***Review Article***

# APPLICATION OF MARKET INFORMATION SYSTEM FOR MAJOR AGRICULTURAL COMMODITIES IN HARYANA

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## ABSTRACT

The study on "Application of Market Information System of Major Agricultural Commodities in Haryana" was carried out in Karnal, Ambala, Mahendergarh, Bhiwani and Sirsa districts of Haryana, selected purposively based on the highest area under the major agricultural commodities. Two blocks from each district i.e., from Karnal (Karnal and Assandh), Ambala (Naraingarh and Sahazadpur), Mahendergarh (Mahendergarh and Kanina), Bhiwani (Siwani and Tosham) and Sirsa (Dabwali and Baragudha) were selected purposively. Form each district, four regulated markets were selected based on maximum arrival *i.e.*, Basmati Rice from Karnal (Karnal, Gharaunda, Assandh and Taraori), maize from Ambala (Sahazadpur, Mullana, Naraingarh and Ambala city), mustard from Mahendergarh (Mahendergarh, Ateli, Kanina and Narnaul), gram from Bhiwani (Siwani, CharkhiDadri, Tosham and Bhiwani) and cotton from Sirsa (Dabwali, Ellenabad, Sirsa and Kalanwali) under the major agricultural commodities. The total sample size consisted of 300 farmers, 200 traders and 20 market committees was surveyed. Out of the expectations of farmers on quality, prices in potential markets, price projections; only arrivals and prices were documented and disseminated with traditional/modern approach. Forecasting of prices showed that the prices of Basmati rice, maize, mustard, gram and cotton in Karnal, Ambala, Mahendergarh, Bhiwani and Sirsa districts, respectively were moving in same trend as predicted. The Dickey-Fuller test indicated that the order of integration of prices among selected markets was similar with zero suggesting that the prices are integrated in the long run in Karnal, Ambala, Mahendergarh, Bhiwani and Sirsa districts.



**Key words: Marketing Information System, regulated markets, price forecasts, traders, farmers.**




## Introduction

Marketing deals with customers in addition to any other business function, where building customer relationship based on customer worth and agreement is the heart of modern marketing (Armstrong and Kotler, 2010). Marketing is the procedure of creating, distributing, promoting, and selling the goods, services and ideas to make easy satisfying exchange relationship with customers in a lively environment (Pride and Ferrell, 2003). According to Kotler and Keller (2009), financial achievement depends on marketing ability, financial operations, accounting and additional functions will not really matter, if there is no requirement for the company's products and services. Moreover, the market competition is rising day by day in the very fast growing global marketing where marketing is affected by internal and external surrounding activities (Taey and Alaq, 2009). Marketing managers have to identify what to sell, when to sell and how to sell the goods and services. In order to do so, the managers have to get definite information to enable them to build the right marketing result. The value of information increases from the time when it becomes one of the majority valuable assets in ranking the competitive opposition of the modern markets. The marketing managers need to create marketing decisions such as service to provide, price of the service, promoting the service and the place to sell the service (McLeod and Schell, 2001). This means that the firms need an efficient organization and improvement of marketing information systems (MIS) which can successfully collect, process and diffuse the essential information accessible both to the internal and external levels (Panigyrakis, 2006). MIS include as a support system for the firms' marketing organization with its decision making process. Furthermore, from the administration viewpoint, marketing information system can also be a vital tool for the entire market organization. Marketing information system is defined as a process of gathering, processing, storing and using information to make better marketing decisions and to

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improve marketing exchange (Nickels, 1986). Lack of information is an entry barrier to both production and trade. The farmers who have access to better market informations, shifts in cropping patterns to higher value produce have been found to enjoy higher incremental incomes. Again, in the area of trade, individuals find it difficult to begin trading without proper market information and also reducing competition within markets. Market information can also an important component of early warning systems for food security as it can assist in identifying areas of possible shortage and can highlight whether the prices are above or below normal seasonal trends. Kotler and Keller (2012) defined the MIS as an interacting organization of people, equipments and events together, who analyze, appraise and distribute, timely and accurate information for use by marketing decision makers to recover their marketing arrangement, implementation and management of tasks. MIS have four parts, which are internal records, market intelligence, marketing research 2 and marketing decision support system (MDSS). Internal records are mainly used information by all the companies around the world such as reports of guidelines, sales, prices, costs, register levels, receivables, payables and so on (Kotler, 2008). Market intelligence system is a process and sources used by managers to find their everyday information about relevant developments in the marketing environment (Kotler and Armstrong, 2010). According to Proctor (2005), the marketing research follows convinced steps in the course of action to get the preferred and precise results. Marketing decision support system (MDSS) is a set of interior applications in the MIS that provides computer-based tools, models, and techniques to carry the marketing decision making procedure (Kotler, 2006). Market information is critical to the social and economic activities that comprise the development process. Developing economy has witnessed agricultural (green, white, yellow, blue and now rainbow), industrial and information technology revolutions. Good communication system and information system reinforce commitments to sustainable productivity. The Government of India has given more thrust on agriculture, food and information technology sectors towards achievement of economic reforms for achieving high growth rate in production (Dhankar, 2003). The partial success of agricultural development programs in developing countries is often due to the lack of understanding by decision makers at all levels of the marketing links. Marketing is often conceptualized and understood only as a process of assembling produce in rural or wholesale markets. While the other aspects and roles of marketing mainly as incentives for production are often not well understood. Thus, the process of improving development policies often depends on trial and error, and can be generally enhanced with more accurate information. On the other hand, notions about marketing that are wrong or based on half-truths are accumulated over the years and passed on from generation to generation as facts. The lack of market research results and information can be a major problem facing the augmentation of marketing efficiency because poor information increases market imperfection and results in inefficient and ineffective policies. The rapid growth in agricultural production and increased food system specialization in developing countries increases the demand for efficient marketing system. Market intermediaries, like wholesalers, commission agents, retailers and brokers, etc. need information to divert supplies from one market to another and to adjust their services and selling practices in order to maximize their returns. Market information is an important facilitating function in the agriculture marketing system. It facilitates marketing decisions, regulates the competitive market process and simplifies marketing mechanisms. Market information is a means of increasing the efficiency of marketing system and promoting improved price formation. It is crucial to the farmers to make informed decisions about what to grow, when to harvest, in which market produce should be sent and whether or not to store 3 it. At present, the information is disseminated through various media like radio, newspapers, blackboard display and public address system at market yards. The market information provided so far by these methods for selling actually does not help the farmers sufficiently in taking decisions in marketing of their produce. The farmers in the country are in dire need for reliable and timely market intelligence for a decision support system. In India, the traditional agricultural farming is rapidly being transformed into a commercial venture to cater to the needs of national and international consumers of food products. Inadequacy in the dissemination of accurate and timely market information, however, still remains a prime constraint for taking right decisions by

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the farmers, processors, traders and the policy makers. The directorate of marketing and inspection (DMI) in collaboration with the national informatics center (NIC) initiated steps to establish agricultural MIS network. This is likely to transform future agricultural growth in the context of global liberalization and changing food habits of the domestic population of our country. The statistics of arrival, sales and prices are generally maintained by APMCs. The dissemination of market information is a common function of APMC, which is performed through displaying of the prices existing in the markets on the notice boards and broadcasting the same from time to time through All-India Radio and other media. This information is also supplied to state and central government from important markets. Realizing the deficiency of traditional market information and with the advent of information technology, the government developed the system to link the market data on agricultural commodities at the national level through AGMARKNET. Similarly, the Haryana government has developed the network within the state in Haryana and uplinked to AGMARKNET. Day-to-day market trade information in agricultural commodities is collected at all important agriculture produce market committees (APMC) in the state. All district centres of NIC are being used as data entry points and for reporting. These data are made available on the NIC System installed at New Delhi through NICNET for easy access by any other APMC. All the APMCs become aware of the latest market trends all over India within a day. NICNET based Agricultural Marketing Information Network (AGMARKNET) envisages to transmit price and arrivals of agricultural commodities to State Agricultural Marketing Board/Directorate for analysis and local dissemination as well as for onward transmission to DMI Head quarters at Faridabad. To start with, 810 AGMARKNET nodes were established in the country during ninth plan period. This included 735 agriculture produce wholesale markets, State Marketing Boards/Directorates (48) and DMI offices (27) spread all over the country (Suri, 2005). Further, market information can break the vicious poverty trap, reduce inequality in markets and can also emerge as an accompanying measure to market liberalization to improve competitiveness and functioning of markets (Kpenavoun et al., 2009). More often, 4 agricultural markets fail for small scale farmers who form the majority of agricultural producers and live in the rural areas thus, this structure of the intricate marketing system (Barrett, 2008). A malfunctioning of agricultural markets often results from lack of access to information or as that of the endemic difficulty of information irregularity between the farmers and the buyers. Therefore, anything that can be done to trim down market entry cost especially the cost of access to information such as supplying marketing information forms a central feature of any developmental activity especially the developing country like Africa and India (Poulton et al., 2006).

Keeping in view the above facts, in mind the present study was undertaken with the following specific objectives:

1. To study the existing market information system for Basmati rice, maize, mustard, gram and cotton crops in Haryana.

2. To study the pattern and extent of dissemination and utilization of existing formal information by stakeholders.

3. To estimate the price forecasts and long term relationship in prices among domestic markets, and

4. To identify the constraints in the existing formal information system and suggest alternatives.

A comprehensive review of relevant literature in any scientific investigation is imperative. Besides providing knowledge of the work already done in the study area, it provides an insight into methods/procedures. It provides the researchers proper direction to carry out their research work and enables them to arrive at meaningful conclusions. Therefore, the past studies were reviewed and offered in this chapter. Very few research studies have been carried out in the field of market information for agricultural commodities like basmati rice, maize, mustard, gram and cotton crops in

**Comment [U4]:** The introduction is very well documented, but less well structured. In the -Introduction- section, a bibliographic study of the specialized literature is usually done. Between the two sections marked in light blue, bibliographic references are completely missing. Do we only have the authors' input here, or is it data collected from various studies? Please check this aspect.

**Comment [U5]:** If we are discussing about an "Review Article" it is not very correct to use the term "study". Possibly the term "market analysis" can be used.

particular. The studies having direct or indirect link with the present investigation have been reviewed and presented under the following heads:

2.1 Existing market information system

2.2 Dissemination and utilization of existing formal information

2.3 Price forecasts and long term relationship in prices, and

2.4 Constraints in the existing formal information system

**2.1 Existing market information system**

Nickels (2000) in his book on the 'Principles of Marketing' has stated that information is one key to increase marketing success for everyone. A market information system is an important device used by modern management to aid in problem solving and decision making. Market Information System is a process of gathering, processing, storing and using information to make better marketing decisions and to improve marketing exchange.

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Raigar (2001) in his conceptual analysis of MIS and Management Science opined that though computers had of course a role to play in MIS, all computerized systems did not necessarily mean MIS nor did MIS necessarily imply computerized processing of data to create information.

Rahman (2003) reported with the purpose of the growers received low prices in Bangladesh because of lack of market information which resulted in wide intermarket price variation. Improvement of agricultural market information services was required for domestic market efficiency and to integrate domestic agricultural market with regional and international market for sustainable development of agriculture sector and to ensure country's long run food security.

Rupasena*et al.* (2008) revealed that government intervention shifted from direct intervention to indirect intervention in marketing during the postliberalization period. Paddy marketing board (PMB) was closed down and government direct purchases from farmers now operate on ad hoc basis. Now, rice trading is entirely in the hands of private sector. The government promotes private sector purchasing through forward trading. The universal rice-rationing scheme was replaced by the targeted food stamp scheme. Rice import was liberalized. The buffer stock maintained by the food department was stopped and price is being stabilized through variable tariff. Market regulation policies such as fair trading act, consumer protection act and food standards were imposed to enhance healthy competitive environment, government set up a monitoring system for market operation by establishing the food security committee, which functions as a monitoring body. The study suggested setting up an organization responsible for agribusiness promotion through a catalytic role for market information system.

Badu (2011) observed that the fast changing market environment to agriculture on account of globalization, liberalization and new economic policies made it necessary that the farming community should be provided with latest market inputs so as to enable them to reduce the price risk and to handle the new challenges posed by a fast changing market dynamics. In India, the agricultural market information was criticized for many shortcomings, the most important being the message not relevant to the needs of the farming community. The NAIP project on "Establishing and Networking of Agricultural Market Intelligence Centres in India" could not only help the farmers in reducing their price risk, but provided many developmental options. Also, the expectations are great, so are the challenges.

Kalamkar*et al.* (2014) found that the nodal agencies should decide, in consultation with the state government, the location and number of purchase centers to be set up much in advance of the marketing season. The information regarding norms, number and location of purchase centers should

be given wide publicity through media, radio, television and leaf-lets. Procurement agency should come to purchase at the start of the harvesting season, not after two weeks of theharvest. Adequate trained administrative staff should be placed at the procurement centre in order to avoid any misunderstanding between farmer and the official. The Government of India should encourage the state government to initiate MIS operations well in advance for saving the farmers in distress. The operational efficiency of purchasing agencies requirements to be toned up in the context of cost efficient purchases vis-a-vis competitive sales so as to avoid or reduce losses.

Pandy (2015) revealed that Rajasthan was the largest state of the country and also the largest producer of bajra, mustard, cumin, coriander, isabgol, etc. but still there is a lot of scope for improvement in the field of agricultural marketing not only in Rajasthan but in the whole country. Thus, to remove the gliffing of traditional marketing system and to facilitate stake holders in agricultural marketing the government has initiated APMC Act in 1960's to protect the interests of the farmers and to provide them various incentives. In 2003, the new model act got formulated in which certain shortcomings of APMC Act, 1960 were tried to be replaced with more innovative and revised rules and regulations like abolition of middlemen, full payment on same day, contract farming, e-trading public-private partnership (PPP), etc. PPP also tends to play an important role for the development of agricultural marketing infrastructure by initiating private investment. In PPP both the parties share the capital, profits and risks to work for the social welfare. The government should adopt policies to promote private investment by providing subsidy on interest rates, promoting more projects for PPP, creating awareness programmes and workshops for farmers, etc.

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Hatai, L. D. (2015) studied the existing agricultural marketing information system (AMIS) and its dissemination, in two regulated markets one in Khasi Hills and other in Garo Hills district of Meghalaya were selected purposively. Study revealed that market arrivals and prices werethe only two major types of market information documented and made available to the farmers and other intended beneficiaries in sample regulated markets. Both the regulated markets transmitted the information to AGMARKNET, Meghalaya State Agricultural Marketing Board (Portal), farmers, Department of agricultural marketing, Department of agriculture and newspaper. Farmers are unable to evaluate and document the agricultural market information due to illiteracy and poor communication ability. There is a need to revitalise of APMCs and develop a system of market information utilising the modern information communication techniques so that market information reaches timely to the end users in the hilly regions of Meghalaya.

**Comment [U8]:** Hatai and Panda, 2015. That's how it's mentioned in the bibliography.

Shalendra and Jairath (2016) revealed that E-national agricultural market has the potential to encourage integrated value chains, bring in transparency, competiveness, efficiency, reducing transaction cost, price stabilization, quick realization by the farmers and to help evolve a system at national level having integrated different service providers. The implementation of the scheme with participation from all the states will encourage balanced development of agriculture as well as harmonisation of legislative measures. The provision for assistance from the central government to improve the status of infrastructure in participating wholesale markets should be linked to the scale of operation of trade in the market to make it more fruitful. There is need for getting more and more warehouses registered under ware housing regulatory authority (WDRA) for their true integration with national agricultural market. The implementation of the concept in the light of above suggestions along with a mechanism for monitoring, supervision and evaluation by the third party with no conflict of interest with the implementing agencies may help emerge the national agricultural market as a real game changer for Indian agriculture.

Ameru*et al.* (2018) studied the existing map of Agricultural marketing information systems (AMIS), assess the challenges farmers face in their access and use and propose improvements to guide development of robust easy to use and accessible AMIS. Findings show that, a number of AMIS platforms exist in TharakaNithi. Farmers who had access to relevant information on appropriate farming methods and output marketing sold their farm produce at higher prices. Using 10% of total

land area of TharakaNithi to represent the high potential land allocated to maize and beans, we estimate that at the entire county level the financial benefits associated with access to information could conservatively be estimated at more than Ksh 200 million (US$ 2 million) per year. These benefits can potentially be scaled up with improved information dissemination because currently, over 50% of the farmers in the region lack access to various types of existing information packages. To address challenges, there is aneed for government support in development of technological and ICT infrastructure as a foundation for modern ICT based MIS.

Dlamini and Worth (2019) examined that agricultural extension is a communication network linking different stakeholders in agriculture to improve their productivity and ICT has been utilised as an extension tool for enhancing information flow between agricultural extension services and their clients. Efforts are, therefore, needed to scale up investments in physical ICT infrastructure and services across developing country. This could be realised through the implementation of interventions aimed at speeding up assimilation and adoption of improved agricultural technology and management practices of the less productive smallholder farmers. Smallholder farmers need to develop and utilize ICT based knowledge management techniques to implement strategies and interventions to transform the agricultural sector and improve their productivity.

**2.2 Dissemination and utilization of existing formal information**

Subrahmanyam and Mruthyunjaya (2000) based on their study on marketing of fruits and vegetables in Bangalore suggested the suitable dissemination of market intelligence and information through all possible means of communication for improving the marketing efficiency of fruits and vegetables.

Rai *et al.* (2001) in their study on relevance of information technology in agricultural marketing, explained the essential for developing a Farmers Agriculture Information System (FAIS) which may perhaps operated at Zonal Agricultural Research Stations (ZARSs), KrishiVigyanKendras (KVKs), Agricultural Marketing Corporations (Mandis) and Extension Centers of SAU's where farmers normally assemble for various reasons.

Gunatilke (2003) reported with the purpose of the private sector played a chief role in production and marketing in Sri Lanka, while the state sector played a supportive role in facilitating them and for the improvement of the living standards of the farmers. The market information system was completely based on private sector participation.

Yan Bo and Bu Yibio (2003) considered the agricultural marketing system in China and found that the most important information sources of Chinese farmers were other farmers, television and broadcast. The Chinese farmers were not susceptible to the price changes on future market and international market. Similar results were obtained by Rana and Astuti (2003).

Reddy *et al.* (2007) revealed that price discovery mechanism in national spot market exchange (NSME) was very transparent, farmers themselves were quoting price for their produce as against traders in traditional market. The quality characteristics of Tur crop of the farmers in Gulbarga district met the grade specification of National Spot Market. The total cost of marketing in national spot market exchange (Rs.114/q) was found to be lower than traditional spot market (Rs. 266/q).

Mahalakshmi*et al.* (2011) studied that e-Marketing system operated in an open environment having multiple stakeholders and varied structure of benefits and costs. Here a method based on the agriculture history project (AHP) technique hadbeen proposed for assessing the change in service quality in aquaculture marketing brought in by implementation of the aqua-choupal model in West Godavari and East Godavari district, Andhra Pradesh. The results show that there was significant improvement in the service quality in aqua-culture marketing due to the implementation of aqua-choupal in the study areas. The method prioritizes the service quality dimensions from die farmers' point of view along with the change in satisfaction level of those service attributes resulting from

aqua-choupal services. This information could be significantly help in improving the system as periodic evaluations can provide inputs to organizations regarding the priorities of the farmers and their current level of satisfaction of those priorities.

Reddy *et al.* (2013) revealed that price discovery mechanism in natonal sport market (NSPOT) exchange was very transparent, farmers themselves were quoting price for their produce as against traders in traditional market. The quality characteristics of Tur of farmers in Gulbarga district met the grade specifications of NSPOT market. The total cost of marketing in NSPOT exchange (Rs. 114/q) was found to be lower than traditional spot markets (Rs. 266/q). Farmers were benefitted by selling through NSPOT exchange by way of transparent transactions, lower marketing cost, better storage and warehousing facility, easy access to pledge loan payment, better mechanism, etc. Awareness programmes on selling through NSPOT exchange should be organized by the concerned agencies to encourage the farmers to make increasing use of NSPOT exchange platform for redgram sales.

Amruthaet *al.* (2015) found the use of electronics and communication technologies (ECTs) in marketing of agricultural commodities in selected districts of north eastern Karnataka. The study indicated that the illiteracy level of farmers coupled with limited access or no access to electronic devices, led to unawareness of modern electronic devices which were more accurate and within less time help in marketing process than traditional means of methods/measurements. Further, selling operation time had reduced considerably in these markets due to the use of e-balance and the e-tendering process. Thus, these electronic equipments had no direct impact on the price mechanism but alleviated the buying and selling processes. Hence, the study suggested that there is an immediate need to introduce/put to use the electronic display boards, TV display in these markets for the benefit of farmers.

Kafuraet *al.* (2016) analysed the extent of use of ICT tools by the farmers and to find out the relationship between the selected characteristics of the farmers. The study was conducted in two upazilasnamed Kapasia and GazipurSadar of Gazipur district during November to December 2014. Findings revealed that most use of different ICT tools was found low among the respondents in the study area. Television as ICT tool was found more popular among the farmers in securing agricultural information. CD/DVD and Grameenphone Community Information service were the least popular ICT tools in dissemination of agricultural information. Level of education, annual income, innovativeness, and cosmopoliteness and ICT knowledge had positive significant relationship with the extent of use of different ICT tools by the farmers while age and farming experience showed negative significant relationship.

**Comment [U9]:** What is upazilas? Please try to use an international term or explain this "upazilas"

Mishra *et al.* (2020) examined the benefits of the use of ICT services perceived by farmers for acquiring agricultural information. So, six villages from the BakshikaTalab block in the Lucknow district in 2018 was surveyed using a randomized survey with a questionnaire and interview schedule with a sample of 20 respondents from each village. Out of the 120 respondents, the study revealed that ICT tools like radio 51.67 per cent as low, T.V. 48.33 per cent as a medium, Mobile phone 51.67 per cent as medium, Internet 47.50 per cent as medium, Social media 48.33 percent as low level of benefits perceived by respondents respectively. It is concluded the there is a need for improving the awareness and infrastructure of ICT tools in rural areas.

Hoqueet *al.* (2021) conducted the study to assess the status of ICT's utilization in receiving agricultural marketing information in a selected Charland area of Bangladesh. Study revealed that almost 60% of the sampled respondents seek information related to agricultural marketing. Although a significant number of the farmers had access to different ICT tools such as mobile phones, radio, and television, the majority of them depends on peer-group farmers and the union digital center as the key sources of marketing-related information. Nonetheless, 26.58% of ownership farmers utilized ICTs for getting agricultural marketing information. Low access to electricity connection and their interrupted supply, lack of sales and customer delivery center for ICT-based tools in the rural areas,

and insufficient training and awareness building initiatives are major challenges for effective utilization of ICTs by the rural Charland farmers.

**2.3 Price forecasts and long term relationship in prices**

Ansari and Ahmed (2001) applied ARIMA modelling for time series analysis of world tea prices and industrialized countries export prices. The results of the estimated ARIMA equation imply that the information on the current period's tea price is sufficient to forecast the next periods and the industrialized countries export prices can be forecasted from information on the prices of the previous two periods. They concluded from the fitted ARIMA models that the autoregressive process generated both price series and there was no influence of external factors.

Basu and Dinda (2003) revealed that the wholesale and retail prices were strongly correlated but the co integrations setup did not support it. Thus, the high degree of market integration showed that potato markets in the state were competitive and efficient at the wholesale level. This was mainly attributed to close proximity, good communication facilities and good infrastructure availabilities among the market centers in Hooghly district of the West Bengal state.

Farmer *et al*. (2004) studied monthly unemployment of three G-7 countries which displayed explosive behaviour in recessionary periods, while there seemed to be stationary behaviour in expansions. Allowing parameters in an autoregression to vary across regimes and hence over time, can capture this feature. In this paper, they put forward a new autoregressive time series model with time-varying parameters, where this variation depends on a linear indicator variable. After the value of this variable exceeds a stochastic threshold level, the parameters change. They discussed representation, estimation and interpretation of the model.

Conejo*et al*. (2005) considered forecasting techniques to predict the 24 market clearing prices of a day-ahead electric energy market. The techniques considered included time series analysis, neural networks and wavelets. Within the time series procedures, the techniques considered comprised ARIMA, dynamic regression and transfer function. Relevant conclusions were drawn on the effectiveness and flexibility of any one of the considered techniques. Furthermore, they were exhaustively compared among themselves.

Chebbi and Lachaal (2007) in their study on agricultural sector and economic growth in Tunisia using time series co-integration techniques indicated that in the long-run all econometric sectors tended to move together (co-integration). But, in the short-run, the agricultural sector seemed to have a limited role as a driving force for the growth of the other sectors of the economy. In addition, growth of the agricultural production could not be conducive directly to non-agricultural economic sector in the short-run.

Nikhil (2008) in his study on arecanut marketing and prices under economic liberalization in Karnataka, fitted an interactive Autoregressive Integrated Moving Average Process (ARIMA) to monthly average prices of two varieties of arecanut. The ACF and PACF showed autoregressive and moving average process with seasonality component in the preferred markets. The auto correlation coefficients were significant in both the varieties which implied that there was a strong seasonality component in the error terms. By means of the model, the prices of both types of arecanut were ex-post forecasted. Accordingly, prices of both reached a peak in the month of August and declined thereafter.

Upendra and Sujan (2008) attempted to perceive the cointegration between labour productivity and money wage rates in the Indian industries. The results based on unit root tests exemplified that labour

productivity and money wage rates were cointegrated showing the existence of long run equilibrium between them.

Vasisht*et al.* (2008) studied the price behaviour in fruits and vegetable markets using co-integration and error correction analysis techniques. The empirical results on the price behaviour provided evidence of high volatility in the prices of fruits and vegetables in major markets. The findings clearly indicated that the horticultural sector in India could thrive for greater benefit of both producers and consumers only if better infrastructural facilities like storage, modern marketing infrastructure, as well as timely availability of market information, and better market intelligence are developed fast across all states.

Burark*et al.* (2011) studied that market information and intelligence were crucial to enable farmers and traders to make informed decisions about what to grow, when to harvest, to which markets produce should be sent to sell and whether to store it or not. It was found that ARIMA model of order (1,1,0) fitted the data well with lowest percentage error. The price forecasted for harvesting months April to June 2011 was Rs. 4000/q. For the impact assessment of price forecast, 26 farmers were randomly selected from two villages of Kota district, namely, Umerhedi and Khandgaun. On an average, 2.35 ha area was under coriander crop. Average price realised by the farmers before May 2011 was Rs. 2430/q ,whereas those who retained coriander and waited for forecasted price realised Rs. 3980/q (After May to June 2011). Thus, incremental income was realised to the extent of Rs. 23477/ha by the farmers who sold their produce after May 2011.

Singh *et al.* (2011) observed that market information and intelligence were crucial to help farmers in making appropriate marketing decisions, the data on monthly modal prices of basmati for period from January, 2000 to October, 2010 were analyzed by time series method. The estimated ARIMA model used to forecast the likely basmati prices in post-harvesting months and found that these would not increase significantly as compared to those during the harvesting. Based on this along with subjective review of traders' views and government policy, the farmers were advised not to store their produce and sell it immediately on harvesting.

Pant *et al.* (2015) indicated that the price series of all markets were stationary at their levels themselves. Trace statistic and maximum Eigen values test revealed that the domestic cotton markets were found to be integrated with three cointegrating equations. The estimated error term coefficients indicated that in Adoni markets of Andhra Pradesh and Warangal market of Telangana, 49 and 26 per cent of disequilibrium got corrected within a month by change in its own prices. It is also evident that the long-run price movements of Andhra Pradesh, Telangana and Gujarat markets were heavily influenced by price change in Rajasthan market. All the market pairs exhibited bi-directional causality and price information was transmitted vice versa *i.e.,* mutual influence was exerted by the markets on each other.

Kaur *et al.* (2016) indicated that weekly wholesale maize price data for the period April, 2010 to March, 2014 from five markets in India, this study examined the extent of market integration. The results from trace statistics show that there were four co-integrating vectors and four common trends, which suggested that maize markets were stationary in four directions and non-stationary in four directions. Granger-causality results indicated that Hoshiarpur market price had depicted a unidirectional causality on the prices of SBS Nagar. SBS Nagar market price had shown a uni-directional influence on the price of shown a bi-directional influence on the price of Ahmednagar. Bengaluru market price had shown uni-directional influence on the price of Ahmednagar. Ahmednagar market price had shown a bi-directional influence on the price of Bengaluru. The short-run results indicated that these maize markets were not well integrated while long-run integration was evident, suggesting that the markets did eventually move together in the long term.

Venujayakanth*et al*. (2017) examined the performance of major groundnut domestic markets viz. Kurnool (Andhra Pradesssh), Rajkot (Gujarat) and Villupuram (Tamil Nadu) in terms of market integration by using Engle-Granger bivariate co-integration test and Johansen multivariate co-integration test. The findings revealed the existence of long-run equilibrium between the markets in such a way that a 1% price rise in Kurnool market leads to 1.22% price rise in Villupuram market. Similarly, for every 1% price rise in Rajkot market, price in Villupuram market increases by 1.13%. The presence of short run disequilibria between market pairs was also captured using Vector Error Correction Model (VECM) and the findings revealed that almost 11 to 37% of the short-run fluctuations get corrected with a month. Overall, the results signified effective price transmission mechanism in the domestic markets and any further boost to the existing infrastructure will only help in improving both producer's and consumer's surpluses.

Saha*et al*. (2021) studied the market integration and price transmission during the period March 2009 to March 2019 across the wholesale markets of onion and potato using Johansen's cointegration test and Granger Causality test. In this study to test the stationarity of the price series, Augmented Dickey Fuller test and Phillips-Perron test was used. The outcomes of the study strongly supported the presence of co-integration and interdependence of the selected markets from the result of Johansen cointegration test and Granger causality test revealed the presence of bidirectional relationship among most of the markets but also there exists unidirectional relationship among few markets.

Kumar *et al*. (2022) investigated seven major onion wholesale markets in India, namely Pimpalgaon, Lasalgaon, Solapur, Pune, Bangalore, Hyderabad and Indore to explore the interdependence of wholesale prices amongst Indian onion markets. The study was conducted in all India perspective and the study period involves the seventeen years data of onion wholesale prices (January 2004 to December 2020). The Trace and Maximum Eigen-value tests results showed that the onion prices in India moves together in the long run equilibrium. As a result, it may be stated that India's onion markets are well-functioning. The direction of information flow was determined by using Granger Causality test. It was found that in few markets pairs, price transmissions were bi-directional whereas between Bangalore and Pune market, no transmission was found. The study reveals that Lasalgaon market is dominating in terms of price determination. The empirical study also recommends keeping a careful eye on diverse market behavioural patterns, since "news" in one market might have an influence on other markets due to the numerous interdependencies.

**2.4 Constraints in the existing formal information system**

Rahman (2003) reported that the existing service capability of market information system (MIS) was extremely poor in Bangladesh. The restrictions were non-availability of required information, unreliable and untimely availability of information and lack of awareness among farmers with respect to the use of available information.

Shreshtha (2003) identified duplication of efforts, lack of standardization, inadequate network for information flow, lack of coordination and integration with various agencies as some of the limitations of Market Information System in Nepal. The researcher also reported that the information service served the needs of the policy makers rather than the producers and traders.

Hoang *et al*. (2006) explored how social networks functioned as assets for people and households in the rural areas of developing countries and influenced the access to information and the benefits from research and development and provided evidence of the need for the efficient delivery of extension services and research and development interventions at the micro level.

Amrutha (2007) reported that lack of information was an entry barrier to both production and trade. Conventionally, the markets maintained information in the form of registers. The daily prices were compiled manually and written on the blackboards for the use of farmers visiting the markets. The information was disseminated through various media like radio, newspapers, blackboard display and

**Comment [U10]:** Amrutha and Hugar, 2007

community address system at market yards. The utility of market information was low among the farmers as compared to traders. The benefit derived in the form of obtaining higher price by traders was relatively higher as compared to the benefits derived by farmers.

Anavrat (2010) studied that the growers perceived Nagpur mandarin cultivation as a profitable venture, their concern for market infrastructure was valid. If the cold storage facilities were created in the market premises, it would enhance their credit standing and offer an opportunity to safeguard against distress sale. Similarly, the extent of blemished fruits mostly due to infestation of mites and thrips, etc. could be considerably reduced with application of plant protection measures at critical stages. Hence, they need to be educated on such basic but vital technical aspects affecting the fruit quality influencing the price. For most of the problems in Nagpur mandarin orchard cited by growers can be managed with timely care. Therefore, the growers concerns on credit supply for input and technology were addressed properly, the profitability of Nagpur mandarin orchards would be considerably increased.

Chauhan and Sharma (2011) revealed that the policy implications requiring attention of the planners were: lack of marketing facilities for maize grain in Himachal Pradesh itself is a major problem and farmers have to sell their produce outside state leading to higher transportation cost and/or in the hands of itinerant traders using incorrect weights and make wrong calculations. Therefore, better marketing facilities should be created, especially in the area where spring maize production is fast increasing. Huge wastage of maize residues such as stems & stubbles need conduct of research for development of alternative and more productive uses like the production of bio-compost or animal feed ingredients.

Reddy *et al.* (2013) revealed that the quality characteristics of tur crop farmers in Gulbarga district met the grade specifications of National spot market (NSPOT) market. Farmers were benefitted by selling through NSPOT exchange by way of transparent transactions, lower marketing cost, better storage and warehousing facility, easy access to pledge loan, immediate payment better price discovery mechanism, etc. Awareness programmes on selling through NSPOT exchange should be organized by the concerned agencies to encourage the farmers to make increasing use of NSPOT exchange platform for redgram sales.

Sankar and Singh (2014) studied that lack of adequate marketing facilities in the agricultural sector remained one of the most talked about bottleneck in the efforts for well-being of the agriculture dependent population in the newly formed state of Uttarakhand. The present article, with an endeavor to review the performance of the APMC Act in the state of Uttarakhand, highlights that not only the Act has failed in improving the marketing opportunities for the agricultural sector, but in reality it has squeezed the market for the general producers due to immoderate delays in institutionalizing the Act and other factors related to governance of the Act.

Renuka and Reddy (2015) studied the major causes of poor marketing of agricultural products in the Kurnool district of Andhra Pradesh, which were: fluctuations in agriculture prices and supplies (surpluses/scarcities), conflicting interests of farmers, middlemen and consumers, under-utilization and inappropriate functioning of resources such as rural warehouses, market yards, etc. Inadequate transportation, communication and information network, increased agricultural production leading to glut in the market and ultimately fall in price. Among these problems, communication played a vital role in determining the success or failure of commercialization/marketing of the agricultural produce in rural India.

Islam, R. (2017) carried the investigation with the objective of identifying major factors (constraints) affecting marketing of major vegetables from growers perspective in Bangladesh. Results of the study showed that lack of access to storage facilities was ranked the most prominent constraint followed by presence of middleman, lack of market information, inadequate access roads, lack of access to credit availability and high perishability of produce. Therefore, development of better infrastructure in the

form of storage facilities and availability of marketing information are vital for commercialization of vegetables.

Gohain and Singh (2018) studied the problems of farmers in the marketing of paddy, wheat, maize and cotton in the state of Punjab. The results of the study revealed that the most important problem identified by the farmers in the marketing of paddy and wheat was the delay in procurement of paddy in the markets followed by the deduction of payments by commission agents due to higher moisture content in the grains. However, the major problem during marketing of basmati was the exploitative practices by the intermediaries followed by lack of public procurement. The problem faced by majority of farmers in the marketing of maize and cotton was the lack of public procurement of the produce and lack of remunerative price of the crop respectively.



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