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Constraints Faced by Maize Farmers of Tamil Nadu in Use of Smartphone for Accessing Agricultural Information

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study was carried out to analyse the constraints faced by maize farmers of Tamil Nadu in use of smartphone for accessing agricultural information, and to elicit strategies for improving the smartphone usage among maize farmers. Ex- Post Facto Research Design. The selected districts for the study were Perambalur and Cuddalore based on maximum area under maize cultivation. Two blocks were selected from each district, and from the selected blocks, two villages were

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selected for the study based on maximum area under maize cultivation. The study was conducted during June 2023. Totally 120 respondents were selected for the study based on simple random sampling technique. The responses of the respondents were subjected to frequency and percentage analysis. The constraints were grouped into two categories viz., hardware constraints and software constraints. The suggestions were grouped into three categories viz., hardware strategies, software strategies, and training needs. Most of the respondents reported that the major hardware related constraints were high cost for repair and maintenance of smartphones (70.83%), high data tariff (66.67%), and less knowledge and skill in using smartphone (57.5%). The major software related constraints were less availability of location-specific information (85.00%), information not updated (81.67%), receiving unreliable forward messages (71.67%) and less awareness on agricultural mobile apps/web portals (69.17%). The major strategies suggested by the farmers for improving smartphone usage were provision of assistance by the government to purchase high end smartphone (91.67%), sale of farmer friendly data packs (79.17%), adding voice recognition facility in mobile apps (98.33%), developing maize specific mobile apps (97.50%), developing knowledge of farmers on downloading and operating different apps and portals related to agriculture (99.17%) through method demonstration and trainings. Most of the farmers faced high cost for repair and maintenance of smartphones, high data tariff, and less availability of location-specific information as major constraints. To overcome these constraints State Department of Agriculture may consider providing assistance to farmers to purchase high end smartphones. Farmer friendly data packs and Location specific contents will also enhance smartphone usage behaviour among farmers.

Keywords: Smartphone; ICT; agricultural information; maize farmers; mobile apps.

1. INTRODUCTION

India is the fifth largest producer of maize in 2020 as per FAO data and India's share in world production accounted for 2.59 per cent in the same year. According to the Press Information Bureau (Feb. 14, 2023) of GOI, production of maize in the country during 2022-23 is estimated at (record) 346.13 lakh tonnes, which is higher by 8.83 lakh tonnes than the previous year's production of 337.30 lakh tonnes. Therefore, maize production, processing and marketing can greatly benefit through digital media and tools [1,2].

Digital media facilitates knowledge sharing and networking among farmers, extension agents, researchers, and experts. Social networks of farmers are constituted by different human actors, such as other farmers, advisors, researchers, input suppliers, traders and processors [3]. According to FAO (2018), in India, 85.0 per cent of the farmers are small and marginal farmers. The spread of mobile technologies, remote-sensing services and distributed computing are already improving small holders' access to information, inputs, market, finance and training. Digital technologies are creating new opportunities to integrate small holders in a digitally driven agrifood system [4,5].

Rapid advancements in mobile and internet technology have opened new avenues for farmers to acquire real-time information on weather patterns, market trends, crop management techniques, and government schemes. Smartphones, with their internet connectivity and diverse applications offer a convenient and accessible platform for farmers to access these resources right at their finger-tips. Digital transaction is another main reason why smartphone and internet penetration in rising in rural India [6,7].

The constraints to the use of mobile apps are high cost of phones, poor network, poor power supply, high cost of airtime and complexity in operating phones [8]. Lack of service centre and expensive mobile were also major constraints faced by farmers [9]. Poor linkages among knowledge intermediaries, high-cost mobile phone and running cost were the major constraints in use of mobile phone in agricultural information dissemination [10]. High cost of ICT gadgets like smartphones, computers etc., and high cost of servicing charges of ICT gadgets were the major constraints in usage of ICT tools by farmers [11]. Even though mobile phone has a tremendous penetration in rural areas and has several advantages, still many farmers face many difficulties in using smartphone for accessing agricultural information [12].

Hence, this study was carried out to find out the constraints faced by maize farmers in using smartphone for accessing agricultural

information, and to elicit strategies for improving the smartphone usage among maize farmers.

2. METHODOLOGY

The study was conducted in Perambalur and Cuddalore districts which were selected based on maximum area under maize cultivation. From each district, two blocks were selected for the study based on maximum area under maize cultivation. The selected blocks were Veppanthattai and Veppur from Perambalur, Mangalur and Nallur from Cuddalore district.

Among the selected blocks, two villages from each block were selected for the study based on maximum area under maize cultivation. The selected villages were Veppanthattai and Noothappur from Veppanthattai block, Perumathur and Keelapuliyur from Veppur block, Mangalur and Ma.Podaiyur from Mangalur block, and Periyanasalur and Kattumailur from Nallur block. From each block 30 farmers were selected using Simple Random Sampling method by which totally 120 respondents constituted the sample size.

Respondents were asked to express the constraints in using smartphone for accessing agricultural information and the responses were grouped and percentage analysis was carried out to analyse the constraints. Similarly, strategies from the respondents were also recorded and analysed using percentage analysis. Level of importance of the constraints was measured on a dichotomous response pattern of 'Yes' or 'No' with scores of 2 or 1 respectively.

3. RESULTS AND DISCUSSION

3.1 Constraints Faced by Maize Farmers in Use of Smartphone

I. Hardware

From Table 1 it is observed that majority (70.83%) of the respondents expressed high cost for repair and maintenance of smartphones as their primary constraint in use of smartphone, followed by high data tariff (66.67%), less knowledge and skill in using smartphone (57.50%), poor mobie network connectivity (40.83%), smartphones are expensive (24.17%) and non- availability of mobile service centres (19.17%).

High cost for repair and maintenance of smartphones, and high data tariff were the major constraints, because farmers operate on tight budgets and may struggle to afford the high costs associated with smartphone repairs and monthly maintenance. Farmers depend on mobile technology to access weather forecasts, market prices, agricultural information and to communicate with buyers and suppliers which may be disrupted and might lose access to critical information during smartphone breakdown, which can impact their decision-making and productivity. In rural areas, access to reliable and affordable smartphone repair services may be limited. Farmers might have to travel long distances to find a service centre, incurring additional costs and inconvenience. High data tariff can limit farmer's ability to access online resources, agricultural apps, and websites that provide valuable information. Farmers may miss out on opportunities to enhance their productivity and efficiency.

More than half of the respondents had expressed less knowledge and skill in using smartphone because of less education and less technical exposure. This limits their ability to utilize communication apps like messaging or email, restricting their access to vital networks and support. The fear of making mistakes or not being able to fully utilize the device may lead to resistance towards incorporating smartphones into their farming practices. Remaining 42.50 per cent of the respondents expressed that less knowledge and skill in using smartphone was not a constraint, may be because they are educated and well exposed to using smartphones.

Poor mobile network connectivity was a constraint stated by a large percentage of the respondents because this hinders their ability to access real-time agricultural information such as weather forecasts, market prices, crop management techniques, and government schemes, leading to lack of timely and relevant information for decision-making. The frustration caused by unreliable connections might lead to reluctance in adopting digital tools. More than half of the respondents conveyed poor mobile network connectivity was not a major constraint for them in using smartphone because they have better connectivity.

II. Software

From Table 1 it is also seen that more than three-fourth (85.00%) of the farmers had stated

that less-availability of location specific information as their major problem, followed by information not updated (e.g., Seed stock position, fertilizer stock position, etc.) (81.67%), receiving unreliable forward messages (71.67%), less awareness on agricultural mobile apps/web portals (69.17%), non-availability of agricultural information in regional languages (66.67%), complicated procedures in availing government schemes through app (63.33%), multiple steps involved to access information causes frustration (61.67%), security threat due to downloading mobile apps (48.33%), and less knowledge on downloading mobile apps (46.67%).

More than three-fourth of the respondents had expressed less-availability of location specific information as their major software constraint, because agriculture is highly location-dependent and farmers require precise and tailored information to make informed decisions about their crops, soil, weather conditions and local markets.

More than three-fourth of the respondents expressed information not updated (e.g., Seed stock position, fertilizer stock position, etc.) as a major constraint, because farmers using smartphones for agricultural purpose are in need of timely and accurate information like weather forecast, market dynamics, pest and disease outbreaks, etc., for making informed decisions in farming practices like crop management, pest control, irrigation scheduling and market strategies.

Nearly three-fourth of the respondents informed that receiving unreliable forward messages as their major software constraint, because unreliable messages lead to sub-optimal decisions and negative consequences for their crops and livelihoods. It is time-consuming for farmers to find useful and accurate agricultural information.

Two-third (66.67%) of the respondents expressed non-availability of agricultural information in regional languages as a major constraint, because lack of agricultural information in their regional language creates a language barrier, hinder their ability to access and comprehend the information provided, lead to incorrect implementation of agricultural practices, resulting in potential crop losses, discourage farmers from using agricultural apps and websites.

About two-third of the respondents reported complicated procedures in availing government schemes through app as a constraint, because the complicated procedures deter the farmers from utilizing the available resources effectively.

Multiple steps involved to access information causes frustration was a major constraint expressed by majority of the respondents, because the time-consuming process, technical complexity, and limited patience cause frustration.

Nearly half of the respondents expressed security threat due to downloading mobile apps as a constraint, because mobile apps can present various security risks, and farmers need to be cautious about the apps they download and use to protect their data, personal information, and overall digital safety.

Less knowledge on downloading of mobile apps was a constraint reported by nearly half of the respondents, because they have limited awareness of available apps, limited exposure to technology, language barrier hinderance, fear of misuse, and lack of guidance.

3.2 Strategies for Improving Smartphone Usage by Maize Farmers

I. Hardware

The data presented in Table 2 shows that an overwhelming majority (91.67%) of the maize farmers suggested provision of assistance by the government to purchase high end smartphone as the most important suggestion for improving smartphone usage, followed by offering farmer-friendly data packs (79.17%), improvement in network connectivity (39.17%), and establishment of mobile service centres in villages (19.17%).

Provision of assistance by the government to purchase high end smartphone will improve smartphone usage among maize farmers. Farming communities often have limited financial resources, and smartphones can be expensive. Government assistance, such as subsidies or grants, can help make smartphones more affordable for farmers, encouraging them to invest in this technology.

Offering farmer-friendly data packs will improve smartphone usage among maize farmers. Smartphones offer access to a vast amount of

agricultural information, including weather forecasts, market prices, pest control technologies, and best farming practices. Providing friendly-data pack to farmers will empower them with valuable information that can lead to better decision-making and improved agricultural outcomes.

By improvement in network connectivity, farmers can access real-time information on weather updates, market prices, agricultural technologies, and government schemes more easily. Timely information empowers them to take informed decisions and adapt their farming practices accordingly.

Establishment of service centres in villages can provide technical support and training on how to use smartphones effectively. Service centres offer guidance on basic functions, apps relevant to agriculture, and troubleshooting assistance, increasing farmers' confidence and competence in using smartphone.

II. Software

As per the data presented in Table 2, almost all (98.33%) the maize farmers suggested adding voice recognition facility in mobile apps as the most important software strategy for improving smartphone usage, followed by maize specific mobile apps to be developed (97.50%), location specific contents to be given (86.67%), regular updating of information (83.33%), and contents to be created in regional languages (68.33%).

Adding voice recognition facility in mobile apps will enhance farmers smartphone user experience, making it a valuable tool for accessing information, managing farm-related tasks, and improving agricultural practices. It simplifies interaction, saves time, and ensures that farming knowledge and resources are more accessible to all farmers.

Maize specific mobile apps can be highly beneficial for farmers for providing them with specialized and relevant information related to maize farming and empower farmers to make more informed decisions, enhance their crop management practices, and improve overall productivity and profitability in maize farming.

Location-specific contents will greatly enhance smartphone usage of farmers by providing them with personalized and relevant information that is tailored to their specific geographical location like localized weather information, crop recommendations, pest and disease alerts, soil health information, market prices and demand, government schemes and subsidies, crop growth stage alerts, and local agricultural events and resources.

Regular updating of information tailored with accuracy of data, results in timely alerts and notifications, adoption of best practices, improved decision-making, access to new technology, real-time market information, and weather forecast accuracy.

Content in regional language would enhance smartphone usage because of increased accessibility, better comprehension, enhanced engagement, local relevance, overcoming language barriers, and increased adoption of technology.

III. Training Needs

As per the data presented in Table 2, almost all (99.17%) of the maize farmers expressed that knowledge on different apps and portals related to maize should be created by conducting training as a key strategy to improve the smartphone usage among maize farmers, followed by purchasing of agricultural inputs through e-commerce portals (94.17%), accessing Market prices/Marketing Intelligence through portals/apps and downloading and using mobile apps (93.33%), accessing/registering as beneficiary for availing government schemes (90.83%), carrying out online money transactions (82.50%), and using online video conferencing tools for interacting with farmers (79.17%).

Teaching knowledge and skill on different apps and portals related to maize through training would enhance farmers digital literacy, app selection skills, data management ability and empowers farmers to leverage technology for decision-making, adoption of improved agricultural practices, and increased productivity, and contribute to sustainable development of agriculture. Purchasing of agricultural inputs through e-commerce portals streamlines the buying process, enhances access to products and information, and facilitate cost-effective and convenient transactions. Accessing market price/market intelligence through portals/apps promotes transparency in the agricultural market. Farmers can better understand price fluctuations and track how market dynamics affect the value of their produce.

Downloading and using mobile apps empowers farmers with digital skills, awareness and the ability to access valuable information and resources. Training on accessing/registering as beneficiary for availing government schemes will increase the awareness among farmers, help them to understand their eligibility, step-by-step guidance to access subsidies and support. Online money transaction will bring farmers into the formal financial system, promoting financial inclusion, increase convenience, security and transparency. Online video conferencing tools will empower farmers by providing them with remote access to knowledge, support, and markets. It enhances smartphone usage as farmers can participate in virtual meeting, training, and networking events, leading to improved agricultural practices, access to information, and overall productivity in the farming sector.

Table 1. Constraints faced by Maize farmers in use of smartphone (n=120)

S. No.	Constraints	Response			
		Yes		No	
		f	%	f	%
I.	**Hardware**				
i.	High cost for repair and maintenance of smartphones	85	70.83	35	29.17
ii.	High data tariff	80	66.67	40	33.33
iii.	Less knowledge and skill in using smartphone	69	57.50	51	42.50
iv.	Poor Mobile network connectivity	49	40.83	71	59.17
v.	Smartphones are expensive	29	24.17	91	75.83
vi.	Non-availability of mobile service centres nearby	23	19.17	97	80.83
II.	**Software**				
i.	Less availability of location-specific information	102	85.00	18	15.00
ii.	Information not updated (eg: Seed stock position, fertilizer stock position, etc.)	98	81.67	22	18.33
iii.	Receiving unreliable forward messages	86	71.67	34	28.33
iv.	Less awareness on agricultural mobile apps/web portals	83	69.17	37	30.83
v.	Non-availability of agricultural information in regional languages	80	66.67	40	33.33
vi.	Complicated procedures in availing government schemes through app	76	63.33	44	36.67
vii.	Multiple steps involved to access information causes frustration	74	61.67	46	38.33
viii.	Security threat due to downloading mobile apps	58	48.33	62	51.67
ix.	Less knowledge on downloading mobile apps	56	46.67	64	53.33

Table 2. Strategies for Improving Smartphone Usage by Maize Farmers (n=120)

S. No.	Strategies	Response			
		Yes		No	
		f	%	f	%
I.	**Hardware**				
i.	Government assistance to purchase smartphone for farmers	110	91.67	10	8.33
ii.	Farmer friendly data packs to be offered by service providers	95	79.17	25	20.83
iii.	Improvement of internet connectivity facilities in rural areas	47	39.17	73	60.83
iv.	Establishment of mobile service centres in villages	23	19.17	97	80.83

S. No.	Strategies	Response			
		Yes		No	
		f	%	f	%
II.	**Software**				
i.	Adding voice recognition facility in mobile apps	118	98.33	2	1.67
ii.	Maize specific mobile apps to be developed	117	97.50	3	2.50
iii.	Location specific contents to be given	104	86.67	16	13.33
iv.	Regular updating of information	100	83.33	20	16.67
v.	Contents to be created in regional languages	82	68.33	38	31.67
III.	**Training Needs**				
i.	Knowledge on different apps and portals related to maize	119	99.17	1	0.83
ii.	Purchasing of agricultural inputs through e-commerce portals	113	94.17	7	5.83
iii.	Accessing Market prices/Marketing Intelligence through portals/apps	112	93.33	8	6.67
iv.	Downloading and using mobile apps	112	93.33	8	6.67
v.	Accessing/registering as beneficiary for availing government schemes	109	90.83	11	9.17
vi.	Carrying out online money transactions	99	82.50	21	17.50
vii.	Using Online Video Conferencing tools for interacting with farmers and others	95	79.17	25	20.83

4. CONCLUSION

Among ICTs, smartphone is a more powerful and a convenient tool that offers accurate, timely and relevant information to farmers. It is necessary to find out the major constraints faced by them in using smartphone for accessing agricultural information and provide strategies to overcome those constraints. Most of the farmers faced high cost for repair and maintenance of smartphones, high data tariff, and less availability of location-specific information as major constraints. To overcome these constraints State Department of Agriculture may consider providing assistance to farmers to purchase high end smartphones. Farmer friendly data packs and Location specific contents will also enhance smartphone usage behaviour among farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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