Original Research Article

Information and communication technologies for marketing of horticultural crops in India

Abstract

In most developing countries, including India, agriculture is moving away from traditional self sufficiency goals (subsistence) to commercialization. In this changing scenario, an efficient marketing system is central to future growth of the sector. In the context of developing countries, it has been suggested that Information and Communication Technologies (ICTs) can play a significant positive role by improving arbitrage and reducing information asymmetries. On the other hand, there is strong evidence to suggest that potential gains are offset by socio-cultural, infrastructural and institutional bottlenecks. Horticultural crops are highly vulnerable to market fluctuations. Problems due to perishable nature of the crop are compounded by lack of storage facilities, weak infrastructure, and poor transport. This often leads to market glut and distress sale at low paying outlets. The Market Information Centre (MIC) in Kerala was established to provide vital market information to the state's fruit and vegetable cultivators. This paper describes the use of price information provided by MIC to banana cultivators for making market transactions. The study was conducted in Wayanad district of Kerala, India. Data was collected using structured schedule and in depth interviews. Information on price realized by the farmers was collected from both users and non users of information provided by MIC centres.

Key words: Banana, marketing channel, information system.

1. Introduction

Agriculture sector in India provides employment to around 58% of the workforce and contributes approximately 18% to the national Gross Domestic Product (GDP). The sector plays a key role in ensuring national food security, contributes significantly towards India's export earnings and is an important source of raw material for many industries. Agriculture sector in India showed impressive gains in production following Green Revolution in 1960s. However, by 1980s the sector registered a loss of dynamism with productivity reaching a plateau in most areas and crops. Several factors including shrinking natural resource base, decline in public investment, land fragmentation, absence of policy support, inadequate infrastructure , lack of information and supply chain inefficiencies have

constrained agricultural development in India. According to the Planning Commission (2008), improvement and strengthening is required in infrastructure, input delivery, credit, post harvest facilities, cold storage, marketing, credit, and extension services. Agricultural production and marketing in India have been further complicated by international trade agreements and change in domestic demand and consumption patterns. Globalization of agricultural trade following WTO agreements has resulted in new challenges to the sector in the form of need for new technologies, shift in production functions, pressure to improve the quality at competitive prices and to meet international standards and procedures. On the other hand, in the home front, increasing income coupled with changing in lifestyles have led to a decrease in direct consumption of food grains and a concomitant rise in the consumption of high-value items in recent years.

Horticultural crops play an important role in "improving productivity of land, generating employment, improving economic conditions of farmers and entrepreneurs, enhancing export and providing nutritional security to the people" (Planning Commission, 2007). Hence, several initiatives have been taken up by the Central and State governments in India to encourage production of high value crops (especially fruits and vegetables) to bring about diversification in agriculture, lower the risk and augment farmers' income. India is the second largest producer of fruits and vegetables in the World. Currently, the country produces 44.04 million tonnes of fruits from an area of 3.72 million hectares. Production of vegetables stands at 87.53 million tonnes from 5.86 million hectares with a 14.4 per cent share in the world production (http://agricoop.nic.in/hort/hortrevo5.htm). Marketing of fruits and vegetables in India poses a special challenge due to limited opportunities for spatial and temporal arbitrage. Fruit and vegetable cultivators are often forced to sell their produce at sub optimal prices due to small quantity, distant markets, lack of transport facilities, absence of institutions and lack of information. Hence, special emphasis is being given to setting up ICT based Agricultural Market Information System (AMIS) to support marketing of horticultural crops in the country.

India is the second largest producer of banana after Brazil, with a cultivated area of 5,29,700 hectares and production of 16,225 tonnes (http://www.krishisewa.com/articles/2011/banana.html). Important varieties of banana grown in India are *Dwarf Cavendish, Rasthali, Poovan, Ney Poovan, Nendran, Robusta, Red Banana, Virupakashi, Pachanadan, Karpuravalli, Monthan*, and *Safed Vechi Musa*

(http://nhb.gov.in/fruits/banana/ban013.pdf). The major planting seasons are June-July and October–November and the crop is ready for harvesting within 6-12 months. Banana is a popular fruit due to its low price and high nutritive value. It is a good source of carbohydrates, rich in vitamins particularly Vitamin B, easy to digest, free from fat and cholesterol. A wide variety of value added products like banana powder, chips, jam, jelly, juice, wine are made from banana and banana fibre and waste are used for making rope and paper. Kerala is the fifth largest producer of banana in India with an area of 1,04,865 hectares under banana cultivation and production of 16.820 metric tonnes per annum. Marketing is critical aspect of banana cultivation due to several factors. First, surplus production makes it mandatory to explore and seek markets for the produce as it cannot be consumed locally. Secondly, farmers have to sell the crop soon after harvesting due to poor storage facilities. Lastly, due to its short shelf life, farmers incur considerable loss unless the fruit is passed on to the consumer within a short period. The Market Information Centre (MIC) in Kerala was established for providing vital market information to fruit and vegetable farmers of the state. MIC acts as a reliable data bank for production planning, price forecasting and fixing fair prices in the farmers' markets (http://www.vfpck.org/docs/main.asp?ID=MIC). This study was taken up to find out if access to price information through ICTs leads to better prices for the banana cultivators.

2. Marketing of agricultural commodities

Hornik (1988) refers to two types of efficiencies that influence agricultural productivity; viz; technical efficiency and allocative efficiency. Both these concepts are related to the quality of information flow. Technical efficiency refers to the application of knowledge to increase productivity (usually related to access to extension agencies and other sources of agricultural information). While Hornik observes that "the failure of conventional programs to reach their audience supports the explanation that non-optimum practice reflects a poor flow of information and not an unwillingness of audiences to respond", in reality technical efficiency in the Indian context is hampered by both supply (inadequate Public Extension System) and demand (farmers' refusal to seek new information in the absence of other critical factors) issues. According to FAO (1999), more than 50% of the difference in productivity between India and developed nations (say the U.S.A) can be attributed to knowledge gap and surpasses differences in yield arising due to size of the holdings. In a

similar vein, Planning Commission, Government of India (2008) notes that the existing gap in productivity between trial and farm conditions has been due to less than optimal performance of the Public Extension System especially *Krishi Vigyan Kendras* or Farm Science Centres across the country. On the other hand, allocative efficiency refers to the ability of the farmer to manage resources to maximize economic return (specifically concerned with market related information, sources of credit and allocation of resources to various activities in the value chain).

Agricultural commodities in India are sold through a network of regulated markets owned, operated, and managed by Agricultural Produce Market Committees (APMCs). Most of the State Governments and Union Territories provide regulated markets for sale of agricultural produce. In addition, about 15 per cent of the Rural Periodic Markets (RPMs) also function under the ambit of this regulation. However, trade of agricultural commodities in India is severely hampered by variation in market fee, neglect of rural markets, absence of standards/ specifications, variation in entry tax/ octori and restrictions on storage and movement of commodities under the Essential Commodities Act (Planning Commission, 2007). Agricultural markets in India are poorly developed with significant temporal and spatial variations, resulting in skewed transactions, greater transaction costs to some farmers' and at certain locations, market frictions and distress sale especially by small and marginal farmers. It has been estimated that farm-gate price available to the farmers in India is only 25% of the retail price, whereas farmers in developed countries where more efficient marketing system is in place, get about 70% of the price (http://agmarknet.nic.in/). According to Shepherd (2011) availability of reliable market information can assist farmers reduce the risks associated with marketing, compare the prices with market prices and take decisions regarding where to sell the produce, whether to store or sell, and what to grow. While market information has several dimensions, timely price information is believed to be the most critical as it reduces information asymmetry, brings down transaction costs and increases the bargaining power of small holders who produce 41 percent of India's total cereals and over half of fruits and vegetables (Planning Commission, 2007).

Several policy documents have identified setting up and improving Agricultural Marketing Information System (AMIS) as one of the priority areas. Report of the Working Group on "Agricultural Marketing Infrastructure and Policy required for internal and external trade" for XI Five Year Plan, Government of India states that "there is a need to develop a

comprehensive 'Agricultural Marketing Information System' that can be used to deliver a package of information to assist small farmers and entrepreneurs at the village level so as to enable them to take well-informed business decisions and minimize business risks". Accordingly, several states in India have taken steps to set up ICT based AMIS to support decision making, ensure sale in high demand markets, shorten marketing channels, lower transport costs and enable fair transactions.

In India, market information is collected/ compiled by various government and semi government agencies and disseminated through display boards, newspapers, radio and TV broadcasts. Government-operated AMIS is authentic, unbiased and extends over a large time period but is not satisfactory due to time lag, absence of commercially relevant data, and lack of information on grades and measures. Market information collected and distributed by large traders is usually up-to-date but is often biased. Lastly, price information is also collected and disseminated by agribusiness firms as a part of their overall business strategy. It has been observed that both traders (small) and farmers use both formal and informal sources to gather market news and intelligence.

3. ICTs and market efficiency

The Working Group on Agricultural Extension constituted by the Planning Commission (Eleventh Five Year Plan), Government of India has recommended that there is a need to strengthen information dissemination to the farmer's through use of Information and Communication Technologies (ICTs). It is believed that their "effective deployment can lead to increased agricultural competitiveness through cuts in production and transaction costs, raising production efficiencies and farm incomes, conserving natural resources, and by providing more information, choice and value to stakeholders". Use of ICTs to create AMIS is one of the strategies being used by the government to create a level playing field and revitalize the agriculture sector. It is believed that ICTs can open opportunities for the rural poor and improve their linkages with the market by generating useful databases and information packages.

Pingali et al (2005) work on transformation of food systems in developing countries and its impact on small holders can be considered as the starting point for discussion on use ICTs for enhancing allocative efficiency. They point out that agricultural sector across the world has undergone widespread changes due to rising incomes, demographic shifts, technological

changes and globalization. This has significant implications for small farmers as they are faced with a new set of transaction costs that emerge from this altered environment. It has been suggested that the cost of market participation to small farmers can be reduced by providing market information through improved telecommunications.

The World Bank (2011) points out that ICTs can empower poor farmers with information and communication assets and services that will help them to compete in a complex and rapidly changing global market. The notion that ICTs can play an important role in increasing efficiency and significantly improve the income of farmers has led to considerable speculation and research.

In rural China, better access to price information helped farmers make better production decisions, improve agricultural productivity, and obtain a better price (Eggleston et al, 2002). Exploring the link between ICTs and poverty in rural China, Soriano (2007) concluded that telecentres can play a huge role in reducing poverty and enhancing rural livelihoods. Using a modified rural livelihoods approach, the author extends the implications of internet deployment beyond economic dimensions. Positive implications of internet can include creation of venues for community integration, knowledge sharing, and e-literacy. In the Sri Lankan context, de Silva and Ratnadiwakara (2010) found that mobile phones can significantly reduce information search costs and create greater incentives for commercialization and market participation by small holders.

In a study designed to measure the effect of market access on price realization by small holders in Uganda, Kiiza et al (2010) found that farmers who had access to information from formal channels consistently obtained higher farm-gate prices than those who obtained information from informal channels. Furthermore, it has been argued that ICT-based market information has to be promoted along with yield-augmenting agricultural seed technologies in order to ensure food security and higher income (Kiiza and Penderson, 2012). In Bolivia, farmers with cell phones have greater access to market information, which in turn effects decision regarding place of sale. Use of cell phones to access price information resulted in distant urban markets being viewed as a viable sales outlet, reduced risk and greater marketing efficiency. However, the actual benefits accrued to the farmers depend upon volume and time available for travel to distant markets. Use of cell phones has "…not fundamentally altered the sources of market information, but has widened the information network and speeded up the flow of information through it" (Amaya and Alwang, 2011). In

Kenya, use of ICT tools in general and mobile phones in particular, helped resolve the idiosyncratic market failures that smallholders face due to lack of access to market information. However, the use of ICT tools is driven by a number of farmer specific and farm specific variables, capital endowment and location variables, which necessitates tools that can be easily used by the less educated farmers (Okello et al, 2011).

In the Indian context, wide-spread use of mobile phones by fishermen led to gain in productivity, reduced risk, greater market integration, and lesser price dispersion and fluctuations. Reuben (2006), however, notes that potential efficiencies are subject to easy access to capital. Jensen (2007) arrived at similar conclusions in his study on fishermen in the same locale. While these studies look at unmediated use of mobile phones and its impact, *e-choupal* initiative of the Indian Tobacco Company (ITC) presents a case of well thought out and organised use of ICTs to improve the supply chain. This venture gives more than four million farmers information on new farming techniques and commodity prices at local and global markets. During procurement season, ITC buys the produce directly from the farmers at a competitive price which is about 2.5% higher when compared to government market. Customization to suit local conditions, leadership role played by e-*choupal* operators, trust, transparency, equitable and tangible benefits that can be traced to the use of the technology and covering all aspects of the agriculture supply chain are key reasons behind the success of the initiative (Bowonder et al, undated; Annamalai & Rao, 2003).

Several researchers have pointed out that agricultural development in the third world is constrained by several factors and ICT applications have a limited role to play. In Melur Block, Tamilnadu, it was noticed that farmers did not reap the benefits of market integration and price information due to several factors. These bottlenecks include lack of variability in prices due to government regulations, long standing relationships between farmers and middlemen, high transport costs, lack of storage facilities and locale specific preference for varieties of rice (Blattman, 2003). In the context of *e-choupal*, Kumar (2005) points out that caste affiliations, political alignments, and farm size influence access to the *e-choupal* and play an important role in the extent of increase in farmers' income. It has also been pointed out that *e-choupals* are confined to larger and more prosperous villages leading to questions regarding their reach and applicability in poorer and remote parts of rural India. She further contends that benefits to farmers are due to modifications in the

"supply chain so that farmers can exchange harvested crops for instant cash, often yielding better prices to the farmer than going to the traditional market place". In Tanzania, farmers were unable to take advantage of mobile phone-based services to seek price information and new buyers due to pre-existing credit relationships with the local buyers (Molony, 2008). Concluding her study on use of mobile phones by grain sellers in Niger, Aker (2009) says that while information (through mobile phones) is necessary for market efficiency, development (in general and of agricultural markets in particular) require infrastructure, financial services to work, power and roads in Sub Saharan Africa. In a study conducted with farmers across three states and two Union Territories in India, Mittal et al (2010) found that realising the full benefits of services delivered by mobile phones was limited by a set of constraints which apply more to small farmers. In an evaluation study of Pallinet, a mobile phone based agricultural market information service in Bangladesh, Islam (2011) noted that greater availability of information helped in reducing uncertainty and empowerment of farmers, but did not lead to relocation of agricultural produce to other more profitable markets or greater bargaining power.

The transaction cost theory indicates that market information through ICTs can result in better prices to the farmers. However, studies indicate that ICT based market information system in developing countries rarely operates under ideal conditions and is constrained by several factors. Till date, most studies in this area deal with marketing of staples or crops with long shelf life whose marketing is not unduly influenced by lack storage facilities or restricted by government regulations in India.

Perishablility is the number one risk faced by growers of horticultural crops (Chang, 2011). Do risks unique to horticultural crops influence use of market information through ICTs by farmers? If so, what effect does it have on their income? This study seeks answers to some of these questions with reference to banana cultivators in the state of Kerala, India.

4. Methodology

Present study was conducted in Wayanad district in Kerala, India. The district was selected purposively, as it has the largest area under banana cultivation (12,582 hectares) and is the leading producer of banana (75,917 tonnes) in the state (Farm Guide, 2011).

Kalapetta market is the main trading centre for agricultural commodities in the district. As distance from the market can critically influence the use of ICTs by farmers for seeking price

information, it was used as a criterion while selecting the villages. Hence, taking Kalapetta market as the centre point, the district was divided into two spatial zones (within 30 Kms and beyond). One village from each spatial zone (Vythiri and Pulpally) was selected randomly using chit method.

Banana cultivators' in the state have two marketing avenues open to them. They can either sell the crop directly to traders/ middlemen or in the farmers' market. Farmers' markets are formal and organised marketing channels. In these markets price is fixed based on data collected and disseminated by Market Information Centre (MIC) of the state. On the other hand, farmers who sell directly to traders/ middlemen get information from mass media or word of mouth. This information is often not up-to-date and price is open to negotiation during actual sale. For the study, 30 farmers selling through formal and informal channels were selected from the two villages. The final selection of respondents was based on Probability Proportionate to Size (PPS) method using size of the land holding as the criterion. In all, 120 banana cultivators were selected for the study. An appropriate number of buyers were also selected using snowballing method to study the marketing pattern of the crop.

Interview schedule comprising of closed and open ended questions was developed to collect information from the farmers and a checklist was used to interview buyers/traders. Price information from both categories of farmers was collected during the peak harvest time. Variables included for data collection are detailed in Table 1:

Table 1: Variables included in data collection tool

Categories	**Variables**
Demographic & socio-economic	Gender, age, education, caste, family size, size of the holding, irrigation facilities, occupation , income, organizational membership.
Agricultural activities	Crops grown, cropping pattern, type of farming, number of crop cycles.
Media ownership and usage	Ownership and access to conventional mass media and ICTs, purpose of use, frequency of use.
Agricultural Information	Information needs, Sources of information,

	accessibility of different sources.
Banana cultivation and marketing	Varieties cultivated, area under cultivation, harvesting, buyers, transportation, storage, price obtained.

5. Results and discussion

Sample characteristics

The majority of banana cultivators in the study area were men (88.33%). All of them were above 25 years of age and 56.66% of the respondents were above the age of 45 years. All the respondents had received formal education (at least up to middle school). More than half of the respondents (58.34%) belonged to reserved categories (Other Backward Castes, Scheduled Castes and Scheduled Tribes). Agriculture is the primary occupation for 54.16% of the respondents. However, most households also rely on a secondary source of income. Majority of farmers (65.8%) have marginal and small holdings and 53.33% of the farmers have no irrigation facilities and are fully dependent upon rain water for irrigation. Banana, coffee, ginger, cardamom, arecenut, cassava, coconut and turmeric are the main crops grown in the study area. Vast majority of the farmers (95%) were involved in commercial agriculture. Participation in formal producers' associations was found to be high (67.5%).

Media ownership and usage

Respondents had access to a wide range of conventional mass media and ICT tools. These include radio, television, daily newspaper, other print media, telephone, mobile phone and internet. Among conventional mass media, 84.16% households owned a television set, where as ownership of radio was 57.5%. A high number of households (84.16%) also subscribed to daily newspaper, which can be attributed to high literacy rate and better economic conditions in the state. Only 52.5% households had fixed landline connection. On the other hand, mobile phone ownership was 81.66%. More than half of the respondents had access to internet either at home or at internet cafes or *Akshaya* telecentres.

The respondents expressed need for a wide range of agricultural information. Price information was sought by all the respondents. Other areas in which information was

needed by the farmers include pest control (72.5%), subsidy and credit schemes (64.5%), post harvest technologies (60.8%), organic farming (59.5%), new varieties (54.16%), weather forecasting (57.5%), and cultivation practices and improved technologies (54.16%).

Banana cultivation and marketing

Nendran, Robusta, Chingan, Kadhali, Njali Poovan, Rasthali, and *Gandhakapacha* are the main varieties of banana grown in the study area. Out of these, *Nendran, Robusta, Chingan* and *Kadhali* are commercially important varieties. However, only *Nendran* and *Robusta* were cultivated by all the respondents. Extension support for banana cultivators is provided by Vegetable and Fruit Promotion Council Keralam (VFPCK). Extension activities include training programs on fertilizer application, pest control, selection of suckers and post harvest management. Three Non Government Organizations (Shreyas, Wayanad Service Society and Roista) working in the area also provide support to the farmers. They provide extension services to banana growers, especially during planting season and in intercultural operations.

Fruit is usually harvested at an interval of 5-7 days. However, during peak season, harvesting is done at shorter intervals. Harvesting starts in mid January and lasts till the first week of March. Normally, the crop is sold immediately after harvest as farmers are apprehensive about fall in prices and due to absence of cold storage facilities. Under exceptional circumstances (very low prevailing market price), harvesting may be postponed by 5-6 days.

Banana marketing follows four channels in the study area:

Channel I**:** Farmer → Village level collection centre → VFPKC Centre at Panchayat level → Wholesaler → Retailer → Consumer.

Channel II: Farmer → Village level Collection Centre → VFPKC Centre at Panchayat level → Horticorp → Consumer.

Horticorp is a government owned agency involved in retail distribution of fruits and vegetables in urban areas.

Channel III: Farmer → Village level Collection Centre → VFPKC Centre at Panchayat level → Food Processing Industries.

Calicut Chips Ltd. and Vasudeb Chips Ltd. are the major food processing units that procure raw material from the VFPCK centres in the study area. Both these firms produce value added products like banana jam, banana chips, etc.

Channel IV: Farmer ⟶ Retailer ⟶ Consumer.

Channels I, II and III are formal and organised marketing avenues and channel IV is the informal and unorganised route. At VFPCK Centres, price is fixed based on market data collected by the Market Information Centre (MIC) at VFPCK headquarters from 16 wholesale markets in Kerala and from four other states. During the peak season, each Panchayat level Collection Centre in the study area has a daily turnover of about Rupees[1] Seven lakhs and 25-30 tonnes of the fruit is traded every day. During the study period, farmers sold their crop at VFPCK Centres for Rs 22-24/- per Kg (*Nendran*) and Rs 15-17/- per Kg (*Robusta*). During the same period, wholesale buyers paid Rs 24-26/- per Kg for *Nendran* and Rs 17-19/- per Kg for *Robusta*. The average price of both the varieties in the retail market was Rs 36/- Kg and Rs Rs 25/- Kg respectively.

During the same period, famers who used informal and unorganised channel (Channel IV) received Rs 18-20/- per Kg for *Nendran* variety and Rs 13-15/- per Kg for *Robusta* variety from the retail traders. Since, price paid by the consumers does not depend upon the marketing channel, it can be concluded that farmers receive approximately 10% more when the crop is sold through organised channels where price is fixed using ICT based market information system.

The t-test was applied to measure the significance of difference in mean prices obtained by farmers using organized (hence ICTs) and unorganized marketing channels. Data was analyzed separately for the two villages. Results indicate that the price realized by the two groups of farmers was significantly different (at 5% level of significance). Further, it was found that the result hold true for both common varieties (*Nendran and Robusta*) of banana, which were tested separately.

6. Institutional arrangement for marketing

Why do some farmers sell their produce through unorganized marketing channels even though the price fixed at VFPCK Collection Centers using ICTS is significantly higher? It was found that there were several reasons behind farmers' preference for informal markets. First, farmers who sell their crop to retailers were often engaged in other occupations. As a result, returns from agriculture have limited appeal to them and they look for the easiest way to dispose off their produce. Secondly, farmers with very small holdings or small area

[1] At the time of writing (mid-June 2013), INR1 was approximately equivalent to $US0.016.

under banana cultivation harvest insignificant quantity. The enhanced price offered at the VFPCK Collection Centers does not make much difference to these farmers due to small volume. Thirdly, some farmers sell their output to the local retailer due to long standing trade relationship. Some of them may be involved in reciprocal arrangements (supply of credit and other inputs) with the traders. Lastly, some farmers were not able to spare time for other activities of the Self Help Groups (SHGs) through which the fruit is sold at the VFPCK Collection Centers. Hence, they opt for direct selling.

The VFPCK does not deal directly with individual farmers. Rather, it organizes them into Self Help Groups (SHGs), where groups of farmers work together to address their common problems and utilize opportunities following co-operative decision making. Each SHG is a voluntary group of 15-20 commercial fruit cultivators. They meet regularly to arrive at consensual decisions regarding adoption of advanced technologies, production planning, sourcing of quality inputs and credit and bargaining for prices. A group of 7 to 15 neighbouring SHGs constitute a Field Centre (FC). SHG farmers' bring their produce to these Centres for group marketing, which increases their bargaining power. The daily market price of banana collected (from different markets in Kerala and neighbouring states) by VFPCK's Market Information Centre (MIC) is used to fix the price at Field Centres. While membership to SHG entails a number of benefits to the farmers, it also requires farmers' commitment to sell their crop through VFPCK outlets and taking part in other group activities. It was found that all farmers' who used the organised channels were also members of Self Help Groups (SHGs). They were not only involved in collective marketing but had greater access to improved technologies through training programs, and quality inputs (especially planting material). Though majority of the respondents were small holders, they were able to remain competitive due to the innovative institutional arrangement. While access to market information through ICTs helped them in price fixation, trading in large volumes enhanced their bargaining potential. Due to large quantity, traders (especially wholesale merchants) also find it economical to pick up the fruit from the VFPCK Centres.

Concluding remarks

Crop diversification helps in minimizing risks, enhancing farm income, generating employment, and improving land quality. It is especially important in Third World countries where poor infrastructure and inadequate institutional and marketing facilities hinder gainful returns from agriculture. In India, government is promoting cultivation of horticultural crops as a part of overall strategy towards crop diversification. However, marketing of horticultural crops poses a serious challenge due to perishable nature of the produce, lack of storage and transport facilities. Banana is an important horticultural crop of India. This study was conducted mainly to find out if access to price information through ICTs leads to better income to the farmers.

Information and Communication Technologies (ICTs) can enhance profitability from agriculture by providing information on improved technologies and giving access to far off markets. While there are some success stories, studies also indicate that structural constraints hinder farmers' from realizing the full potential of price information available through ICTs.

In the study area, marketing of banana takes place through both formal and informal channels. In case of formal channels, price is fixed on the basis of market price information collected and distributed by the Market Information Centre (MIC). On the other hand, farmers who sell through informal channel get lower price, but prefer it due to less dependency on agricultural income and small harvest.

It was found that the price realized by farmers using formal and informal channels was significantly different. However, this difference cannot be solely attributed to use of ICTs for accessing price information. Rather, the price difference is an outcome of use of ICTs and innovative institutional framework. Farmers who sell their produce through organised channel are also members of Self Help Groups (SHG). This collective institution plays an important role in enhancing their bargaining power, providing access to improved technology and credit. While ICTs provide reliable and usable market information, the SHGs help the farmers capitalize on this information through good cultural practices, large volume, ready availability of inputs and collective decision making process. Lastly, government has played a critical role in the marketing of banana in the state by setting up ICT based market information system and encouraging formation of viable SHGs under the guidance of Vegetable and Fruit Promotion Council Keralam (VFPCK).

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