ICT as A Means for Linking Farmers to Market - A Case of Banana Cultivation in Kolhapur District of Maharashtra

Dr. Purushottam Sharma
Senior Scientist, Directorate of Soybean Research, Indore, Madhya Pradesh, E-mail: purushottamji@gmail.com
Dr. K. C. Gummagolmath (Author for Correspondence)
Assistant Director, National Institute of Agricultural Marketing, Jaipur- 302033, Rajasthan,
E-mail: kcgum123@gmail.com, Phone: 91-9314570916
Dr. Shalendra
Research Officer, National Institute of Agricultural Marketing, Jaipur- 302033, Rajasthan,
E-mail: shalendra_cpsingh@rediffmail.com
Mr.Nitish B Ghodake
Research Associate, Regional Sugarcane and Jaggery Research Station, Kolhapur, Maharashtra
Prof. Vinay B. Nandre
Assistant Professor, Padmashree Dr. D. Y. Patil Institute of Management Studies, Pune – 411044, Maharashtra
E-mail- vinaynandre@gmail.com

Abstract:

Availability and access to reliable information on different aspects of agriculture including marketing plays a crucial role in linking farmers to market. In most of the developing countries, much of the agricultural information has been found out of date and irrelevant which is many a time not applicable to requirements of farmers, eaving them with very little information or resources to improve their productivity and marketability. There are several interventions both by public and private agencies available in rural India for dissemination of information relating to horticultural crops. The interventions are using different technologies such as internet, mobile phone, radio, television, personal contacts, etc. but with a limited reach to the ultimate users leading to poor dissemination of information. Also the access to this information has not been effective among different stakeholders due to lack of awareness about the benefits of it and unwillingness to pay for the same. With this background, the paper attempts (i) to assess the information requirement of farmers in the marketing of banana, (ii) to evaluate the availability and utilization of different sources of information dissemination, and (iii) to identify factors responsible for adoption of modern ICT means for availing information. The paper has utilized primary information collected from selected banana growers from Kolhapur District of Maharashtra. The findings of the paper are based on the analysis of primary information using descriptive statistics. In addition, the logistic regression technique has also been employed to analyze the factors influencing the decision of adoption of modern means ICT for access to information. The findings of the study suggest that television, radio and mobile phones are the major ICT means used for information access. The farmers are mainly interested in prices and arrival information with regard to information on marketing. The logistic regression analysis suggests that age and monthly income are the factors that significantly influence use of ICT as a mean for information access. Efforts need to be made to popularize ICT means for information dissemination amongst young-farmers for efficient use of such means for information dissemination. This in-turn will enhance the process of linking of farmers to the market.

Key Words :
Information, Modern ICT means, Linking Farmers, Adoption, Willingness to Pay, Banana

Introduction

Agriculture is an important sector of Indian economy as it contributes about 17 percent to the total GDP and provides employment to over 60 percent of the population. Indian agriculture has registered impressive growth over last few decades. The food grain production has increased from 51 million tonnes (MT) in 1950-51 to 234 MT in 2008-09. The production of oilseeds (nine-major oilseed) has also increased from 5 MT to 28 MT during the same period. The horticultural crops have also registered an impressive growth. India stands number one and two in the production of fruits and vegetables, respectively. The total fruit and vegetable production of India during 2010-11 was 221.43 million tonnes. Banana is an important fruit crop in India and it is cultivated in India on an area of 830 thousand hectares leading to a production of 29,780 thousand tonnes. In-spite of this formidable growth in Indian agriculture, the producers are not able to realize the right value for their produce due to their weak link with the markets. One of the crucial factors is availability and access to information on various aspects. The issue may be addressed effectively by integrating the production of agricultural commodities with their efficient marketing.

Availability and access to reliable information on different aspects of agriculture including marketing will play a crucial role in linking farmers to market. Even with advent of modern ICT means, farmers are not able to access the relevant information at the right time and right place. In most of the developing countries, much of the agricultural information has been found out of date and irrelevant which is many a times not applicable to requirements of farmers, leaving them with very little information or resources to improve their productivity and marketability. There are several interventions both by public and private agencies available in rural India for dissemination of information relating to horticultural crops. The interventions are using different technologies such as internet, mobile phone, radio, television, personal contacts, etc. but with a limited reach to the ultimate users leading to poor dissemination and utilization of information. Also the access to this information has not been effective among different stakeholders due to lack of awareness about the benefits of it and unwillingness to pay for the same. With this background, the paper attempts (i) to assess the information requirement of farmers in the marketing of banana, (ii) to evaluate the availability and utilization of different sources of information dissemination, and (iii) to identify factors responsible for adoption of modern ICT means for availing information.

Methodology

The paper is mainly based on primary data collected from selected fifty banana growers from Kolhapur District of Maharashtra using pre-tested schedule structured for the purpose. The farmers have been segregated into two groups i.e. adopters and non-adopters of ICT means for access to information. The farmers utilizing one or more than one means out of phone (both mobile and landline), internet, radio and television are categorized as adopters while remaining are categorized as non-adopters. The farmer's responses to various questions related to use of ICT for access to information were obtained and recorded by personal interview with the help of structured schedule. In addition to primary data, the information from other published research work has also been utilized. The paper mainly utilizes descriptive statistics for analysis of primary information.

In addition, the logistic regression analysis is used to analyze the factors influencing the decision of adoption of ICT as a means for access to information. The model utilized for the study is as given below:

$$Y_i^* = a + \sum_{i=1}^{n} b_i X_i + e_i$$

Where, Yi*defines whether farmers adopting information from any source of ICT or not., Xi are independent variables influencing adoption of ICT means for information, β is a vector of unknown parameters, α is the intercept and εi is the error term

Based on the variables used in the present study, the model was specified and estimated to predict the likelihood or probability of the factors influencing adoption of ICT means (Ali, 2011), as follows:

$$Log(ICT\_U) = a + b_1 AGE + b_2 EDU + b_3 LAND + b_4 IRR\_L$$

$$+ b_5 INC + b_6 DIS\_MAR + b_7 GCA\_F + e_i + b_8 FAMS + e_i$$

The description of variables used in the model along with descriptive statistics and the expected directional effects of each independent variable is given in Table-1. The logit model is based on the cumulative probability function and is specified as

$$P = F(Z) = \frac{1}{(1 + e^{-(a + b_i X_i)})}$$

Where, Z determines a set of explanatory variables X; F(Z) is the cumulative logistic function; e represents the base of natural logarithms and P is the probability of success when explanatory variable has the value X. Logit models are interpreted using Odds and Odds ratios. The odds ratio indicates the multiplicative impact in the odds for a unitary change in the explanatory variable, holding other variables as constant. If the exponentiated coefficient is greater than unity, it explains that the odds are increasing and on the other hand negative value indicates that the odds are decreasing. Deviation of the exponentiated coefficient value from one indicates the magnitude of impact on the odds for a unit change in independent variable.

Table-1: Description of Variables Considered in Logistics Regress Analysis

Variable	Description	Mean	St. Deviation	Expected Sign
Dependent				
ICT_U	Use of ICT Mode for Agril Information	0.64	0.49	
Independent				
AGE	Farmers' Age (Yrs)	38.5	6.32	-
EDU	Farmers' Education (No. of years)	11.88	2.16	+
LAND	Farmers Operational Land Holding (Ha)	3.50	2.55	+
IRR_L	Proportion of Irrigated Land (%)	94.28	11.99	+
INC	Monthly Household Income (Rs/month)	9880.44	8474.35	+
DIS_MAR	Distance to Market (km)	9.34	5.36	-
GCA_FV	Proportion of GCA put to horticultural crops	10.24	11.48	+
FAM_SIZE	Family Size (No)	5.02	1.77	

Result and Discussion

General Characteristics of sample respondents in the study area are presented in the Table-2. In all 50 farmers were selected for the study, of which 32 were adopters and 18 were non-adopters. The mean age of the sample farmers was 38.5 years and adopters were found to be relatively younger (36.3 years) compared to non-adopters (42.4 years). The mean education of the sample respondents revealed that, all the respondents were educated beyond matriculation. Among the groups, education level of adopters was marginally on higher side. Similarly, the average size of land holding possessed by the adopters was higher (3.90 ha) compared to non-adopters (2.8 ha). However, the proportion of land allocated towards banana crops was found to be high in the case of non-adopters (32.14%) as against adopters ((25.64%), though in absolute terms, the size of holding was marginally low for non-adopters.

Table-2: General Characteristics of Sample Respondents in the Study Area

SN	Values	Ado-pter	Non-adopter	Over all
1.	No of Respondents	32.0	18.0	50.0
2.	Age	36.3	42.4	38.5
3.	Education (Yrs)	12.5	10.7	11.9
4.	Family size (No)	5.0	5.0	5.0
5.	Distance from mandi (km)	8.5	10.8	9.3
6.	Cultivable land (Ha/farm)	3.9	2.8	3.5
7.	Gross area under fruits (Ha/farm)	1.5	1.3	1.4
8.	Gross area under vegetables (Ha/farm)	0.8	0.1	0.5
9.	Gross area under food grains (Ha/farm)	1.9	1.2	1.7
10.	Area under banana (Ha/farm)	1.0	0.9	1.0
11	Area under banana (percent)	25.64	32.14	28.57

Information Requirement

The information requirements of the farmers in the study area on different aspects of banana cultivation and marketing were elicited and farmers were asked to give a preference in the form of rank. Farmers need information on every crucial aspect in the value chain. Hence, the information requirements are discussed under different heads in the following sections to bring the precession in the presentation of the facts.

The results on the preference of farmers with regard to information requirements on agricultural inputs are depicted in the Table-3. It can be noted from the table that, with respect to inputs, more than 50 percent of the farmers gave first priority for information on Plant Protection Chemicals followed by information with regard to quality inputs (36%) and planting material (8%). Major proportion of sample respondents (56%) gave second priority for information on Chemicals, followed by 36 percent seeking information on availability of inputs and fertilizers. While, information on availability of balanced fertilizers was given third priority by 56 percent of respondents, followed by information on price of inputs (40%) and only four percent of them sought information on implements (4%) in this category. Hence, it can be concluded that, the priority basket of the farmers contains seeking information pertaining to quality of inputs and their availability and information on price of inputs.

Table-3: Preference of Farmers with Regard to Information Requirements on Agricultural Inputs

	Order of Preference							
Inputs	**1**	**Inputs**	**2**	**Inputs**	**3**	**Inputs**	**4**
High quality suckers	4 (8.00)	Availability of inputs	18 (36.00)	Balanced fertilizers	28 (56.00)	New technology	18 (100)
PP Chemicals	28 (56.00)	Chemicals for sigatoka	28 (56.00)	Implements	2 (4.00)		
Quality of inputs	18 (36.00)	Fertilizers	4 (8.00)	Price of inputs	20 (40.00)		
Grand Total	**50 (100)**	**Grand Total**	**50 (100)**	**Grand Total**	**50 (100)**	**Grand Total**	**18 (100)**

The results on Information requirements of farmers relating to production of crops are presented in the Table-4. It is revealed from the table that, farmer's strong felt need for information was on the issues like advice on GAP (36%) and intercultural operations (56%). New varieties and plant protection issues are also found to be on priority of the farmers in the second order of preference. Most of the farmers were interested in information on fertilization and harvesting aspects.

The least preferred information was with respect to use of implements, use of polythene and how to apply pesticides. Hence, it can be concluded from results of the study that farmers are well aware about different aspects of cultivation except the advice on harvesting. Not many farmers were interested in knowing about Good Agricultural Practices due to its complexity and limited know how about it. The findings of the study were similar to the findings of other studies conducted by Meera, et. al., 2004, Metti and Devi, 2009, Narula and Nainwal, 2010. They found that, a strong need has been felt regarding

the information needs of the farmers throughout value chain.

Table-4: Preference of Farmers with Regard to Information Requirements on Production of Banana

Production	1	Production	2	Production	3	Production	4
Advice on GAP	18 (36.00)	Advice on PP Measures	18 (36.00)	Advice on proper fertilization	18 (85.71)	Advice on harvesting	18 (90.00)
Chemicals	2 (4.00)	Application of pesticides	2 (4.00)	Use of Implements	1 (4.76)	Use of implements	2 (10.00)
GAP	2 (4.00)	Inter-culture	2 (4.00)	Use of polythene	2 (9.52)		
Intercultural operations	28 (56.00)	New varieties	28 (56.00)				
Grand Total	50 (100)	Grand Total	50 (100)	Grand Total	21 (100)	Grand Total	20 (100)

The results pertaining to information requirement of farmers with respect to Postharvest management are given in the Table-5. Since, appropriate stage of harvesting and grading are prime factors in getting better price for banana, majority (56%) of the farmers sought information on harvesting time and grading practices (40%). Apart from it, information on transportation, ripening was sought by about 50 percent of the farmers. Almost all the farmers sought information on storage aspects and it was ranked third in the priory list of the farmer. Packaging and processing issues were ranked second and were on top priority of the farmers' information requirement.

Table-5: Preference of Farmers with Regard to Information Requirements on Postharvest management in Banana production

PHM	1	PHM	2	PHM	3	PHM	4
Grading practices	20 (40.00)	Packing	20 (56.00)	Storage facilities	47 (100)	Grading practices	1 (2.44)
pre-cooling	2 (4.00)	Processed products	28 (56.00)			Ripening	20 (48.78)
Proper time of harvesting	28 (56.00)	Ripening	2 (4.00)			Trans portation	20 (48.78)
Grand Total	50 (100)	Grand Total	50 (100)	Grand Total	47 (100)	Grand Total	41 (100)

The most crucial aspect in the supply chain of any crop is marketing part wherein, the realization of right price for the crop will decide the level of income of the farmers. Table-6 explains the information seeking behavior of the farmers with regard to marketing of banana in the study area. Timely, accurate and representative market information is a powerful tool in empowering of the farmers in a liberalized marketing system (Tollens, 2006).

The farmers were more interested in information on prices and international markets. Price fluctuation is the common features of perishable crops in India. Hence, 58.33 percent of the farmers wanted know about this aspect followed by alternative market available for marketing of their produce. Better marketing practices emerged as another important aspect where about 50 percent of the farmers sought the information on this issue. It revealed that, some of the farmers trying to find an international market needed this information. This is also supported by the fact that over 50 percent of them sought information on various aspects of export of banana. Interestingly, the information pertaining to price was sought by only 40 percent of the farmers in the first order of preference. Banana being one among all weather crops, farmers' priority basket of seeking information on price though received importance, but was not in the forefront.

Table-6: Preference of Farmers with Regard to Information Requirements on Marketing of Banana

Marketing	1	Marketing	2	Marketing	3	Marketing	4
Export	28 (56.00)	Alternative markets	20 (41.67)	Availability of markets	20 (41.66)	Better marketing practices	20 (48.78)
Nearby market	2 (4.00)	Local market	28 (58.33)	Price fluctuations	28 (58.33)	Certification	21 (51.22)
Price information	20 (40.00)						
Grand Total	50 (100)	Grand Total	48 (100)	Grand Total	48 (100)	Grand Total	41 (100)

The foregoing discussion on information requirement of the farmers revealed that, the factors such as, crop cultivation, input requirement, cultural practices, plant protection chemicals in general have been perceived as most important. Information relating to marketing and export has been prioritized by the farmers on issues such as price information, alternative marketing and good marketing practices. They are mainly concerned about the fluctuations in the prices and availability of markets in their

vicinity.

Sources of Information and their Utilization

As per the results presented in the Table-7, it is apparent that, farmers in the study area have access to wide range of sources of information and its use is also diverse. Television, radio and Newspaper are the sources possessed and utilized by almost all the sample farmers of adopter category, while the non adopters wherein only about half of them have utilized it though all of them possessed these sources. Access to information by the farmers through the same sources was also reported in other studies (NSSO, 2004 and Mwakaje, 2010).

Table-7: Source of Information and its Utilization Pattern

Values	Source of Information			Utilization of Information		
	Adopter	Non-adopter	Grand Total	Adopter	Non-adopter	Grand Total
Television	32 (100)	18 (100)	50 (100)	32 (100)	9 (50)	41 (82)
Radio	32 (100)	18 (100)	50 (100)	32 (100)	9 (50)	41 (82)
Mobile	31 (97)	--	31 (62)	22 (71)	--	22 (71)
Internet	8 (25)	--	8 (16)	4 (50)	--	4 (50)
Fellow Farmers	16 (50)	12 (67)	28 (56)	14 (88)	--	14 (50)
Relatives	15 (47)	10 (56)	25 (50)	14 (93)	9 (90)	23 (92)
Extension Agents	15 (47)	6 (33)	21 (42)	11 (73)	--	11 (52.4)
Private Extension	3 (9)	--	3 (6)	2 (67)	--	2 (66.7)
News paper	32 (100)	18 (100)	50 (100)	32 (100)	17 (94)	49 (98)

It is interesting to note that, more than 50 percent of the farmers till today rely on fellow farmers for seeking the information on various aspects of crop cultivation and marketing. This is true with sources like relatives, extension agents and private extension agencies. The magnitude of use of various sources is on higher side for adopters than the non-adopters except the use of private extension. Internet as a source of information was found to be not so popular among both the categories of farmers. Thus the findings of the study revealed that, despite various initiatives taken by the public and private agencies to promote ICT, the Indian farmers till today heavily rely on other conventional sources for information. Moreover, most of the ICT initiatives are technology savvy and also they are facilitated more for the operations in the functioning of either extension machinery or market level operations than the farmers.

Factors affecting the adoption of ICT means

The paper tried to identify the factors which are more likely to have influence on the decision of adoption of ICT as means of access to information. Accordingly, the logistic regression technique was used to ascertain the same and the results are presented in the Table-8. It is apparent from the table that, factors like age and monthly income have a significant influence on the adoption of ICT as means of source of information. Other variables considered for the study had non-significant influence on the adoption of ICT. The likelihood ratio test statistics revealed that, explanatory variables used for predicting the decision of ICT as means of source of information explained fairly good fit in the model (82%).

Table-8: Parameters Estimates of Logistics Regression

Parameters	Description	β	Std. Error	Sig.	Exp(β)
Intercept	2.573	8.513	0.762	13.106	
AGE	Farmers' Age	-.179**	.095	0.060	.836
EDU	Farmers' Education	.405	.279	0.147	1.500
LAND	Operational Land Holding	-.120	.352	0.734	.887
IRR_L	Proportion of Irrigated Land	-.049	.052	0.350	.952
FAM_SIZE	Family Size	-.057	.092	0.538	.945
DIS_MAR	Distance to Market	.206	.335	0.538	1.229
INC	Monthly Household Income	.000*	.000	0.036	1.000
GCA_FV	% GCA horticultural crops	.067	.044	0.128	1.069
-2 Log Likelihood	36.438				
Chi-Square	28.904 df=8	0.000			
Correct Prediction (per cent)	82.0				

* and ** significant at 0.05 and 0.10 level, respectively

Willingness to pay for ICT based information

The functioning and efficiency of any model whether it is private or PPP initiative for providing accurate information, revenue generation out of it is a crucial aspect for sustenance. Thus it is imperative that, the farmers must shell out a part of their revenue towards seeking information on various aspects of supply chain. In this regard an attempt has been made to know the willingness of the farmers to pay for the information and the results of the same are presented in the Table-9. It is revealed from the table that, 29 of the adopters and about 17 of the non adopters are willing to pay for the information. If the cost of the information is less than Rs. 30 per month, only nine of non-adopters and 26 of the adopters are willing to avail the service. If the cost of getting information is in the range of Rs.30 to Rs.50 per month, only 22 and nine of adopters and non-adopters respectively are willing to pay. When the cost of information is more than Rs 50 per month, 22 adopter and nine non-adopters are willing to avail the service. Hence, it can be concluded that, willingness to pay for the information using ICT was not uniform across the categories of the farmers. Majority of the farmers are willing to pay for the information if it is available at a cheaper rate. Hence, it is the need of the hour to create awareness among the farmers about the importance of the information. The farmers need to be educated that the payment made towards accessing the information will lead to many fold increase in the realization of the income. The identification of the factors motivating the farmers to pay for information will help in formulating appropriate strategies for promoting the ICT as means of source of information, which could not be covered under the present study.

Table-9: Willingness to Pay for Information

Values	Adopter	Non-adopter	Grand Total
Willing to Pay for Info	29	17	46
If yes, Less than 30	22	9	31
If Yes, 30-50	26	9	35
If yes, >50	22	9	31

Conclusion and Recommendations

Based on the findings of the study an attempt has been made to come up with some recommendations to enhance participation of farmers in marketing by utilizing ICT as a means of source of information. The emphasis need to be given on popularizing ICT as a means for dissemination of information because majority of the farmers in the study area are possessing modern information tools like radio, television and mobile phones. However, the farmers still rely heavily on conventional sources of information

such as fellow farmers and relatives. The study suggests that majority of the farmers are willing to pay for the information. Hence, private players should be encouraged to participate in the information dissemination initiatives basically with revenue model. The government should participate to a greater extent having its stake in such initiatives for making such services available to the end users at a reasonable rate. The logistic regression analysis revealed that the factors like age and monthly income are responsible for adoption of ICT. Considering the higher proportion of younger population and increasing rate of per capita income in India, such means can be extensively utilized for dissemination of information. Efforts need to be made to popularize ICT as a means for information dissemination of information amongst young-farmers. This in-turn will enhance linking of farmers to the market.

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