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SOURCES OF INFORMATION AND USE OF MOBILE PHONES IN MAJOR SEED SPICES GROWING STATES

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ABSTRACT

The present study attempts to know the effective sources of agricultural information and usage of mobile phones by seed spice growers. The total 450 respondents were interviewed from Rajasthan, Gujarat, Madhya Pradesh, and Uttar Pradesh during 2018-19. The results found that sixty-six percent of the respondents approached private agencies whereas forty-four percent farmers relied upon government sources. A large group of medium farmers approached to input dealers, whereas small and medium farmers preferred government agencies. Further, we found that ninety-five percent of the farmers owned mobile phones, and ninety percent of them used it to access agricultural information. Eighty-nine percent of smart phone owners were using social media platforms to share and access agricultural information. Logit analysis of socio-economic factors influencing farmers' access to information sources found that literacy considerably enhanced the likelihood in favor of government sources over private ones due awareness to various government programs and services. The size of landholding and was prime factor for contacting government agencies specially Kisan Call Centre for their queries. This paper highlight's potential role of mobile phones as a tool for information and communication to reach resources constrained geographical isolated seed spice growing areas.

Keywords: *seed spices, sources of information, mobile phone, logit analysis*

INTRODUCTION

Lack of information on weather, inputs, good agricultural practices, and market adversely affects crop production consequently farm income (Patel & Vinaya, 2021). For agriculture development in the countries, access and utilization of advanced information and communication technologies are necessary owing to a positive relationship between the increased flow of knowledge and information and agricultural development (Lwoga, 2010 and Yeragorla et al., 2021). Timely access to precise information in cost-effective manner is key to agricultural development through optimal decision making (Mittal & Mehar, 2012). The use of ICT has a crucial impact on sustainable development in agriculture and poverty reduction (Torero, *et al.,* Braun, 2006 and Mishra, 2020). Increasing and varying agricultural problems call the need for demand-driven agriculture extension system in the country (Adhigurua, 2009).

Major seed spices like cumin cultivation in the country are primarily grown in the geographically isolated areas of western and semi-arid regionsfrom the Thar desert of Rajasthan to Kutch of Gujarat. The public extension system is a challenge in the above regions. The accessibility to information viamobile phones can play an essential role in enhancing the production of seed spices in distant, isolated regions. The promotion and use of mobile phones can bridge the information gap and asymmetry among geographically isolated farmers by deliveringprécised agriculturalinformation on time (Mittal and Tripathi, 2009). Studies on the integration of ICTs in agricultural extension have sown encouraging experiences.

OBJECTIVE

To know the sources of information and use of mobile phones to formulate an effective information delivery system in seed spices

METHODOLOGY

The primary information for the study was collected through personnel interviews of 450 seed spice growers, using random sampling techniques in major seed spices growing states in India. Total 450 farmers were surveyed; a field survey of 300 farmers was carried out in Rajasthan and Gujarat during 2018-19 because these two states are the most significant seed spice producing states in the country. During 2020-21, both states jointly contributed78.80 and 70.40

percent share to the total seed spice area and production, respectively (Spice Board, India 2021). In Rajasthan,150 farmers covering major seed spice growing districts, namely, Jodhpur, Jaisalmer, Barmer, Sikar, Nagaur, Dungarpur, Udaipur, Kota, Baran, and Jhalawad, were interviewed. In Gujarat, 150 farmers from Banaskantha, Patan, Mehsana, Junagadh, Rajkot Surendranagar, and Kheda districts were surveyed. Other than the field survey, 150 trainees of farmer attended a farmer's training program at ICAR-National Research Centre on Seed Spices, Tabiji, Ajmer (Rajasthan). The trainee farmers were from Madhya Pradesh, Maharashtra, Uttar Pradesh, and Rajasthan. The descriptive statistical analysis was carried out to know the demographic profile of the respondents like age, education, landholding, family size, etc. Logistic regression was employed to assess the influence of above socio-economic factors on farmers' choice to approach either government or private sources of information and know if he contacted Kisan Call Centre (KCC) for his problems.

Binary logit model

Logit models have been used extensively in studying the adoption behavior of farmers (Adeogun *et al.*, 2008; Aswathy & Joseph, 2020). It is employed when the dependent variable is dichotomous, taking the value 1 with a probability of success (p), or the value 0 with the probability of failure (1 - p). Therefore, logit regression was used to explain the relationship between dependent variables, i.e. farmers' choice to government (KVKs, Agri. Dept., Ext. Officer) or private (input dealers and other farmers) sources and explanatory variables age, education and landholding of the farmer.The logit model is specified as follows

$$P_i = P(Z_i) = P(\alpha+\beta Xi\ ) = \frac{1}{(1+e^{-Zi})}$$

Where,

P_i is the probability that the respondent asses to the source of information given X_i;

X_i represents the i^{th} explanatory variables; and α and β are parameters to be estimated.

The logistic model could be written in terms of the odds and log of odds, which helps to understand the interpretation of the coefficients. The odds ratio implies the ratio of the probability (P_i) that an individual would choose an alternative to the likelihood ($1-P_i$) that he/she would not choose it (Gujarati *et al.*, 2012 and Kumar, 2020).

$$(1 - Pi) = \frac{1}{(1+e^{Zi})}$$

The odds ratio is expressed as

$$\frac{Pi}{1-Pi} = e^{Zi}$$

Taking the natural logarithms

$$Zi = Ln\ (\frac{Pi}{1-Pi}) = Zi = \alpha+\beta iXi$$

If the disturbance term e_i is taken into account, the logit model becomes

$$Zi = \alpha + \sum_{i=1}^{n} BiXi + ei$$

RESULTS AND DISCUSSION

Socio-demographic particulars of the surveyed seed spice farmers are given in table 1. The average age of the respondents was 46 years, and the average landholding was 2.38 ha. Rajasthan respondents were comparatively younger than Gujarat and trainee farmers. The average land holding in Rajasthan was higher (3.51 ha) than Gujarat (2.38 ha) and trainee (1.54 ha) farmers. On average, respondents completed their formal school education of 9 to 10 years. Farmers who attended a training programme at ICAR-NRCSS Ajmer were the highest educated, with more than twelve years of education. As per the 2011 census literacy rate in Gujarat (69.1%) is higher than Rajasthan (60.4%)(Govt. of India, 2021) but surveyed growers in Gujarat possessed less education than Rajasthan farmers. As per the agriculture census, 2015-16, small and marginal holdings taken together (0.00-2.00 ha.) constituted 86.08% of the total holdings at the country level. In the present study, only 65 percent of the respondents were small and marginal, indicating relatively more extensive land holding among seed spice growers. Semi-medium and medium farmers constituted 23 and 20 percent respondents with 2.7 and 5.9-hectare average landholdings. Only six out of 450 farmers were large farmer shaving more than 10 ha of land. Large farmers were relatively older indicated decreasing landholdings. In India, the average size of operational holding has declined to 1.08 ha. in2015-16 as compared to 1.15 in 2010-11.Younger farmers (less than 40 years) were found most educated with the most minor holding size, which shows an increasing literacy rate and decreasing holding size in the country. Our acreage has remained almost 140 million hectares, and farmers has increased from 7 to 15 crore since the 1970s.

Table 1: Demographic profile of respondents

Category	No. of farmers	Age (in years)	Land holdings (in ha)	Education (in years)
State-wise				
Gujarat	150	47	02.08	07
Rajasthan	150	42	03.51	09
Trainee farmers	150	48	01.54	12
Landholding wise				
Small & Marginal (upto 2 ha)	294	44	01.02	09
Semi medium (2-4 ha)	81	44	02.69	09
Medium farmer (4 to 10 ha)	69	45	05.92	08
Large farmer (>10 ha)	06	56	22.88	11
Age group wise				
<40 years	164	30	02.18	11
40 to 60 Years	219	49	02.44	08
> 60 Years	67	66	02.69	06

Agriculture extension services (AES) play a crucial role in farm productivity, output, and farm earnings (Birthal, 2015), technology diffusion (Feder and Slade, 1986), knowledge acquisition (Feder and Slade, 1984), and technology adoption (Cotlear, 1986). Indian public agricultural extension system has played a key role in witnessing Green Revolution in the 1960s noticed a shrinking role by the end of the 1970 (Babu, 2013 and Gulati, 2018).

Respondents were inquired about the source of information in seed spice cultivation. Most farmers (66%) gathered data from input dealers, followed by KVK's (25%). Four percent of the seed spice growers replied that they got information from the agriculture department, and two percent farmers from Extension workers and other farmers each. A study in 2004 found that public extension (including the KVKs) reached only 6.4 percent of the farmers, who instead mostly got their information from other progressive farmers, input dealers,and mass media (Hans & Zhou, 2012).Most of the field surveyed farmers in Gujarat (84%),and Rajasthan (81%) approached the input dealers to get information on pest and diseases management and other crop-related problems. On the other hand, sixty-two percent of the trained farmers accessed agricultural information from KVK's indicates that trained farmers had more preference and access to government agencies than to the private source of information due to higher education level and more awareness about AES (Table 2).

Table 2: Source of information adopted by respondents

(n=450)

Source	Overall (%)	Gujarat (%)	Rajasthan (%)	Training (%)
Agri. Dept.	04	09	02	01
Ext. Officer	02	04	01	0
KVK	25	02	09	62
Other farmers	02	01	07	0
Input dealers	66	84	81	34

A large amount of advanced production technologies is available with institutions like ICAR research centres, SAU's, and State Agri. Department and other government offices need to be passed from Lab to farmer's field. Weaker linkages between farmers and extension agencies are the major obstruction in using new technologies in developing countries (Lwoga, 2011). The scarcity of extension staff in the country is one of the major constraints in AES. As per the report, in 2012-13, one extension functionary served 1162operational holdings against recommended 1:400 in hilly areas, 1:750 in irrigated areas, and 1:1000 in rain-fed regions of the country. Input dealers were providing manipulated information on the specific issue in the particular crop raised by the farmer (NSSO 2005).

Table 3 presents the accessibility of farmers to different sources of information according to the size of landholdings. Medium farmers mostly depended on input dealers (90%) against small and marginal (S&M) farmers. S&M farmers were found to frequent KVK's to collect agricultural information more frequently. Large farmers in the study area sought information from input dealers mainly. The finding suggests that more comprehensive coverage of farmers by government agencies using ICT tools and mobile-based applications will decrease the dependency of farmers on a private agency.

Table 3: Landholding wise accessibility to different source of information (in percent) (n=450)

Sources of information	Small and Marginal	Semi medium	Medium	Large
Agri. Dept.	03	07	07	0
Ext. Officer	02	01	01	0
KVK	30	22	01	17
Other farmers	03	0	0	0
Input dealers	60	70	90	83

Use of ICT tools and mobile phones by seed spice growers

Reforms in AES are highly admirable, and the use of ICT tools in agriculture is imperative, having great potential to link farmers with sources of information. Digital transformation creates more opportunities for mobile phones as the fastest and cheapest source of information. Increasing availability (36.5% in 2018 increased to 61.8% in 2020 and 67.6 % in 2021) with increasing growth in the use of smart phones in rural India suggests it is the best channel to reach farmers (Mittal, 2010 and Gulati,2018).

In present study it was found that 95 percent of the farmers had mobile phone. Moreover, 41 per cent of the surveyed farmers possessed smart phones (Table 4). Among trainee farmers ninety seven percent possessed mobile phones and more had of smart phones. The results are encouraging to promote mobile extension in these crops. Farmers with basic phone can be provides with text and voice massages whereas farmer's with smart phone can download mobile app namely Seed Spices Info developed by ICAR-NRCSS.

Table 4: Possession of mobile phones by surveyed farmers (n=450)

Category	Possession of mobile	No. of farmers	Per cent share
Overall	Do not have mobile phone	24	05
	Have basic mobile phone	241	54
	Have smart mobile phone	185	41
Gujarat	Do not have mobile phone	12	08
	Have basic mobile phone	87	58
	Have smart mobile phone	51	34
Rajasthan	Do not have mobile phone	07	05
	Have basic mobile phone	84	56
	Have smart mobile phone	59	39
Training	Do not have mobile phone	05	03
	Have basic mobile phone	70	47
	Have smart mobile phone	75	50

On investigating the use of social media by smart phone owner it was found that 91 percent of the seed spice growers were active on social media, highlighted the scope of such platforms to disseminate seed spice information. In training group, all the participants were accessing the information through SM platforms (Table 5). Young farmers were comparatively more active on SM compared to aged one, indicates the increasing scope in years to come. Mittal and Mehar (2012) found that use of mobile phones helped farmers to access market information. Farmers (87.2%) feel that they are better connected to the markets, 71.7% of the farmers had better access to the price information after the introduction of mobile phones.

Table 5: Use of social media by respondents posses smart mobile phones (n=450)

Category	Have smart phone	Use Social Media (Per cent)
Overall	185	91
Gujarat	51	86
Rajasthan	58	86
Training	76	100
Small & marginal	121	92
Semi medium	29	83
Medium	30	93
Large	05	100
Age <40	98	94
Age 40-60	74	89
Age> 60 years	13	77

Forty nine percent farmers were receiving SMS related to market price, weather forecast, pest and disease forewarning, good agriculture practices etc. Coverage of SMS services was more in Gujarat, where more than half of the surveyed farmers were receiving text or voice messages. In Rajasthan, comparatively less seed spice growers were receiving informative messages. Trainee farmers had better access to information over mobile phones because they were more aware of the use of mobile phones in agriculture. S&M farmers had relatively better access to SMS service providers in the present study. Similar results were also found by Mittal and Mehar (2012), showing that mobile phones possession by small and marginal (S&M) farmers has increased over the period. Young seed spice growers were more registered with service providers than old farmers (Table 6). The findings highlighted the scope to use SMS service to disseminate agricultural information.

Table 6: Farmers receiving agricultural information via text or voice messages (n=450)

Category	No. of the farmer having mobile phones	Farmers receiving SMS	Percent share
Overall	426	209	49
Gujarat	138	71	51
Rajasthan	143	32	22
Training	145	106	73
S&M	283	147	52
Semi medium	74	31	42
Medium	67	24	36
Large	06	04	67
Age<40	160	83	52
Age 40-60	215	96	45
Age> 60 years	59	30	51

An enquiry was made among respondents regarding training on the use of ICT tools in general and mobile phones in particular. Findings revealed only 9 percent of the 450 respondents had attended any training programme or lecture on the mobile phones as source information in agricultural business. In the trainee group, 28 percent of participants attended such technical training resulted in higher uses of mobile phones as an information source by this group (Figure 1). The results suggested that trainings are needed for the effective utilization of mobile phones in agriculture. ICAR has developed 117 mobile apps (till June 2018) that could be effectively utilized (ICAR, 2018), provided farmers are imparted with technical guidance.

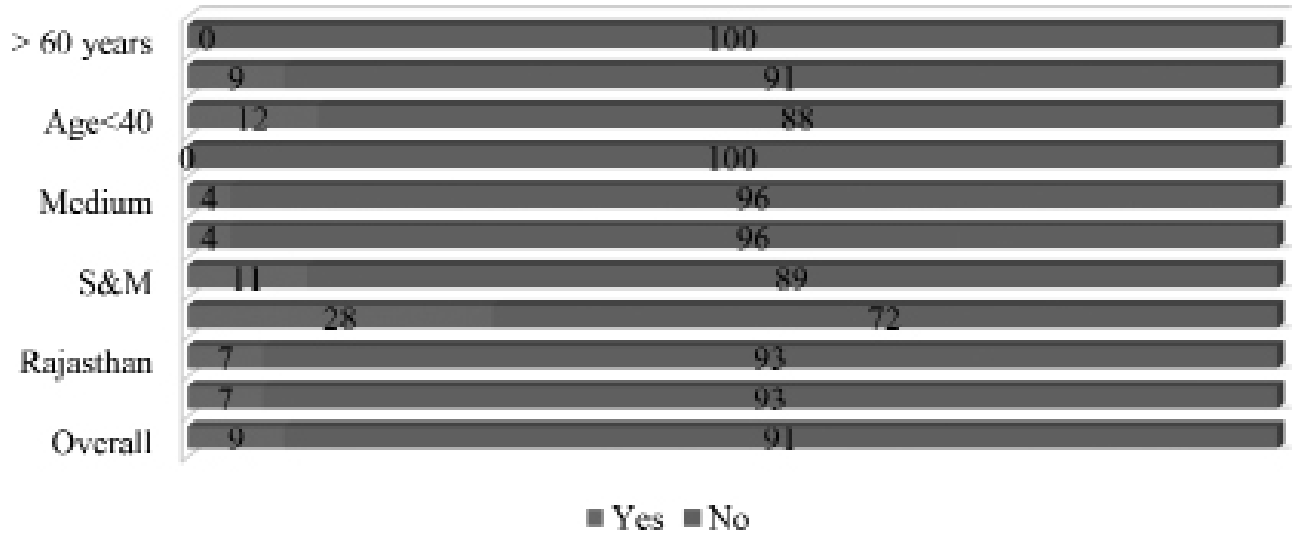

Fig. 1: Percent share of farmers received training on the use of ICT tools in agriculture

The respondents were asked to know whether they contacted Kisan Call Centre (KCC) to get solution on agricultural problems. Out of 450,only 175 farmers contacted KCC. Farmers from Rajasthan contacted KCC more frequently than Gujarat. More of trainee farmers (60%) contacted KCC (Table 7). S&M farmers were found more frequent than big farmers. Older farmers (above sixty years) were less frequent to contacted KCC.

Table 7: Number of farmers contacted Kisan Call Centre

(n=450)

Category	Yes	No
Overall	175	275
Gujarat	21	128
Rajasthan	63	87
Training	91	60
S&M	124	170
Semi medium	22	59
Medium	27	42
Large	02	04
Age<40	69	95
Age 40-60	82	137
Age> 60 years	24	43

Farmers were also asked if they contacted experts from agriculture dept./KVK/ICAR institute or other government agencies to get information on cultivation of seed spice. Forty five percent replied that they contacted experts either on phone or physically. Seed spice growers in Rajasthan contacted more than Gujarat farmers. In trainee group, two-third of the participants contacted experts to seek information about good agriculture practices in seed spices (Table 8).

Table 8: Number of farmer contacted experts

(n=450)

Category	Yes	No
Overall	201	249
Gujarat	38	112
Rajasthan	64	86
Training	99	51
S&M	141	153
Semi medium	31	50
Medium	26	43
Large	3	3
Age<40	74	90
Age 40-60	104	115
Age > 60 years	23	44

Socio-economic factors influence farmers' access to sources of information

Various studies on technology adoption behavior of farmers attempted to measure the influence of socio-demographic factors like age, education, size of landholding, etc. using Logistic regression (Kenneth, *et al.,* 2005; Keelam, 2009, Seyyed, 2012, Farid *et al.,* 2015 and Njabulo, 2018). Here farmers' decision to approach government or private sources was regressed against socio-economic factors viz; age, education level, and size of land holdings of the respondents. The dependent variable took value 1 if farmers approached government sources, namely, Krishi Vigyan Kendra's (KVK), State Agriculture Department, or other government agencies; otherwise, 0 was assigned for private sources like input dealers and other progressive farmers. Table 9 depicts the results of logistic regression. Farmer's land holding and education level played signification role in selection of sources of information. There was inverse relationship between size of land holding and farmers approach to government sources. A unit increase in land holding probability in favour of farmers' approach to government sources decreased by 0.03 units, indicating that comparatively large farmers preferred private sources over government sources. , The education level of farmer, had a significant favourable influence on the adoption of government sources. If farmer's education increased by one-year probability to opt for government sources increased by 0.01 units. It indicates that more educated farmers had more probability to approach government sources.

Table 9: Results of logistic regression; dependent variable-sources of information (n=450)

Variable	Coefficient (β)	Std. Error	z-Statistic	Prob.	Exp (β)
C	-1.35	0.50	-2.70	0.01	0.26
Land holding (ha)	-0.03	0.01	-3.20	0.00	0.97
Education (in yrs)	0.08	0.02	3.41	0.00	1.08
Age (in yrs)	0.01	0.01	1.00	0.32	1.01
LR statistic (3 df)	28.10	McFadden R-squared		0.047823	

Logit analysis was employed to knowhow socio-economic factors influence the farmer's decision to call KCC. Dependent variable took value 1 for the farmers who called KCC to get information on seed spices, otherwise 0. The education level of the farmers played a significant role in making the call to KCC (Table 10). The odds in favor of making the call to KCC increased with education. More educated farmers contacted KCC frequently than less-educated farmers due to awareness of KCC among knowledgeable farmers.

Table 10: Results of Logistic regression; dependent variable- Contact to KCC (n=450)

Variable	Coefficient	Std. Error	z-Statistic	Prob.	Exp(β)
C	-0.94	0.45	-2.08	0.04	0.39
Land holding (ha)	0.00	0.00	-0.71	0.48	1.00
Education (in yrs)	0.07	0.02	3.42	0.00	1.07
Age (in yrs)	0.00	0.01	0.30	0.77	1.00
LR statistic (3 df)	**14.28**	**McFadden R-squared**		**0.02**	

CONCLUSION

In this paper, we investigated the sources of agricultural information to seed spice farmers in major growing states of India during 2018-19. We found that most of the farmers frequently contacted local input dealers than government agencies for information on various aspects. We observed that the majority of farmers owned a mobile phone, and out of that nearly half answerers had smart phones. Through logit analysis, we infer that education and landholding were crucial factors for the farmers, who relied on the government sources and agencies due to their awareness of government schemes and services. We further suggest the need to promote mobile phones in agricultural extension because of accessibility to farmers and ease of the diverse applications.

CONFLICT OF INTEREST

The authors of the paper declare no conflict of interest

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