CHAPTER TWO

AN OVERVIEW OF STUDIES OF MARKETING EFFICIENCY IN INDIA AND ABROAD

2.1 Introduction

We have discussed different concepts of marketing efficiency in the first chapter. In this chapter we shall make a brief review of literature on marketing efficiency of agricultural commodities. A fairly large number of studies have attempted to analyse various facets of agricultural marketing in India. Most of these studies relate to one particular region of the country and to a single or few crops only. This is nothing unusual. In a country with India's size and diversity intra and interregional variation and inter-commodity variations are significant. There are two main approaches to measure the marketing efficiency in these studies. The first refers to the analysis of market structure, conduct and performance and the second refers to the analysis of marketing costs and margins. In section 2.2 we have reviewed the studies made on the basis of the first approach. Traditionally simple correlation coefficients have been used to measure the marketing efficiency under the first approach. Studies using this traditional approach have been discussed in the sub-section 2.2.1. In subsection 2.2.2 we have discussed the studies, which have used the modern approach – the cointegration method. We have reviewed the studies made on the basis of marketing cost and margin in section 2.3. In section 2.4 we shall indicate the conclusion of this chapter.
2.2 Studies Based on Market Structure, Conduct, Performance Approach

This approach treats the competitive market as an efficient market. Thus to test the efficiency we must test the competitiveness of the markets. The textbook conditions of efficiency are difficult to apply in practice. Integration among the spatially and temporally separated markets is considered to be an important indicator of efficiency. Traditionally correlation coefficient of prices between the two markets has been used as an index of market integration. In section 2.3.1 we shall review the studies of marketing efficiency made on the basis of correlation coefficients of prices among different markets.

2.2.1 Traditional Approach: Correlation Studies

The inter-market price correlation coefficients are often computed with the help of the time series price data. The correlation coefficients indicate the degree of market integration. High correlation coefficients reveal close correspondence among markets, which is regarded as an index of efficiency.

Perhaps I.D. Mahendru (1937) did the earliest study of market integration in India. His study was based on the fortnightly wholesale prices of wheat for six months at four important markets in Punjab. He used the degree of correlation between prices in spatially separated markets as an indicator of the existence of the degree of market relationship. In that study correlation coefficient ranged between 0.43 and 0.86.

Cummings (1964) studied the pricing efficiency of wheat in Khanna market of Punjab. Cumming stressed that market prices reflect the conditions of efficient marketing if: (1) prices reflect demand and supply conditions, (2) seasonal prices are related to storage costs and (3) spatial price differences are
related to transport costs. To test the interdependence of interstate marketing
system in attaining efficient pricing he studied two periods – one in which private
wheat movements among states were unrestricted (representing normal
marketing relationships) and in the other interstate trade was restricted by the
government. Correlations between monthly prices of Khanna, Delhi, five other
markets of Punjab (Abohar, Ludhiana, Barnala, Karanl and Patiala) and two
markets of Uttar Pradesh (Agra and Kanpur) were observed.

The three criteria of pricing efficiency identified by Cummings were that
prices reflect demand and supply conditions, that seasonal differences do not
consistently exceed storage cost and that on the average, price differences
among markets do not exceed transport cost.

Cummings used the price data collected directly at the auction. The price
data were collected from the government sources. Wholesale prices were
collected from 27 important wheat markets. From these prices he recorded the
high, low and modal prices each representing several transactions for wheat for
acceptable quality. Cummings studied the price data for eight-year period (1956-
64). During 1957-61 the government restricted interstate movement of wheat by
private trade. In the first two years MP, Rajasthan and Bombay (undivided) states
were grouped together in a large western zone, but this was dissolved in 1959
into separate three zones. The zones consisted of separate states, which are
areas of general surplus or shortage. During the unzoned period i.e. 1956-57 and
1961-64 there were few restrictions by the government on the private marketing
system.

During zoned period due to separation of markets in different states prices
reflected local conditions of supply and demand since dealers could not export or
import from out of the state markets to overcome local surplus or deficit. There
was greater instability of harvest prices from year to year because demands in
restricted markets changed and stock requirement had to be supplied from local
supplies. Though seasonal price movements were less during this unzoned period, there was no consistency between states in direction or magnitude of seasonal movements each year. In comparison with the unzoned periods the pattern of prices was more random in zoned period.

For the unzoned period the monthly price series of each market was correlated with the price series of every other state to simplify comparisons of different states. From the correlation coefficient it appeared that private market for wheat in India during unzoned period was unified.

During the zoned period (1957-61) there was greater independence in monthly market prices between different states since private interstate movements were restricted. Compared to the zoned period there were higher correlations of the market prices within the states, which had wheat surpluses. But all correlations between market prices in different states were lower during the unzoned periods with a very few exceptions.

Market prices keep Khanna prices competitive with other Punjab markets. The producers used to withhold their crop from the market if they considered their price too low. Itinerant traders also solicited wheat directly from farmers. To test the effect of competition, price differences between Khanna and Delhi were compared with the transport cost. The cost involving moving wheat physically from Khanna to Delhi included fixed costs irrespective of distance per quintal, rent, additional labour charges and waste if wheat was stored in godowns. The variable cost included the truck-hauling rate per bag. The average price difference between the two markets during the period was Rs. 0.88 which shows the close relationships between prices in the two markets. For seasonal variation in prices the unit net returns for individuals holding periods were calculated by subtracting storage costs (rent, labour and waste but excluding interest) from the price difference between June and respective month. In general prices reflected
the supply and demand in the markets and returns from holding wheat were consistent with storage costs plus a return to the arhatya (trader) for his services.

Interpreting the results of the study it appears that during the unzoned periods market prices reflected the supply and demand shared by competing markets. Seasonal prices though exceeded storage costs for some months it did not exceed consistently and the price differences between markets were less than transportation costs. There was no evidence of collusion among traders. Thus Cummings summarized that given the marketing environment for wheat in India, the wheat price tended to move toward achievable under pure competition.

Since the private marketing were found to be relatively efficient Cummings suggested that the government policy should serve to supplement and strengthen private trade rather weaken it or replace it. Following were the guidelines as given by Cummings: -

1) Government policies must make use of market forces rather than interfere with it.
2) A consistent agricultural price policy should be applied to all commodities using forces to influence production and marketing decisions in the desired direction.
3) Prices should be allowed to move within limits such that normal returns from storage are obtained.

However, Cummings admitted that the data and information on which this analysis was based were the only data available and were unsatisfactory. The high values of correlation coefficients were obtained without de-trending and de-seasoning the rice data. When Cummings reworked the correlation coefficient by eliminating the seasonal and trend elements the average coefficient of correlation was lower for the harvest months and for the most relevant part of the year the
average coefficient of correlation became lower than what had been reported earlier.

**Uma Lele (1971)** also studied the efficiency of market structure for different food grains in 1965. She felt that it was necessary to consider whether the market structure that existed at that time was capable of handling rapid increase due to technological advances or whether there was a need of alternative distributional arrangement. The appropriate distribution also plays an important role as a broadcaster of appropriate signals for substantial increase in agricultural production. She evaluated the performance of traditional trading sector with regard to: (1) the degree of efficiency of the structure and (2) causes of inefficiencies, if any.

Lele chose three types of food grains from three different states – rice for the state of West Bengal, wheat for Punjab and Jowar for Maharashtra. She selected five primary markets in the heart of food grain surplus area where transactions at the wholesale level take place directly between the cultivator and the wholesaler. One terminal market, a major urban consuming center that receives a significant portion of the supplies from primary markets was selected for study of price relation over time and space.

Lele laid down the similar criteria like Cummings for efficient marketing. For efficient market the price differences in two spatially separated markets must be less than or equal to transport cost between the two. Lele like Mahendru and Cummings used the correlation coefficient as an indicator of marketing efficiency. "The degree to which price formation in an individual market is influenced by price in another market is estimated by obtaining correlation coefficient between weekly wholesale prices in these markets". Lele found correlation coefficient of 0.9 for wheat in Punjab. The correlation coefficients between weekly prices of Jowar in the seven markets of Sholapur were high which indicated close correspondence between price movements in various markets. The terminal...
markets also showed very high correlation between prices. Similar were the results for rice in West Bengal. Thus she concluded that private trade in three major food grains "operates efficiently within the technological and policy confines" and hence "the scarce governmental resources should be allocated to areas where private resources are not likely to flow abundantly".

Lele admitted, "even if market is highly efficient, it may have certain unacceptable features, e.g. it may operate in a manner that causes a great deal of year to year instability in the price level. Or the market may provide a price deal which adversely affects the growth of the industrial or the agricultural sector". But disappointingly enough she did not examine whether the different food grains in the country had these or other unacceptable features.

**Jasdanwalla (1966)** studied the marketing efficiency of agricultural crops in Rajkot district. She restricted her field investigation to the study of groundnut and cotton only, the major crops entering the market.

She followed the same type of reasoning as Cummings to judge the efficiency of agricultural markets. "Agricultural markets in order to function with the maximum efficiency must satisfy most of these conditions of perfect market." She has given the importance on large number of farms. She took another important criteria of marketing efficiency as marketing margin.

Jasdanwalla has given the same prerequisites as of Lele for efficient marketing. "Marketing operation may be carried out smoothly if certain general facilities are provided like market information, adequate transport and communication facilities, proper storage facilities, standardized weight and measures and regulated market. In addition to these, cultivators must not be heavily indebted to private agencies so as to exercise their freedom." She found that the majority of framers in the region satisfied the criteria of efficient marketing.
She took frequency distribution as the method of analysis for studying gross relationship between sets of variables. After giving frequency distributions, multiple regression equations, correlation coefficients and other measures of association were computed.

Jasdanwalla classified the criteria for efficient marketing into two groups – one relating to physical and external conditions and other relating to certain general characteristics among cultivating families. The general facilities in the nature of external economies must be provided to carry out the marketing function smoothly and effectively. These facilities, according to Jasdanwalla, include market information, adequate transport and communication facilities, proper storage facilities, standardised weights and measures, and regulated market. In addition to these facilities cultivators must be free from restrictive influences, they must not be heavily indebted to private agencies and the decision regarding time, place, agency and method of sale must be unfettered. Jasdanwalla found that a number of facilities were available for satisfactory marketing in the region and the cultivators were not constrained by restrictive influences.

She identified eight factors, which can influence the prices of agricultural commodity. These factors are (i) distance from the market center (ii) indebtedness (iii) place of sale (iv) place of delivery (v) time of sale (vi) size of surplus (vii) standardized weight and measure and (viii) deductions for quality. The association between prices and the last three factors was weaker which showed that there was no such exploitation of sellers. By analyzing the factors influencing the prices Jasdanwalla found that interregional price differences did not arise due to imperfection and inefficiencies in the market mechanism but due to external factors.
She found that there was a close relationship between groundnut oil and groundnut prices. There was a strong relationship between prices spatially and a close integration between terminal market centers and upcountry markets. She concluded that the requirements of perfectly competitive and efficient marketing are satisfied in the district concerned.

Though the market showed the competitive nature she felt that there was a scope for improving marketing efficiency by introducing auction method sale, disseminating market information, by providing institutional credit etc.

The main objective of the study made by K. Subbarao (1978) was to examine the economic efficiency of the existing paddy/rice marketing system in West Godavari district of Andhra Pradesh in 1968. He also evaluated the impact of public intervention in marketing.

Subbarao also assumed a close correspondence between a perfect and efficient market. But he stressed that efficiency in the marketing system cannot be judged merely by competitive prices it generates but by the degree to which it responds to the needs of overall growth and distributive justice. In a competitive market the undesirable features may be present – the competitive prices may be far above or below the cost of production due to storage or surplus. The competitive price may also have adverse effect on the growth of non-agricultural sector or on intersectoral income distribution. He enquired whether the rice/paddy marketing system in West Godavari district complied with the norms as described above.

Subbarao adopted both the market structure approach and marketing margin approach methodology. He modified the basic elements of market structure approach for the purpose of his study. Market structure has been referred to as the organizational characteristics of the public, private and co-operative marketing agencies, type of agent operating etc. Market conduct has
been referred to as the trading practices (including purchase, handling and storage) followed by agents, the relationship between buyers and sellers, nature of functions performed by agents etc. Market performance is the pricing efficiency reflected in homogeneous pattern between farmers in a geographically contiguous region, price integration among contiguous villages etc. To him the market structure approach seemed appropriate for the use in analyzing the economic efficiency of the prevailing marketing system in terms of food grain pricing efficiency in the villages and as between villages and wholesale markets. He adopted the marketing margin approach for analyzing the differences in marketing costs between public, private and co-operative marketing institutions. However he admitted that marketing margins by themselves couldn't reveal weakness of the existing institutional set up responsible for inefficiency.

He analysed the data on prices received by the farmers season wise for a homogenous variety of paddy sold by them in different villages along with other details such as their size of holding, output, marketed surplus, domestic retentions, sources and extent of indebtedness, storage space, modes of disposal etc. Data on the costs of operation of three agencies - public, private and co-operative – engaged in procurement, processing and distribution of paddy/rice were also used. He used the data published by the State, district authorities and supplemented those by primary data.

The main aspects which are dealt with in his studies were – (1) the organization of marketing system, (2) differences in prices received by farmers in different villages and factors behind such differences, (3) the degree of interdependence of primary markets in price formation, (4) the role of government intervention in food grain marketing.

He assumed that the factors, which influenced the price variations, are:

1. Economic position i.e. income and wealth of the farmer
2. Access to credit and sources of his borrowing
3. Time of sale, and
4. Storage facilities.

He worked out the coefficient of variation to measure the variability of prices received by sample farmers.

Multiple regression analysis was performed with the prices received by sample farmers as dependent variables and total output produced, storage capacity, sources of borrowing, time of sale and level of infrastructure development as independent variables. Subbarao found that there was considerable interpersonal variation in prices received among sample farmers. Small farmers suffered losses due to various imperfections in the marketing system. Underdeveloped infrastructure was the most important source of such losses.

Subbarao examined the pricing efficiency of the marketing system with reference to the following criteria: -

1. Under perfectly competitive conditions mean prices obtained in geographically contiguous villages are expected to be roughly the same;
2. Inter market price differentials approximate to the transport cost of the commodity concerned;
3. In spatially separated markets prices are expected to move in unison in response to the forces of supply and demand;
4. The price of the final product at any place should approximate to price of the raw product at that place plus the cost of processing and millers’ margin, and
5. Seasonal price differentials can be related to costs of storing grain, weight loss etc.
Spatial pricing efficiency was judged by the criteria as follows.

1. Price integration at the village level – where price differentials at different villages were taken into account.
2. Paddy rice price relationship - where comparisons were made between actual prices with the computed prices.
3. Integration at the assembly market level where correlation coefficients were computed between the wholesale paddy prices in every pair of spatially separated markets after de-trending and de-seasoning the raw price data.

He examined the temporal pricing efficiency by comparing the actual seasonal heights in prices at the end of an assumed storage period, with hypothetical prices obtained by computing the costs of storage, losses in storage etc.

The conclusions emerged from his study were the following:

1. Inter village price differences existed due to uneven level of infrastructure development and sample villages were thinly integrated with respect to price,
2. There were weak competitive forces in less developed villages and even in the villages close to market centers millers enjoyed superior bargaining power vis-à-vis the farmers.
3. Wholesale prices were out of line with storage costs, which indicated the possibility of millers making substantial profit through storage operation.

Thus he concluded that horizontal integration of wholesale markets did not ensure competitive prices to the farmers. In villages characterised by low level of infrastructure development coupled with low staying power of farmers,
competitive forces were weakened and thus provided opportunities to millers to make abnormal profit.

In 1974 Prof. D.S. Thakur made a study with the objectives to analyse the operational efficiency and to evaluate the pricing efficiency of food grain markets for bajra, jowar, paddy and wheat in Mehsana, Kaira and Surat districts of Gujarat. "Operational or technical efficiency in marketing refers to physical handling and least cost combination of marketing functions, channels and operation. In order to be technically efficient, the marketing system and agricultural markets have to ensure and utilize the best method and techniques for performing each marketing function and to use these methods and techniques with maximum effectiveness and competence to reduce the marketing costs. For operational efficiency of different marketing channels he analysed the costs and returns of farmers in the marketing of different food grain through various marketing channels. It was observed that sale direct to consumers provided highest net price to the farmers. The next profitable channel was the sale through the retailers. But only a small portion of produce was sold at a time through these channels. The third best alternative was the sale through wholesalers and commission agents. The sale through co-operatives and sale through itinerant merchants was the least remunerative alternative. The remunerative-ness of different marketing channels was similar for all food grain commodities.

He studied the pricing efficiency of marketing system by analyzing (1) price trends of different markets, (2) market integration and (3) price spread in the marketing channels. The trends in wholesale prices of selected food grain commodities for the period 1965-66 to 1970-71 in different markets were analysed through regression analysis. The trends in wholesale prices of food grain commodities were not similar in all markets. There was a wide variation in the trends in prices of same commodity in different markets.
To determine the pricing efficiency market integration was judged by calculating correlation coefficients between wholesale prices in these markets. Price series correlations did not remain high between most of the markets. The interrelation between wholesale price movements of bajra, jowar and paddy in some markets were very low and even negative. Thus he concluded that the food grain marketing system on the whole was not efficient. The reason was the presence of few traders in most of the markets who might agree through mutual understanding and outright collusion to avoid price competition.

The analysis of marketing margin and price spread was made. In efficient marketing system the marketing margin and price spread are fairly close to transportation costs, marketing charges and normal profits of the traders. His analysis of marketing margin and price spread in food grain marketing system showed that even in normal years the traders' profit margins accounted for quite a large proportion of the price paid by the consumers which is a sign of inefficiency.

Thakur (1971) also studied the pricing efficiency in Indian apple market in Kotgarh and Kotkah in Mahasu and Kulu and Nagar areas of Kulu valley of Himachal Pradesh using the same methodology as described above. Pricing efficiency was examined by the analysis of marketing margins and the price spread. His study revealed that marketing system for apple was fairly integrated so far as inter market price movements were concerned. It was also observed that traders' profit accounted for a large proportion off price paid by the consumers, which is a symptom of inefficiency.

D.K. Chatterjee and K. Bhattacharya (1985) enquired into the spatial and inter-seasonal pricing efficiency of rice marketing system in Burdwan district of West Bengal for two agricultural years 1980-81 and 1981-82. They took correlation coefficient as an indicator of market integration. They refrained from de-trending and de-seasoning the price data since their study was restricted to
only two years and the effects of season are likely to be almost uniform on these market prices. They found high correlation coefficients in most of the cases. They felt it necessary that for accessing actual market performance the analysis of market performance must be backed up by the analysis of spatial price differential and transportation cost. The peculiar finding was that in 50% cases the primary market prices were higher than the terminal market prices. They explained that illegal trade through the porous border of Bangladesh might be responsible for this. In the analysis of seasonal variation in prices interest on short term borrowing from nationalized commercial bank was taken as a proxy of normal profit. They analysed the storing activity in terms of three separate phases and the net differences were negative in all the three phases in 1980 whereas it was quite opposite in 1981. This implied that the inter-seasonal price rise did not cover costs and normal return.

The major findings of their study were:

1. Primary wholesale rice markets of the district were spatially highly integrated.
2. Inter-market differences in prices were quite high, and
3. Inter-seasonal price differentials showed heavy losses in one year and abnormal profit in another year.

They concluded that the rice marketing system in Burdwan district had not been working in an efficient manner in the period studied.

Different economists heavily criticize the bivariate modeling made in the studies described above. Harriss (1979) argued that high correlation coefficient may not indicate market integration and perfect competition. The coefficients may rise during secularly rising prices due to population pressure with effective demand relatively higher to supply. Again, there may not be any trade among the markets but higher correlation may be obtained due to trading relationship of a joint destination market. Monopoly procurement at fixed prices may result in
inter-market correlation of 1.0. She said that correlation coefficient by itself is not an adequate indicator of market integration. It may serve as an indicator of likelihood, given many assumptions of structure and conduct.

Ravallion (1986) stated that the time series of prices of two locations which are totally segmented may be synchronously, identically and linearly affected by another variable. Thus a high correlation among variables does not necessarily mean causation. According to Pierce (1977) variables may be functionally related yet uncorrelated (because correlation is a linear relationship only) and they may be correlated yet not causally related (due to a common association of both with a third factor).

According to Bressler and King (1970) in spatial equilibrium theory as embodied in the Law of One Price, prices for a commodity are related over time, space and product form. This says that prices used as explanatory variables will be correlated with the error term of relationships between markets (Granger and Newbold, 1974). Thus mere reliance on correlation coefficient would likely to give spurious results.

Ardeni (1989) argued that bivariate correlation analysis ignores the time series properties of price data and the results obtained may be biased and inconsistent.

It is also argued that interaction among the markets cannot be judged solely from correlation coefficient. "It needs to be backed up by some additional evidences of competitive conditions like low inter-market price differentials, possibility of inter-market trade etc". Rudra has pointed out that small farmers often get lower price compared to large farmers due to small size of their saleable product, which cannot be perceived from correlation coefficient. But Bhattacharya has shown that due to the onslaught of itinerant trade on large scale in rural areas such cases are on the decline. Rudra has argued that large
traders purchase large quantities of grain in post harvest period and sell continuously until the next harvest and the consequent variation in price is an indicator of inefficiency. But as Bhattacharya said "any commodity at different dates can not be treated strictly as a single commodity. So, legitimately inter-season price differential may prevail" and this legitimacy can be examined by comparing price differential with storage cost plus normal profit for storing activity.

Rudra also alleged that there are collations among important traders. But the existence or absence of abnormal profit cannot be assessed by the analysis of data on marketing margins. In this regard Bhattacharya said "the absence of abnormal profit will confirm the lack of any effective collusion, while the presence of that can be an outcome of one or more of several factors including collusion". With the increase in the number of itinerant traders the scope of controlling the market through collusion has decreased. Thus Bhattacharya supported the adoption of 'structure-conduct-performance' framework to study marketing efficiency. But he cautioned that for more dependable and uncontroversial assessment of the functioning of market simultaneous use of both the approaches are necessary.

In the study "Spatial Pricing Efficiency in Groundnut Markets in Tamil Nadu" D. Jayaraj (1992) analysed the correlation coefficient of wholesale prices for ten market centers of South and North Arcot districts of Tamil Nadu for nine years (1975-76 to 1983-84). The correlation coefficients worked for that period were well above 0.90; 62% of total 24 correlation coefficients were above 0.97 and 30% were between 0.95 to 0.97. The correlation coefficients indicate that price movements in related markets were strongly associated. But homogeneous secular and long-term trend present in the time may increase the value of zero order correlation coefficients. Thus Jayraj again correlated the price series (residuals) after eliminating the seasonal and time trends. The cyclical component was assumed to be unimportant because of the length of time series.
The irregular component of price series were obtained by eliminating the trend element by assuming a linear trend and removing the seasonal component using 12 month moving average.

Correlation coefficients were obtained from residual prices and it was observed that nearly 70% of the coefficients were above 0.7 and all residual correlation coefficients were significantly different from zero at 5% level. Thus the markets were interdependent in price formation but degree of price difference was different among different markets.

Regression analysis was also made on residuals of price series. Irregular variations in price series in each of the final demand and producing centers were regressed with that of the three markets. The null hypothesis of the slope coefficient equal to zero could not be rejected by 15 of total 24 regressions. This indicated that a price transmission is instantaneous and efficient. For the other nine regressions the slope coefficient equal unity was rejected. The results indicated that there were bottlenecks either in transfer of goods or information as the adjustment was not instantaneous but the irregular fluctuations in those markets were not taken advantage of by the traders.

The techniques used by Jayraj are simple but the results are much better and less controversial compared to the techniques generally adopted. The results of correlation coefficients of residuals of price series between markets support the results of Blyn (1973), as they are lower than those obtained between absolute price series.

2.2.2 Modern Approach: Cointegration Studies

There are various limitations in using the correlation coefficient as an indicator of efficiency as mentioned above. In mid 1980s attempts have been
made in the form of Engle-Granger, Johansen Juselius test to improve upon the earlier methods.

A major departure in using the methodology was done by Fatimah Mohd. Arshad (1990) in his study titled “The integration of palm oil market in peninsular Malaysia”. In his study he used two models, regression model and causality model. Ravallion’s regression model was used to measure the degree of market integration. This model assumes a radial market i.e. there exists a central market, which is served by groups of local or rural markets. He used the prices discovered in Kuala Lumpur Commodity Exchange Centres. In this model Ravallion assumes an autoregressive distributed lag relationship between each local price of a commodity and an appropriate reference price level.

His study utilized monthly data of crude oil for the four major regions, North (Penang), Central (Port Klang), North-West (Kuantan) and South (Pasir Gudang). The futures price for each month at Kuala Lumpur Commodity Exchange was used as the reference price. Price series for all regions showed the same seasonal pattern and the inclusion of seasonal variable was considered to be insignificant.

The hypothesis of local market segmentation was universally rejected by the regression results. The results also indicated an existence of adequate short-run integration between central and local markets. The results suggested a highly interdependent and non-segmental market. This is a necessary but not sufficient condition for an integrated market. Gupta and Mueller (1982) argued that a market is efficient if there exists an instantaneous transmission of prices between centers such that no room is left for arbitraging. Thus causality test is required to study precisely the direction of causation of price information between markets.

The Ravallion model succeeded in examining the specific time lag involved in price adjustment of two markets without specifically determining the
actual direction of causation. For this reason Arshad altered the equation along the line of economic causation model as developed by Sims. The statistical results of causality show the stream of price information from one market to other market and examine the time lag involved in the transfer between two markets where the causality test is employed.

In his study it was found that Ravallion test rejected the segmentation hypothesis and suggested a highly integrated market in the short run period. Local factors were seen to be statistically insignificant. Both Sims and Haugh-Pierce tests indicated an instantaneous or feedback relationship. These results implied that the crude palm oil market was spatially price efficient. The strong instantaneous relationship also suggested that each region absorbs new information as it becomes available. Arshad concluded that the efficient and instrument facilities made the crude palm oil market highly efficient. He pointed out that palm oil market was highly integrated due to availability of efficient and adequate infrastructure facilities available.

**Goodwin and Schroeder (1991)** judged the overall market performance of eleven U.S. regional cattle markets over a period covering January 1980 to September 1987 with the help of spatial price behaviour. The procedures for evaluating spatial market linkages have been developed using framework of cointegration tests by Granger, Engle and Granger, and Engle and Yoo. The test of nonstationarity has been made by using unit root test by developed by Dicky and Fuller. The seven cointegration tests were conducted for each specification of the ten markets over each of the four periods. For the eastern Nebraska market cointegration was reported by 155 out of 280 different tests. For markets closer to eastern Nebraska cointegration was strongest and it diminished with the distance between individual markets. The western Kansas direct and Omaha terminal markets had results similar to eastern Nebraska. It was also observed that the degree of cointegration among the regional cattle markets appeared to have increased over the past several years.
Boostrapped coefficient estimates and standard errors were used to provide consistent inferences about variables influencing cointegration. The Boostrapping estimates were obtained from 1000 replications. The equations explained from 29% to 54% of variation in the cointegration test statistics.

Empirical tests indicated that regional fed cattle prices have not been fully cointegrated during the 1980s. The markets separated by long distances have lower degree of cointegration than markets in close proximity. It is also seen that cointegration has increased over time.

To avoid the methodological limitations of bivariate correlation method Palaskas T.B. and Harriss -White B. (1993) proposed a new method based on Engle and Granger cointegration test for evaluating market integration. They made their study on the basis of weekly price data related to rice, potato and mustard collected from three market places in Burdwan district in West Bengal for the period from November 1988 to August 1990.

The Durbin Watson test (CRDW) and the Augmented Dicky-Fuller (ADF) test of cointegration are used to examine whether prices in the peripheral markets and the prices in central market are co-integrated. The CRDW results showed that price of rice, potato and oil of the peripheral market and price in the central markets were co-integrated with a few exceptions. The ADF results were similar to the CRDW result.

Given the fact that co-integrating vector existed between prices in central and peripheral markets they estimated the error correction equations using data for the entire period. They estimated the ECM by using five to one period lags and found that two period lags were significant for all estimated error correction equations of rice and potato market price but for mustard one period lag was significant.
Even though the full market integration hypothesis was rejected the error correction regression results reveal that current price change in the central market had an immediate impact on the price of peripheral market of potato and mustard. For rice markets, nine out of sixteen pair of prices did not have any immediate impact.

The speed of adjustment (the coefficient of error correction term) i.e. the speed at which the price of potato in the central and peripheral markets approach their equilibrium point was higher in potato market than between central and peripheral markets of rice and mustard.

The Palaskas and Harriss-White study has been criticized on the ground that it involved serious methodological defects inherent in the Engle-Granger method of cointegration. In the Engle-Granger procedure the test results may be very sensitive to the variable selected for normalization. The Engle-Granger method does not provide any procedure to test multiple cointegrating vectors when there are three or more variables. The identification of central and peripheral market is necessary for properly conducting the test of market integration using the Engle-Granger cointegration method. Palaskas and Harriss-White identified the central and peripheral markets on the basis of population data, volumes and directions of flow of commodities and modes of transport networks. Thus the method suffers from endogeniety problem because prices are simultaneously determined. The identification of central and peripheral markets may be wrong if the geographical flows of a commodity among spatial markets do not provide strong evidence of spatial direction of price causation.

Palaskas and Harriss-White used weekly data for the period of less than three years. But cointegration is a long run concept and test of cointegration requires long span of data. Increasing the frequency of data (taking the weekly data in place of monthly data) of the sampled observations for a given period
does not significantly change the power of tests for cointegration (Hakkio and Rush, 1991). Thus there are doubts whether the conclusions drawn in this study are valid.

The objective of the study made by Baharumshah and Habibullah (1994) was to determine whether the prices of black and white pepper were in parity with prices in a reference market in Malaysia. They used the methodology developed by Granger (1986) and Engle and Granger (1987) to test spatial market linkages because in efficient markets prices in different markets are cointegrated.

The Dicky-Fuller test (ADF test) has been used to determine the seasonality of the price variables. The ADF test showed that prices for six markets are $I(1)$ for both black and white pepper. Test for cointegration is done with the help of the ADF test on residuals of price relationship among markets. Apart from using ADF as a test for cointegration they also used Cointegrating Regression Durbin-Watson (CROW) statistic. The hypothesis that prices were not cointegrated was rejected for the period 1986 to 1991 using both tests. Thus it appeared that pepper markets in Malaysia are spatially linked.

Baharumshah and Habibullah also examined the behaviour of prices over a short period of time. The purpose of the study was to determine the impact of stochastic shock or structural change on the cointegrability of price relationship over time. "If the short run prices are cointegrated then we may conclude that the market is highly efficient and market integration is independent over time."

The results of CROW statistic showed that null hypothesis of no cointegration was rejected in 15 out of 30 cointegrating regression equations for black pepper and 7 out of 30 cointegrating regression equations for white pepper. But the ADF results rejected the hypothesis of no cointegration in all classes. Engle and Yoo(1987) in their simulation study expressed doubt over the
usefulness of CRDW statistic for testing cointegration. So Baharumshah and Habibullah concluded that the both the results (for the year 1986-1991 and for short term) supported the existence of cointegration in the regional pepper markets. There was no evidence that market integration had changed over time.

The weekly pepper prices for six regional markets in the state of Sarawak, Malaysia namely Kuching, Sri Aman, Sarikai, Sibu, Bintangor and Batu Niah for the period of January 1986 to December 1991 were used.

They found that the pepper markets in Sarawak were highly co-integrated. They did not find any non-competitive pricing behaviour in the regional pepper markets. The results show that prices of pepper moved uniformly across the spatial markets.

Nasurudden and Subramanian (1995) attempted to study the price adjustment between oils and oilseeds. The price adjustment among oil and oilseeds can take place at two stages. At the first stage the price adjustment among oils when price of oil and oilcake got fixed the price of its own seed, since oil and oilcake are derived from its seed. Thus in this stage the weighted sum oil and oilcake prices fixes the price of oilseed. In the next stage, prices of all oils respond to change in the price of each oil. They estimated the price relationship at two stages: (i) vertical integration – integration of seed price to price of its oil and oilcake and (ii) horizontal integration – integration between price of different oils.

They used Koyck’s distributed lag model for its superiority over correlation analysis. Koyck’s basic model is:

\[ P_u = \alpha + \beta_0 P_{u-1} + \ldots + \beta_k P_{u-k} + u, \]
is the price of ith oil/oilseed in t-th period and \( \alpha \) and \( \beta \) are parameters. The horizontal and vertical integration of oils and oilseeds were tested with following equations

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

\[
P_{ist} = \alpha + \beta_0 P_{ist} + \mu P_{ict} + \lambda P_{ist-1} + \nu_i
\]

where \( P_{it} \) is the price of ith oil on the t-th day, \( P_{jt} \) is the price of jth on t-th day, \( P_{it-1} \) is the price of ith oil on \( t-1 \) day, \( P_{ist} \) is the price of i-th oilseed on t-th day, \( P_{ict} \) is the price of ith oilcake on t-th day.

For horizontal integration the Durbin–Watson 'h' statistic for each oil was within the accepted level and \( R^2 \) ranged between 0.74 and 0.92. The result shows that groundnut oil influenced the prices of all other oils except castor oil. All oil prices interacted within a short period for its price adjustment. So the markets for oils and oilseeds in Bombay are well integrated with the characteristics of perfect market condition.

The results of vertical integration results showed that the long run price adjustment coefficients were not nearer to conversion ratios of oil and oilcake. This implied imperfection in seed price formation. The price interaction for all oils showed the directional influence of price of each oil on the other.

The study revealed that the assumption of complete oil price integration could not be fully accepted. The vertical integration in oilseed price was much quicker as compared to horizontal integration in oil prices. The characteristics of perfect market condition were shown by its quick adjustment of price changes.

From their analysis it was found that oil price integration was not complete in Bombay. Price integration in most cases was bi-directional. The Bombay
oilseed market showed the characteristics of perfect market condition by its quick adjustment to price changes.

In a much more comprehensive study, Jha (1997) investigated rice and wheat market integration in India involving binary and multivariate cointegration tests based on Engle and Granger (1987), Engle and Yoo (1987) and Goletti – Ravallion (Goletti, 1994; Ravallion 1986) methods. Applying these methods to monthly wholesale prices of rice and wheat for the period from January 1980 to December 1990, they observed that all pairs of prices of rice as well as of wheat are cointegrated. And for the crops all prices taken together are linked in a cointegrating relationship. They concluded that food markets all over India are highly integrated.

Kumar and Sharma (2003) studied the functioning of the regulated markets in Haryana for paddy crop with two objectives: (i) to see whether the liberalisation process has improved the efficiency of regulated markets and (ii) to see the structural and pricing efficiency across different farm size groups at the farm gate level. Market integration among wholesale paddy markets was analysed with the help of cointegration and error correction mechanism. The analysis of market structure and prices at the farm gate level was done with the help of primary data generated by household survey of 400 farmers in two districts of Haryana.

They used Johansen’s maximum likelihood procedure based on error correction representation which is a powerful test compared to Engle- Granger test. The integration tests were out on the log monthly wholesale prices of coarse paddy in four markets in Haryana for the period of 1978 to 2001.

The results of Johansen method of multivariate cointegration tests indicated the presence of three cointegrating vectors at 1% significance level. This implied that all four markets were cointegrated and the markets had
common sharing of information on price changes in the long run. Thus all four markets exhibited long-run relationship.

Their analysis of structural and pricing efficiency was based on the primary survey of 400 households. Two stage sampling was done – village as a first stage sampling unit and household as the second stage sampling unit. Information regarding cropped area, output produced for different crops and their marketed surplus, price obtained for different commodities and cost of production were collected. The following factors were considered in the determination of price in regulated market – (i) sources of borrowing, (ii) availability of storage facility reflected in storage investment, (iii) the point of time at which produce was sold and (iv) distance covered to market the produce.

Multiple regression analysis was made taking the net price (gross price minus cost incurred to market the produce) as dependent variable and value of marketed surplus, net-cropped area, value of aggregate output, total storage investment, distance covered to market the produce and dummies of the time of sale as independent variables. The regression results showed that distance covered to market the produce was most important and significant variable with positive effect on the net price received by the farmers. The value of marketed surplus and value of output also had positive effects. Storage investment and non-institutional loans were not significant. Thus it appeared that though the market was efficient they were not perfectly integrated over space.

In their analysis the cointegration and error correction analysis showed all the four markets were cointegrated and had a long run relationship. But the price determination was not strong in the short run.

The methodology used by Kumar and Sharma was superior to the other methods used to test market efficiency. Their cointegration analysis was also supplemented by micro level study and regression analysis. In the regression
analysis the value of $R^2$ was quite low. This indicates they must have missed to identify some important variables.

**Basu and Dinda (2003)** evaluated empirically the potato market integration of Hooghly district with the help of bivariate price correlation and cointegration test developed by Engle-Granger. They collected the weekly prices of potato (wholesale and retail) for the period from January 1998 to December 2000 from three market intelligence (MI) centers Champadanga, Tarakeswar and Sheoraphully out of seven MI centers of Hooghly district.

The highest correlation coefficient value was observed for the market pairs containing wholesale prices of Champadanga and Tarakeswar and lowest for the market pairs containing retail prices of Champadanga and Seoraphully. All the correlation coefficients of wholesale and retail prices were above 0.974. Even after removing the seasonality the correlation coefficients were found to be in the range of 0.89 and 0.98. The results implied that the wholesale and retail potato markets in Hooghly district were highly interdependent.

To determine whether a long run relationship existed between the prices of different markets the cointegration test was applied. They took all possible combinations of prices of potato markets to carry out the cointegration test. The null hypothesis of no cointegration was rejected for all selected potato markets in Hooghly district. The coefficients of error term were negative and statistically significant for wholesale and retail potato markets in Hooghly district, which implied that there existed short run dynamics with the long run equilibrium. The speeds of adjustment for different markets were also found to be higher. However, the strong form of market integration was observed only between Tarakeswar and Champadanga wholesale markets. Overall the potato markets in Hooghly district were shown to be integrated.
Though Basu and Dinda dodged the problem of selecting the central and peripheral markets by taking all possible combination of prices their study involved the limitations of using short span of data. Testing cointegration requires long span of data but they have used the data for three years only. They increased the frequency of data by using the weekly prices. But as noted earlier, Hakkio and Rush (1991) have shown that increasing the frequency of sampled observation for a given period does not significantly change the power of the tests for cointegration. Their study is not comprehensive; out of seven market intelligence centers they used the prices of only three market intelligence centers.

Madhusudan Ghosh (2000) evaluated empirically the spatial integration of rice markets in Bihar, Orissa, Uttar Pradesh and West Bengal. He used the maximum likelihood (ML) method of cointegration developed by Johansen and extended by Johansen and Juselius (1990) to test whether the intra-state and inter-state regional rice markets were integrated. He used the monthly data of wholesale prices of rice quoted in different market centers of four selected states viz. Bihar, Orissa, Uttar Pradesh and West Bengal.

There were three cointegrating vectors for Uttar Pradesh and one each for Bihar and West Bengal. The number of price series in the vector autoregression was four for Bihar and Uttar Pradesh and three for West Bengal. The number of stochastic trend was one for Uttar Pradesh, two for West Bengal and three for Bihar. For Orissa there was at least one cointegrating vector and at best three common stochastic trends. The cointegration result indicated that the law of one price held for Uttar Pradesh but not in Bihar, West Bengal and Orissa. For inter-state integration of rice markets the results of multivariate cointegration tests showed only one cointegrating vector and three common stochastic trends. Thus the results revealed that though the markets were integrated the law of one price did not hold good. On the basis of the results he argued that there should not be any unnecessary restriction on inter-regional movement of food grains.
2.3 Studies Based on Marketing Margin Approach

In these studies the difference between the cost and receipts from handling the commodity at every stage has been estimated. Markets would be called efficient if the differences between the cost and revenue at different stages are not higher than the normal return for the services rendered at the respective stages.

Jagdish Prasad (1980) undertook a study to examine the operational and distributive efficiency of farmer's share in consumer's rupee of two important food grains namely rice and wheat in regulated markets in North Bihar. He made the hypothesis that (i) larger the farmer's share in consumer rupee, greater the operational efficiency in the marketing system and vice versa, (ii) larger the difference in the share between different categories of farmers lower is the distributive efficiency in the marketing system and (iii) the prices received by the marginal and small farmers are significantly lower as compared to those received by medium and large farmers.

These hypotheses were examined with the help of data collected by a survey of 80 farmers, 10 wholesale/commission agents, 11 village merchants and 6 itinerant traders from Muzaffarpur agricultural market in North Bihar.

Prasad identified principal marketing channels for rice and wheat in Muzaffarpur market. He took the farmer's share in the consumer's rupee as one indicator of efficiency of marketing system. The operational efficiency (E) of the farmer's share can be computed by the ratio between the price received by the farmers and total price spread. The total price spread is the difference between the price paid by the ultimate consumer and the price received by the farmer. For distributive efficiency operational efficiency can be measured separately for each group of farmers and then standardized by dividing each E by the sum of the Es.
Prasad found that the majority of small and marginal farmers sold their produce at the village level to the village merchants and itinerant traders due to smaller marketable surplus, lack of organisation and holding capacity. But the majority of medium and large farmers sold their produce at urban market centers and obtained higher prices. But when market channels are limited and are mostly in the lookout for bulk sales the large farmers will enjoy higher prices considering the fact that the time and energy of the purchaser are not the free goods (Bhattacharya, 1992). He suggested in order to promote efficient grain trade and optimal price to farmers as well as to increase agricultural output there might be an organization of farmers particularly marginal and small farmers which would provide the marketing facilities. Financial help need to be provided to small and marginal farmers.

Jayashankar and Muraleedharan (2000) made a comparative study of bamboo and woods market in testing of efficiency of agro-forestry product markets in Palakkad district in Kerala. They identified four channels by which bamboos are delivered from household to final consumers. There was a chain of vertical interactions involving households, sub-traders/agents, traders, contractors and the final consumers. There was no standardized grading system for bamboos. They observed that total trade margin has increased more than 100 per cent with a unit rise in price. The margin for trader increased higher than that of sub-traders.

Concentration of traders around Palakkad and their lower numbers compared to other market participants like sub-traders showed a lower competition among traders. But households were getting competitive price because there was a large number of sub-traders. There were barriers of entry, seller concentration and collusion. Regarding market information they observed that many producers of bamboo had only little knowledge of market prices or functioning of the marketing system or flow of bamboos. Each stage of marketing
was clearly segregated and households' access was limited to the sub-trader agent. But access to different stages of marketing system and knowledge of prices at different levels by households is important for getting remunerative prices.

They found that traders received 21.6% of the final price and marketing cost was about 26.06%. The margin for traders included the establishment cost, risk, transaction costs, bribes to bureaucracy and it was not seemingly large. The sub-traders were receiving only 4.81% in bamboo trading. The credit relation was limited between trader and sub-trader.

They found that the characteristics of wood market such as the barriers to entry, seller concentration and collusion was also found in the bamboo market of Kerala. But other characteristics of wood markets like limited knowledge of the producers about market flows and prices, limited market access of the producers, excessive marketing margin of the middlemen etc. could not be found in the bamboo market. The households were getting reasonable remuneration due to the competition between the traders for the product and less number of intermediaries. The main bottlenecks in functioning of the bamboo markets in Kerala were legal restrictions and bureaucratic procedures.

R. Ramakumar (2001) attempted to discuss different aspects of marketing of coconut in Kerala through a field survey in four districts. He attempted an analysis of costs and margins in various channels of trade and formulated a composite index of marketing efficiency for each channel.

He selected one panchayat randomly from each of the four districts and surveyed 30 randomly selected farmers for each panchayat. Next he identified the different marketing channels and marketing efficiency (R) of alternate marketing channel was computed by ranking different performance indicators, which were producers' share in consumer's rupee, marketing cost of
intermediaries, marketing margins of intermediaries and return per rupee of investment. The marketing efficiency was calculated as the ratio of sum of ranks in the channel and number of performance indicators. The channel with lower composite index was treated as the most efficient channel. But there are some limitations in using such an index to test the efficiency of the marketing channels; as Ramkumar has admitted that equal weights have been assigned to all the indicators.

There are certain limitations of the marketing margin approach as mentioned earlier. The most important limitation is the difficulty to determine the acceptable limit of the normal return.

2.4 Conclusion

The two approaches of testing the marketing efficiency are not mutually exclusive. Subbarao studied the marketing efficiency using both the approaches. The secondary data on price are available with the Department of Agricultural Marketing in different states and most of the studies are made on the basis of market structure, conduct, performance framework. On the other hand the marketing margin approach are used in the studies made on the basis of primary data collected by the field survey.

In this chapter we have made an overview of the studies of marketing efficiency of agricultural commodities made in India and abroad. In the next chapter we shall discuss the methodology used in our study.