that, as the arrivals increase prices of the commodities decrease. Srinivasapur market revealed that arrivals of ragi and onion responded to the price change in the same direction when compared to other markets. Positive correlation was found in arrivals and prices of groundnut in Bangalore market though it was found statistically insignificant.

4) Market integration for the selected agricultural commodities

Koyck’s distributed lag model was used to analyze the spatial integration between Bangalore and other selected market. The results revealed that the integration was not upto the expected level. This may be due to the data considered for the study (monthly data on prices was considered due to the non-availability of weekly or daily prices), and the results ended up with a non-significant figure.

Policy measures

1. The seasonal pattern of market arrivals was the result of the farmers’ inability to withhold stocks and incur additional costs on storage and also to take on the consequence of price fluctuations. The financial pressures to pay off the costs of cultivation and to meet personal consumption expenses and other financial
obligations was also instrumental in augmenting market arrivals immediately after harvest. Hence, there is need to develop adequate marketing credit facilities and make them available to farmers to relieve them from financial pressures.

2. As both the commodities of potato and onion’s production is seasonal in nature and being their perishability requires storage facilities to meet out their requirement in the market throughout the year.

3. It is know that groundnut and ragi arrivals into the market are more immediately after the harvest which leads to the distress sale. Hence, it requires avail of credit facilities to the farmers so that they can meet their requirements to that period and sale their produce whenever the market prices reaches peak.

4. The cyclical fluctuations in market arrivals and prices have been observed to be both short and long duration. Hence, there is need to have a constant watch on price – arrival trends. The regulated markets may take necessary steps regarding dissemination of market intelligence to the remotest places of production of these crops.

5. The correlation coefficients between monthly arrivals and prices for long and short periods show negative correlation, which is due to heavy arrivals leading to depression of prices especially during peak months after harvest. Hence this calls for providing pledge loans at farm gate itself, development of adequate infrastructure like scientific storage facility in market yard, dissemination of market information etc.,

6. It is evident from the study that very few markets are found to be integrated. They are not influenced by the adjacent markets except few. It is very much necessary that the markets need to be integrated to transfer the price signals from one market to another and help in stabilization of prices of the particular commodity. Hence accelerated efforts are needed at integrating different markets, which would go a long way to protect the interest of producers-sellers.
VII. REFERENCES


MARKET INTEGRATION FOR MAJOR AGRICULTURAL COMMODITIES IN KOLAR DISTRICT

YOGISHA G. M. 2005

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Major Advisor

ABSTRACT

Market integration concept explain the relationship between two markets that are spatially or temporally separated. One of the common indicators of an efficient functioning of the markets is the existence of high degree of integration among them. Mixed trend was noticed in arrivals and prices of the all the commodities in all the markets. Majority of the markets shown increasing trend in arrivals and prices in the later periods. Arrivals of potato was maximum during September and November in Bangalore market whereas in other markets it was during February and March. Prices of potato found highest during off season and lowest during harvest period. Arrivals of onion, ragi and groundnut found maximum during harvesting months. Groundnut prices remained unchanged irrespective of increase or decrease in the arrivals. Uneven cycles were found in all the markets for all the commodities. Negative association between arrivals and prices was found in all the commodities in the selected markets except Srinivaspur and Bangalore. Positive correlation was found in arrivals and prices of groundnut in Bangalore market and Srinivsapur market revealed that the arrivals and prices of ragi and onion responded in the same direction. Distributed lag results of potato prices revealed that the Chikkaballapur took less than a day to transfer the price signals from Bangalore market followed by Srinivasapur (3.48 days), Chintamani (13.03 days) and Kolar (16.18 days). In case of onion Chikkaballapur took 1.38 days followed by Chintamani (4.38 days), Kolar (7.45 days) and Srinivaspur (7.93 days) to reflect the Bangalore onion prices. Kolar took 8.339 days to reflect Bangalore ragi prices and more number of days was observed in Srinivaspur market. In case of groundnut prices Kolar took less than 6 days and it was highest (16.01 days) in Srinivaspur market.