APPLICATION OF MARKET INFORMATION SYSTEM FOR MAJOR AGRICULTURAL COMMODITIES IN HARYANA(INDIA)

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. From 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, Charkhi Dadri, 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 committeeswere 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.

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

Introduction

In addition to dealing with other business functions, marketing deals with customers. The core of cont emporary marketing is developing relationships with customers based on their worth and agreement(A rmstrongand Kotler, 2010).The process of developing, disseminating, promoting, and selling products, services, and ideas i n order to facilitate easy, satisfying exchange relationships with customers in a vibrant environment is known as marketing. (Pride and Ferrell, 2003). According to Kotler and Keller (2009), If there is no demand for the company's goods and services, financial operations, accounting, and other tasks will not be as important for achieving financial success. Additionally, in the extremely fast-growing field of global marketing, where marketing is influenced by both internal and external environmental factors, market competition is increasing day by day. (Taey and Alag, 2009).Marketing managers must decide what products and services to sell, when to sell them, and how to sell them. To do this, the managers must gather precise information that will allow them to create the ideal marketing outcome. Since information has become one of the most valuable assets in assessing the competitive opposition of contemporary markets, its value has increased. The marketing managers must make decisions regarding the services to provide, the price to charge, how to market the services, and where to sell them(McLeod and Schell, 2001). In order to effectively gather, process, and disseminate the crucial information and make it available to both internal and external levels, businesses must effectively organise and improve their marketing information systems (MIS)(Panigyrakis, 2006). The marketing department of the company uses MIS to aid in its decision-making process. Additionally, the marketing information system can be a crucial tool for the entire market organisation from an administrative perspective. The process of gathering, processing, storing, and using information to improve marketing exchange and decision-making is known as a marketing information system (Nickels, 1986). Both production and trade are hampered by a lack of information. Higher incremental incomes have been found to be enjoyed by farmers who have access to better market information and changes in cropping patterns towards higher value produce. Again, people have trouble in starting trades without the right market information and lessening competition within markets. Market data can help identify potential shortage areas and can show whether prices are above or below normal seasonal trends, making it a crucial part of early warning systems for food security. According to Kotler and

Keller (2012) the marketing decision makers to recover their marketing arrangement, implementation, and task management has defined MIS as an interacting organisation of people, equipment, and events who analyse, appraise, and distribute timely and accurate information. Internal records, market intelligence, marketing research, and marketing decision support system (MDSS) are the four components of MIS. All businesses worldwide rely heavily on internal records for information such as guidelines, sales, prices, costs, register levels, receivables, payables, and other reports(Kotler, 2008). A market intelligence system is a method and a set of resources that managers use to find out about pertinent developments in the marketing environment on a daily basis (Kotler and Armstrong, 2010). Proctor (2005) asserts that in order to produce the desired and accurate results, marketing research must proceed with conviction. A collection of internal MIS applications known as the marketing decision support system (MDSS) offers computer-based tools, models, and techniques to support the marketing decision-making process (Kotler, 2006). The social and economic activities made the development process dependent on market information. Agriculture (green, white, yellow, blue, and now rainbow), industry, and information technology have all undergone revolutions in developing economies. Effective information and communication systems support commitments to sustainable productivity. The Indian government has placed more emphasis on the food, information technology, and agriculture sectors in order to achieve economic reforms and a high growth rate in production.(Dhankar, 2003).Programmes for agricultural development in developing nations achieve only partial success because decision-makers at all levels are unaware of the connections between marketing and agriculture. The concept of marketing is limited to the assembly of produce in wholesale or rural markets. While the other facets and functions of marketing, particularly as production incentives, are often underappreciated. As a result, developing better policies often involves trial and error and can be generally improved with more precise information. On the other hand, incorrect or partially true beliefs about marketing accumulate over time and are passed down from generation to generation as facts. As incomplete information worsens market imperfections and leads to inefficient and ineffective policies, a major obstacle in improving marketing efficiency can be a lack of market research findings and information. The demand for effective marketing systems grows as agricultural production in developing countries expands quickly and the food system becomes more specialised. Market intermediaries, such as wholesalers, commission agents, retailers, and brokers, require information in order to shift supplies from one market to another and modify their offerings and business procedures in order to increase their profits. An essential facilitating role for the agriculture marketing system is played by market information. It simplifies marketing mechanisms, controls the process of a competitive market, and makes marketing decisions easier. Market information helps to improve price formation and boosts the effectiveness of the marketing system. Making informed choices about what to plant, when to harvest, which market to send the produce to, and whether or not to store it, is essential for farmers. Currently, news is spread via a variety of media, including radio, newspapers, blackboard displays, and public address systems at market yards. The farmers are not sufficiently assisted in making decisions regarding the marketing of their produce by the market information that has so far been provided by these methods for selling. Farmers throughout the nation have a critical need for timely and accurate 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. The national informatics centre (NIC) and the directorate of marketing and inspection (DMI) started the process of establishing the agricultural MIS network. According to the context of global liberalisation and shifting dietary preferences among our nation's domestic population, this is likely to change future agricultural growth. APMCs typically keep track of arrival, sales, and price statistics. One of APMC's regular duties is to disseminate market information. To do this, the organisation posts market prices on notice boards and occasionally broadcasts them on All-India Radio and other media. The government created a system (AGMARKNET) to link market data on agricultural products due to a lack of traditional market information and the advent of information technology.Similar to this, the Haryana government built a network inside the state and uplinked it to AGMARKNET. All significant

agricultural produce market committees (APMC) in the state gather daily market trade data on agricultural commodities. All of the NIC's district centres are used for reporting and data entry. These data are made accessible on the NIC System in New Delhi via NICNET so that any other APMC can easily access them. Within a day, all APMCs are informed of the most recent market trends in India. The State Agricultural Marketing Board will receive price and arrival information from the Agricultural Marketing Information Network (AGMARKNET), which is based on NICNET, for analysis and local dissemination as well as for forward transmission to DMI Headquarters in Faridabad. First, during the ninth plan period, 810 AGMARKNET nodes were established in the nation. This included 735 wholesale markets for agricultural products, 48 State Marketing Boards/Directorates, and 27 DMI offices scattered across the nation (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 most 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). (The source of information is different citations).

Keeping in view the above facts, in mind the market analysis was donewith 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 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

Raigar (2001) in his conceptual analysis of marketing information system (MIS) and management science, even though computers undoubtedly play a part in MIS, not all computerised systems are MIS, and MIS does not automatically imply computerised data processing to produce 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 during the post-liberalization period, government intervention in marketing changed from direct to indirect intervention. Since the closure of the Paddy Marketing Board (PMB), government purchases directly from farmers on need basis. Trading in rice is now entirely controlled by the private sector. Through forward trading, the government encourages private sector purchasing. The targeted food stamp programme replaced the general rice rationing programme. The food department's buffer stock was stopped, and variable tariffs are now being used to stabilise prices. To promote a healthy competitive environment, market regulation policies like the Fair Trading Act, Consumer Protection Act, and Food Standards were imposed. The government set up a monitoring system for market operation by establishing the Food Security Committee, which functions as a monitoring body. The study suggested developing a company to promote agribusiness by acting as a market information system's catalyzer.

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 dynamic. 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 much earlier than the marketing season, the nodal agencies should choose where and how many purchase centres to open, in consultation with the state government. Through the media, radio, television, and leaflets, information regarding the standards, quantity, and the location of purchase centres should receive widespread publicity. The time to make a purchase from a procurement agency should be at the beginning of the harvest. To prevent any misunderstandings between the official and the farmer, the procurement centre should staff trained personnels. In order to save the struggling farmers, the Indian government should encourage the state governments to start MIS operations well in advance.To prevent or minimise losses, purchasing agencies must improve their operational effectiveness when comparing cost-effective purchases to competitive sales.

Panday (2015) revealed that Rajasthan was the largest state of the country and 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.

Hatai and Panda (2015)studied the existing agricultural marketing information system (AMIS) and its dissemination, in two regulated markets one was in the Khasi Hills and the other was in the Garo Hills district of Meghalaya. According to the study, the only two significant types of market information that were recorded and made available to the farmers and other beneficiaries in a sample of regulated markets were prices and market arrivals. AGMARKNET, Meghalaya State Agricultural Marketing Board (Portal), farmers, Department of Agricultural Marketing, Department of Agriculture, and newspaper received the information from both the regulated markets. Because they are illiterate and have poor communication skills, farmers are unable to analyse and record information about the agricultural market. The APMCs must be revitalised, and a system of market information must be developed using contemporary information communication techniques, so that market information reaches timely to the end users in the hilly regions of Meghalaya.

Shalendra and Jairath (2016) revealed that e-NAM has the potential to promote integrated value chains, bring about transparency, competition, efficiency, reduce transaction costs, stabilise prices, speed up farmer realisation, and support the evolution of a system at the national level that integrates various service providers. The scheme's implementation, with participation from all the states, will promote both the harmonisation of legislative measures and the balanced development of agriculture. To make the market more productive, the provision for aid from the federal government to upgrade the infrastructure in participating wholesale markets should be tied to the volume of trade there. To truly integrate more warehouses with the national agricultural system, it is necessary to have an increasing their number registered with the ware housing regulatory authority (WDRA).The national agricultural market may emerge as a true game changer for Indian agriculture with the help of its implementation in the light of the suggestions listed above along with a mechanism for monitoring, supervision, and evaluation by a third party without a conflict of interest with the implementing agencies.

Amer*u et al.* (2018) studied the layout of the current Agricultural Marketing Information Systems (AMIS), evaluated the difficulties farmers face in using and accessing them, and proposed improvements to develop a strong, user-friendly, and accessible AMIS. Findings reveal that Tharaka Nithi has a few AMIS platforms. Farmers who had access to pertinent information about suitable farming methods and output marketing were able to sell their produce for more money. We calculate the financial benefits of information access at the county level to be more than Ksh 200 million (US$ 2 million) per year, using 10% of the total land area of Tharaka Nithi to represent the high potential land allocated to maize and beans. Due to the fact that over 50% of the farmers in the area do not currently have access to any of the available information packages, these advantages could potentially be scaled up with better information dissemination. Government support is required for the creation of technological and ICT infrastructure, which will serve as the basis for contemporary ICT-based MIS, in order to address challenges.

Dlamini and Worth (2019) examined that ICT has been used as an extension tool to improve information flow between agricultural extension services and their clients. It was also examined that agricultural extension is a communication network linking different stakeholders in agriculture to improve their productivity. Therefore, initiatives are required to increase financial investments in physical ICT infrastructure and services throughout developing nations. This could be accomplished by putting in place interventions meant to hasten the assimilation and adoption of better agricultural technology and management techniques by the smallholder farmers who are less productive. The agricultural sector needs to be transformed, and smallholder farmers need to develop and use ICT-based knowledge management techniques to put strategies and interventions into practise and increase 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) explained the relevance of information technology in agricultural marketing and the need for creating a Farmers Agriculture Information System (FAIS) that could possibly operate at Zonal Agricultural Research Stations (ZARSs), Krishi Vigyan Kendras (KVKs), Agricultural Marketing Corporations (Mandis), and Extension Centres of SAU's where farmers typically assemble for various reasons.

Gunatilke (2003) reported with the intention that the state sector played a supportive role in facilitating them and for the improvement of the living standards of the farmers, whereas the private sector played a major role in production and marketing in Sri Lanka. The private sector played a wholly private role in the market information system.

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 price fluctuations on the domestic and international markets did not affect Chinese farmers. Rana and Astuti (2003) obtained similar outcomes.

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 environment with many different stakeholders and a wide range of benefits and costs. For evaluating the change in service quality in aquaculture marketing brought about by implementation of the aqua-choupal model in West Godavari and East Godavari district, Andhra Pradesh, a method based on the agriculture history project (AHP) technique had been proposed here. The outcomes demonstrate that the introduction of aqua-choupal in the study areas led to a significant improvement in the service quality in aquaculture marketing. The method gives priority to the service quality dimensions from the perspective of the farmers as well as the improvement in the level of satisfaction with those service attributes brought on by aqua-choupal services. As periodic evaluations can give organisations information about the priorities of the farmers and their current level of satisfaction with those priorities, this information could be a significant help in improving the system.

Reddy *et al.* (2013) revealed that the national sport market (NSPOT) exchange's price discovery mechanism was very transparent and that, in contrast to traders in traditional markets, farmers themselves were quoting prices for their produce. Farmers in the Gulbarga district produced Tur that met the grade requirements of the NSPOT market for quality. It was discovered that the overall cost of marketing in the NSPOT exchange (Rs. 114/q) was less than the cost in conventional spot markets (Rs. 266/q). Through transparent transactions, lower marketing costs, better storage and warehousing facilities, simple access to pledge loan payments, better mechanisms, etc., farmers benefited from selling through NSPOT exchange. To encourage farmers to use the NSPOT exchange platform for red gram sales more frequently, the concerned agencies should organise awareness campaigns on selling through it.

Amrutha *et al.* (2015) found the use of electronics and communication technologies (ECTs) in marketing of agricultural commodities in selected districts of north-eastern Karnataka. According to the study, farmers' low literacy levels and limited or no access to modern electronic devices made

them unaware of how much more quickly and accurately modern electronic devices can aid in the marketing process than conventional methods and measurements. The use of e-balance and the e-tendering process in these markets also resulted in a significant decrease in the time required for selling operations. As a result, although this electronic equipment made buying and selling easier, it had no direct effect on the price mechanism. The study concluded that, in order to help farmers, it is urgent to introduce/use electronic display boards and TV displays in these markets.

Kafura*et 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.During the months of November and December 2014, the study was carried out in the Gazipur district's two sub-districts known as Kapasia and Gazipur Sadar. The majority of respondents in the study area used few different ICT tools, according to the findings. Farmers preferred watching television as an ICT tool for obtaining agricultural information. The least used ICT tools for disseminating agricultural information were CD/DVD and Grameenphone Community Information Service. The extent to which farmers used various ICT tools varied depending on their level of education, annual income, inventiveness, and cosmopolitanism, while age and farming experience showed a negative significant relationship.

Mishra *et al.* (2020) examined how farmers perceived the advantages of using ICT services to acquire agricultural information. Therefore, a randomised survey with a questionnaire and interview schedule was conducted in 2018 in six villages from the Bakshi ka Talab block in the Lucknow district, using a sample of 20 respondents from each village. The study found that out of the 120 respondents, respondents perceived the benefits of ICT tools like radio at a level of 51.67 percent as low, T.V. at 48.33 percent as a medium, mobile phones at 51.67 percent as a medium, the internet at 47.50 percent as a medium, and social media at 48.33 percent as low, respectively. It has been determined that there is a need to increase ICT tool infrastructure and awareness in rural areas.

Hoque *et al.* (2021) conducted the study to determine how well ICT is being used to receive information about agricultural marketing in a particular Charland region of Bangladesh. Nearly 60% of the sampled respondents, according to the study, expressed a desire to learn more about agricultural marketing. Although many farmers had access to ICT tools like radio, television, and mobile phones, the majority of them rely on their fellow farmers and the union digital centre as their primary sources of marketing-related information. However, 26.58% of farmers with ownership used ICTs to access marketing data for their crops. Major obstacles to the efficient use of ICT-based tools include limited access to electricity connections and their intermittent supply, a lack of sales and customer delivery centres in rural areas, and inadequate training and awareness-building initiatives.

2.3 Price forecasts and long-term relationship in prices

Ansari and Ahmed (2001) applied ARIMA modelling for time series analysis of global tea prices and export prices from industrialised nations. The estimated ARIMA equation's findings imply that information on the current period's tea price is sufficient to forecast the following periods and that information on the prices of the previous two periods can be used to forecast export prices for industrialised countries. From the fitted ARIMA models, they deduced that the autoregressive process produced both price series and that no outside influences were present.

Basu and Dinda (2003) revealed a strong correlation between wholesale and retail prices, but the co integrations setup refuted this. As a result, the high level of market integration demonstrated how competitive and effective the state's wholesale potato markets were. This was primarily attributed to the market centres' close proximity, good communication capabilities, and infrastructure availability in West Bengal's Hooghly district.

Farmer *et al.* (2004) studied the monthly unemployment of three G-7 nations that showed explosive behaviour during recessions and what appeared to be stationary behaviour during expansions. This

feature can be captured by allowing the parameters of an autoregression to change over different regimes and subsequently over time. A new autoregressive time series model with time-varying parameters that is based on a linear indicator variable is proposed in this paper. The parameters change once this variable's value rises above a stochastic threshold level. They talked about how to represent, estimate, and interpret the model.

Conejo*et al.* (2005) in their study forecasting techniqueswere taken into considerationto forecast the 24 market clearing prices of a day-ahead electric energy market. Wavelets, neural networks, and time series analysis were among the methods taken into consideration. The methods that were taken into consideration for the time series procedures included ARIMA, dynamic regression, and transfer function. On the effectiveness and adaptability of any one of the techniques under consideration, pertinent conclusions were drawn. They were also thoroughly contrasted with one another.

Chebbi and Lachaal (2007) Time series co-integration techniques were used in their study on the agricultural sector and economic growth in Tunisia, and the results showed that over the long run, all econometric sectors tended to move together (co-integration). However, in the short term, it appeared that the agricultural sector's influence on the expansion of the other economic sectors was limited. Additionally, increasing agricultural production could not, in the short term, directly benefit the non-agricultural economic sector.

Nikhil (2008) in his study on arecanut marketing and prices under economic liberalisation in Karnataka an interactive Autoregressive Integrated Moving Average Process (ARIMA) was fitted to the monthly average prices of two varieties of arecanut . In the preferred markets, the ACF and PACF demonstrated an autoregressive and moving average process with a seasonality component. The auto correlation coefficients were significant for both varieties, suggesting that the error terms had a significant seasonality component. Prices for both varieties of arecanut were ex-post predicted using the model. As a result, both products' prices peaked in the month of August before falling later.

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) using techniques for co-integration and error correction analysis, researchers investigated at how prices behaved in markets for fruits and vegetables. The empirical findings on price behaviour showed that the prices of fruits and vegetables in significant markets are highly volatile. The results made it abundantly clear that the horticultural industry in India could only flourish for the benefit of both producers and consumers if better infrastructure, including storage facilities, contemporary marketing infrastructure, timely access to market information, and improved market intelligence, were quickly developed across all states.

Burark*et al.* (2011) examined that farmers and traders needed to have access to market intelligence and information in order to make informed choices about what to grow, when to harvest, where to sell their products, and whether or not to store them. It was discovered that the data fit the ARIMA model of order (1,1,0) best with the least amount of error. For the 2011 harvesting months of April to June, a price of Rs. 4000/q was predicted. 26 farmers were chosen at random from Umerhedi and Khandgaun, two villages in the Kota district, for the impact analysis of the price forecast. 2.35 ha on average were planted with coriander. Before May 2011, farmers realised an average price of Rs. 2430 per quarter, while those who held onto their coriander and waited for the predicted price realised Rs. 3980 per quarter (after May to June 2011). Thus, the farmers who sold their produce after May 2011 saw an increase in income of Rs. 23477/ha.

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 analysed 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) revealed that all market price series were stationary at their own levels. The domestic cotton markets were found to be integrated with three cointegrating equations using a trace statistic and maximum Eigen values test. According to the estimated error term coefficients, a market's own price changes were able to correct 49 and 26% of the disequilibrium in the Adoni markets of Andhra Pradesh and Warangal markets of Telangana, respectively, within a month. Additionally, it is clear that the price change in the Rajasthan market had a significant impact on the long-term price movements of the Andhra Pradesh, Telangana, and Gujarat markets. All market pairs displayed bi-directional causality, and price information was transmitted both ways, *i.e.*, the markets had mutual influence over one another.

Kaur *et al.* (2016) assessed the degree of market integration using weekly wholesale maize price data from five Indian markets from April 2010 to March 2014. The findings from trace statistics suggest that maize markets were stationary in four directions and non-stationary in four directions based on the presence of four co-integrating vectors and four common trends. Granger-causality results showed a unidirectional causality between Hoshiarpur market price and the prices in SBS Nagar. The market price in SBS Nagar had a unidirectional influence on Ahmednagar's price and a bidirectional influence. Ahmednagar's price had exhibited a one-way relationship with the Bengaluru market price. Bengaluru's price had demonstrated a bidirectional relationship with the price at the Ahmednagar market. While long-run integration was evident, suggesting that the markets did eventually move together over time, short-run results showed that these maize markets were not well integrated.

Venujayakanth*et al.* (2017) examined how well the three major domestic groundnut markets—Kurnool (Andhra Pradesh), Rajkot (Gujarat), and Villupuram (Tamil Nadu)—performed in terms of market integration using the Engle-Granger bivariate co-integration test and the Johansen multivariate co-integration test, it was determined The results showed that the markets are in a long-term equilibrium in which a 1% increase in price in the Kurnool market results in a 1.22% increase in price in the Villupuram market. Similar to this, prices in Villupuram market rise by 1.13% for every 1% increase in Rajkot market prices. Using the Vector Error Correction Model (VECM), the existence of short-run disequilibrium between market pairs was also captured. The results showed that almost 11 to 37% of the short-run fluctuations are corrected within a month. Overall, the findings indicated that the domestic markets had an efficient system for transmitting prices, and any further development of the infrastructure will only help to increase consumer and producer surpluses.

Saha*et al.* (2021) utilising the Granger Causality Test and Johansen's Cointegration Test, researchers looked at market integration and price transmission across the wholesale markets of onion and potato from March 2009 to March 2019. In this study, the Augmented Dickey Fuller test and the Phillips-Perron test were used to examine the price series' stationarity. The results of the study strongly supported the existence of co-integration and interdependence of the chosen markets. The Granger causality test and Johansen cointegration test showed that most of the markets have bidirectional relationships, but some markets also have unidirectional relationships.

Kumar*et al.* (2022)investigated the interdependence of wholesale prices among Indian onion markets, focusing on seven major wholesale markets for onions: Pimpalgaon, Lasalgaon, Solapur, Pune, Bangalore, Hyderabad, and Indore. The study spans a period of seventeen years, from January 2004 to December 2020, and was conducted from the perspective of all of India. The results of the Trace and Maximum Eigen-value tests demonstrated that the long-term equilibrium of onion prices in India moves in tandem. Therefore, it can be said that India's onion markets are in good shape. Granger

Causality test was used to determine the direction of information flow. Price transmissions were discovered to be bi-directional in a select few market pairs, but not between Bangalore and Pune. According to the study, Lasalgaon market dominates in terms of setting prices. The empirical study additionally suggests keeping a close eye on various market behavioural patterns because, because of the many interdependencies, "news" in one market may have an impact on others.

2.4 Constraints in the existing formal information system

Rahman (2003) reported that Bangladesh's market information system (MIS) had very limited service capacity. The limitations included the lack of necessary information, the unreliable and imprecise availability of information, and farmers' ignorance of how to use the information that was made available.

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 and Hugar(2007)reported that trade and production were both hampered by a lack of information. Markets traditionally kept information in the form of registers. Farmers visiting the markets could use the hand-written daily prices that were tallied and posted on the blackboards. A variety of media, including radio, newspapers, blackboard displays, and community address systems at market yards, were used to spread the information. Farmers found market information to be less useful than traders did. When compared to the benefits received by farmers, traders' benefit came in the form of getting a higher price.

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 concern 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 must 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 grade requirements of the National Spot Market (NSPOT) market were met by the quality characteristics of the tur crop farmers in the Gulbarga district. Farmers benefited from selling through NSPOT exchange thanks to transparent transactions, lower marketing costs, better storage and warehousing facilities, simple access to pledge loans, immediate payment,

etc. To encourage farmers to use the NSPOT exchange platform for red gramme sales, the concerned agencies should organise awareness campaigns about selling through the platform.

Sankar and Singh (2014) examined that the lack of adequate marketing infrastructure for agriculture is still one of the main obstacles to the well-being of people who depend on agriculture in the newly created state of Uttarakhand. In an effort to assess how the APMC Act has performed in the state of Uttarakhand, the current article demonstrates that, in addition to failing to increase the market opportunities for the agricultural sector, the Act has also decreased those opportunities for general producers as a result of excessive delays in institutionalising the Act and other Act-related issues.

Renuka and Reddy (2015) analysed the main factors that contributed to the poor marketing of agricultural products in the Andhra Pradeshi Kurnool district, including: variations in agricultural prices and supplies (surpluses/scarcities), conflicts between the interests of farmers, middlemen, and consumers, and under- and improperly functioning rural warehouses and market yards. Increased agricultural production caused by an insufficient transportation, communication, and information network led to a market surplus and, ultimately, a drop in price. Among these issues, communication was a key factor in determining whether or not agricultural products were successfully commercialised or marketed 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 challenges faced by farmers in Punjab when marketing paddy, wheat, maize, and cotton. The study's findings showed that farmers' delayed purchases of paddy in the markets, followed by commission agents' deduction of payments because the grains had higher moisture contents, were the two most significant issues they had with the marketing of paddy and wheat. But the main issue with basmati marketing was the unethical behaviour of the middlemen, which was followed by a lack of public procurement. The lack of public purchases of the crop and the undervaluation of the crop were the main issues that the majority of farmers encountered when marketing maize and cotton, respectively.

Conclusion

From the analysis it was concluded that the farmers in the districts of Karnal, Ambala, Mahendargarh, Bhiwani, and Sirsa had very little knowledge of the various aspects of market information compared to traders. None of the farmers in the chosen district had any knowledge of the produce's production, quality and scientific post-harvest handling. In contrast to farmers, traders were informed about information on these factors in addition to specifics of the produce in markets. At the village level, it was discovered that farmers' primary sources of market information were their neighbours and newspapers. Some of the farmers also used magazines and the internet to research the market. Very few farmers also relied on the market announcements and display boards. Contacts in other markets and with fellowtraders were the major source of market information to the traders of selected districtmarkets.The only two main types of market information that were recorded and made available to the farmers and other market workers were prices and market arrivals. Traditional announcements, display boards, television, and newspapers were the primary means of disseminating market information in these markets. Farmers found market information to be less useful than traders, which allowed traders to gain a disproportionately greater benefit in the form of higher prices.

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visualization and writing of the manuscript; A.B. and G.S.: visualization, supervision, review and editing.

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