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Effectiveness of mobile app on knowledge gain about sugarcane cultivation practices among the farmers

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Abstract

Information and communication technology plays a crucial role in addressing challenges in agriculture. This study was conducted in Athani taluk, Belagavi District, Karnataka, using a 'Before-After' experimental design without a control group to assess the effectiveness of a Mobile App on enhancing farmers' knowledge of sugarcane cultivation practices. The App, specifically developed for this research, focused on various aspects of sugarcane cultivation and served as the treatment for the study. A total of 50 sugarcane growers were randomly selected for participation. The findings revealed the highest mean difference of 3.20 in integrated disease management, followed by weed management at 2.40, and both integrated pest management and chemical fertilizer at 2.20. Factors such as farming experience, landholding size, extension contact, economic motivation, management orientation, scientific orientation, and cosmopoliteness were positively and significantly correlated with knowledge gain. These results suggest that extension personnel should focus on disseminating knowledge in these areas, particularly through Mobile Apps, to better educate sugarcane farmers and maximize their benefits. The Mobile App not only enhances the respondents' knowledge but also aids in the retention of that knowledge over time.

Keywords: Effectiveness, knowledge gain, mobile app and sugarcane cultivation practices

Introduction

Sugarcane (*Saccharum officinarum* L.) is a major commercial crop cultivated in nearly 75 countries worldwide, with Brazil, India, China, and Thailand being the leading producers. The sugar industry holds a vital position in India's agricultural economy. Today, sugarcane cultivation and the sugar sector serve as key pillars supporting the nation's economic framework. India is currently the world's second-largest producer of sugarcane. In the year 2023-24, sugarcane was cultivated across 56.48 lakh hectares in India, resulting in a total production of approximately 446.43 million tonnes, with an average yield of 79.03 tonnes/hectare. (Anonymous, 2023-24) [2]. Karnataka benefits from favorable climatic conditions for sugarcane cultivation, which has led to an expansion of the crop's coverage to 6.26 lakh hectares. The state produces approximately 53.20 million tonnes of sugarcane, with an average yield of 85 tonnes/hectare (anonymous, 2023-24) [2]. Belagavi, Bagalkote, Mandya, and Kalaburagi are the major sugarcane-producing districts in Karnataka. Among them, Belagavi is emerging as a key district, with sugarcane cultivation spread across 278487 hectares. It records a production of 26734714 tonnes and a productivity rate of 96 tonnes per hectare. (Anonymous, 2022-23) [1].

Agriculture continues to be the primary occupation and way of life for over half of India's population, significantly contributing to the nation's GDP. Ensuring the long-term prosperity of farmers and agricultural laborers is crucial for enhancing overall human resource development in the country. In the late 1960s, Indian agriculture was largely traditional until the onset of the Green Revolution, which dramatically increased production and productivity, making India self-sufficient in food grain production. However, with the population continuing to grow, there is an urgent need to further boost agricultural output. To achieve this, Indian farmers must stay updated on the latest farming techniques, agricultural machinery, and market trends. The extension personnel of the Agriculture Department disseminate technologies and information to farmers using various outreach methods. However, these approaches often fail to reach the majority of farmers across the country, with a staggering ratio of one extension worker for every 1,000 farmers (Chitra and Shankaraiah, 2012) [3]. This disparity poses a significant challenge for the extension system, especially when trying to reach 120 million farmers spread across more than 500 districts. The diverse agro-ecological conditions further complicate this issue, as farmers have varied needs that exceed the capabilities of grassroots extension workers. In this context, mobile apps can play a crucial role in enhancing and supporting extension efforts. Therefore, this study was conducted to assess the effectiveness of a Mobile App on knowledge gain about sugarcane cultivation practices among the farmers.

Materials and Methods

This experimental study was carried out in Athani taluk, located in the Belagavi District of Karnataka. It employed a 'Before-After' experimental design without a control group

to assess the effectiveness of a Mobile App on knowledge gain about sugarcane cultivation practices among the farmers. The App, specifically developed for this study, focused on various aspects of sugarcane cultivation. Shankaratti village, known for its extensive sugarcane farming, was randomly selected for the research. A total of 50 sugarcane growers were chosen through random sampling to participate in the study. The effectiveness of the Mobile App was evaluated by measuring knowledge gains through pre-tests and post-tests. Data collection was conducted using a standardized interview schedule recommended by Kumar *et al*. (2016) and involved personal interviews. The gathered data was then organized and analyzed using statistical methods, including mean calculations, paired t-tests, correlation, and other relevant tools.

Results and Discussion

Table 1 illustrates the increase in knowledge among sugarcane growers regarding cultivation practices as a result of exposure to the Mobile App. A paired 't' test was conducted to assess the mean difference before and after the intervention across various practices. The mean knowledge gain regarding soil and land preparation was 1.50, with scores rising from 1.70 before treatment to 3.20 after. The paired 't' value was 15.65, significant at the 1 percent level. The mean knowledge gain regarding planting seasons and varieties was 1.60, with scores increasing from 1.80 to 3.40. The paired 't' value was 22.86, significant at the 1 percent level. The mean knowledge gain on seed setts was 1.60, with scores rising from 1.90 to 3.50. The paired 't' value was 10.98, significant at the 1 percent level. The mean knowledge gain related to organic manure was 2.00, with scores increasing from 1.50 to 3.50. The paired 't' value was 12.78, significant at the 1 percent level. The mean knowledge gain regarding chemical fertilizer was 2.20, with scores rising from 1.40 to 3.60. The paired 't' value was 20.58, significant at the 1 percent level. The mean knowledge gain on green leaf manure was 2.10, with scores increasing from 0.80 to 2.90. The paired 't' value was 27.30, significant at the 1 percent level. The mean knowledge gain related to micronutrients was 2.10, with scores rising from 0.60 to 2.70. The paired 't' value was 49.00, significant at the 1 percent level. The mean knowledge gain regarding irrigation was 2.00, with scores increasing from 1.20 to 3.20. The paired 't' value was 31.30, significant at the 1 percent level. The mean knowledge gain on inter-cultivation was 1.60, with scores rising from 1.00 to 2.60. The paired 't' value was 10.98, significant at the 1 percent level. The mean knowledge gain regarding weed management was 2.40, with scores increasing from 0.80 to 3.20. The paired 't' value was 18.33, significant at the 1 percent level. The mean knowledge gain related to integrated pest management was 2.20, with scores rising from 3.50 to 5.70. The paired 't' value was 12.33, significant at the 1 percent level. The mean knowledge gain regarding integrated disease management was 3.20, with scores increasing from 4.30 to 7.50. The paired 't' value was 17.93, significant at the 1 percent level. The mean knowledge gain on harvesting was 0.80, with scores rising from 1.30 to 2.10. The paired 't' value was 7.48, significant at the 1 percent level. Overall, the data indicates a significant improvement in knowledge across various aspects of sugarcane cultivation practices due to the Mobile App exposure.

Table 1 shows that the highest mean difference was observed in integrated disease management at 3.20, followed by weed management at 2.40, and both integrated pest management and chemical fertilizer at 2.20. This is attributed to the Mobile App's comprehensive treatment of sugarcane cultivation practices, which includes valuable information on pests and diseases affecting the crop, accompanied by engaging visuals and recommended solutions. This feature encourages farmers to identify issues and implement timely corrective measures, leading to improved outcomes. Effective weed management is crucial in farming, as neglecting it can significantly diminish crop yields. Therefore, farmers were encouraged to enhance their understanding of weed management practices. Plant requires food/nutrients/elements for its growth and development that are absorbed through soil. Nutrient supply sources are fertilizer. Application of fertilizers in soil is one of the important factors that help increase crop yield and maintain soil fertility. In addition, the general trend among farmers is strong that the application of fertilizer will increase the yield of sugarcane is another reason. This aligns with findings from Dechamma (2015) [4] & Sowjanya (2017) [12].

Table 1 displays the data on the overall knowledge gained from exposure to the mobile app. The computed 't' value was positive and significant at the 0.01 level, indicating a meaningful increase in knowledge. This confirms that there was a significant difference in the respondents' knowledge levels before and after using the app. Prior to exposure, the mean knowledge score was 21.80, which rose to 47.10 afterward, resulting in an average knowledge gain of 25.30. These results demonstrate that the developed mobile app effectively enhanced farmers' knowledge of sugarcane cultivation practices. This aligns with findings from Pavan *et al*. (2017) [10], who reported that a mobile app on fodder production significantly improved knowledge among livestock farmers. Similarly, the Paddy Expert System mobile application has shown that information and communication technology (ICT) can effectively address farmers' knowledge and information needs, enabling them to make timely decisions that contribute to substantial improvements in their livelihoods (Kartikeyan and Kumar, 2022) [7].

Relationship between selected socio-economic characters with knowledge gain

Table 2 reveals that variables such as farming experience, landholding, and scientific orientation have a positive and significant relationship with knowledge gain at the 0.01 level. Additionally, extension contact, economic motivation, management orientation, and cosmopoliteness also show a positive and significant relationship with knowledge gain, but at the 0.05 level. In contrast, other variables—including age, education, extension participation, mass media exposure, innovative proneness, achievement motivation, and risk orientation—exhibit a non-significant relationship with the respondents' knowledge gain.

Farming experience is positively and significantly related to knowledge gain in sugarcane cultivation practices. This can be attributed to the fact that farmers engaged in long-term farming activities are more inclined to learn about new techniques, demonstrating a strong interest in improving their practices. These findings align with the research conducted by Dechamma (2015) [4], Vandana (2016) [13], and Mohanakumar (2018) [8].

Landholding was found to have a positive and significant correlation with knowledge gain. This may be because

farmers with larger landholdings have greater opportunities and resources to adopt technological innovations. Consequently, these farmers are often more eager to learn about new farming practices and more open to new ideas, which enhances their knowledge acquisition. Thus, the size of landholdings is positively and significantly related to knowledge gain. These conclusions are consistent with the findings of Dechamma (2015) [4] and Mohanakumar (2018) [8].

Scientific orientation was found to have a positive and significant relationship with knowledge gain. This can be attributed to the fact that farmers with a scientific orientation are more open to adopting the latest technologies and employing scientific methods in their decision-making processes. This approach enables them to effectively manage their sugarcane cultivation practices. These conclusions are supported by the findings of Priyanka (2016) [11].

Extension contact was found to have a positive and significant relationship with knowledge gain. This can be attributed to the fact that farmers who maintain strong connections with extension agencies are more likely to acquire valuable information, skills, and resources related to their enterprises, which ultimately enhances their knowledge. This finding is consistent with the results reported by Dechamma (2015) [4].

It has been observed that there was a positive significant relationship between the economic motivation and knowledge gain. The reason for this may be economic motivation, it is an indication that the person is oriented towards the achievement of maximum economic returns such as maximization of farm profits. This variable significantly influences farmers' ability to obtain more information about sugarcane cultivation practices. This finding is consistent with the research conducted by Hazarika *et al*. (1996) [6].

The knowledge gain of sugarcane growers showed significant relationship with management orientation. The potential reason may be that the current study defines management oriented as a farmer scientific farm management, which includes farm planning, production and marketing functions. Scientifically oriented farmers are more likely to effectively embrace and implement the scientific aspects of farming. This may contribute to an increase in the increase in the knowledge gains of sugarcane growers.

The significance of cosmopoliteness can be attributed to the fact that farmers who frequently travel to external locations are more exposed to new ideas, technologies, and awareness. Those with greater exposure to various forms of mass media have better opportunities to encounter innovative concepts, highlighting the strong relationship between cosmopoliteness and knowledge gain. This finding aligns with the conclusions of Nain & Chandel (2012) [9], Dechamma (2015) [4], Ghanghas *et al*. (2015) [5], Priyanka (2016) [11], and Sowjanya (2017) [12].

Table 1: Knowledge gain of farmers on exposure to Mobile App on sugarcane cultivation practices

Sl. No	Sugarcane Cultivation Practices	Scores	Mobile App		Paired 't' value
			Mean Knowledge gain		
			Mean	SD	
1	Soil and land preparation	4	1.50	0.14	15.65**
2	Planting season and varieties	5	1.60	0.20	22.86**
3	Seed setts	5	1.60	0.13	10.98**
4	Organic manure	4	2.00	0.31	12.78**
5	Chemical fertilizer	5	2.20	0.00	20.58**
6	Green leaf manure	3	2.10	-0.10	27.30**
7	Micronutrients	6	2.10	-0.03	49.00**
8	Irrigation	7	2.00	-0.20	31.30**
9	Inter cultivation	3	1.60	-0.29	10.98**
10	Weed management	4	2.40	0.00	18.33**
11	Integrated pest management	8	2.20	-0.39	12.33**
12	Integrated disease management	10	3.20	0.48	17.93**
13	Harvesting	3	0.80	0.08	7.48**
Mean Knowledge gain			25.30		54.37**

** Significant at 1% level, * Significant at 5% level

Table 2: Relationship of socio-economic characteristics with knowledge gain after exposure to Mobile App

Sl. No	Variables	Mobile app
1	Age	-0.274 NS
2	Education	0.050 NS
3	Farming experience	0.368**
4	Land holding	0.391**
5	Extension participation	-0.148 NS
6	Extension contact	0.313*
7	Mass media exposure	0.166 NS
8	Innovative proneness	0.077 NS
9	Achievement motivation	-0.013 NS
10	Economic motivation	0.289*
11	Risk orientation	0.204 NS
12	Management orientation	0.295*
13	Scientific orientation	0.525**
14	Cosmopoliteness	0.336*

*Significant at the 0.05% level, **Significant at the 0.01% level, NS- Non significant

Conclusion

Mobile -based technology spread among sugarcane farmers was found to be effective and it would emerge as a new paradigm in the development of agricultural technology transfer and livelihood opportunities for people in developing countries. Therefore, efforts can be made by extension personnel to spread knowledge on such aspects to educate sugarcane farmers, especially by using mobile apps and thus maximizing their benefits. Thus, it can be concluded that the mobile app not only facilitates enlarged knowledge of respondents, but also helps in retention of knowledge gained.

Conflict of Interest

The authors of the paper declare no conflict of interest

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