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RESEARCH ARTICLE

The Story of the Rice Expert Exploring New Vistas of Science Communication

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ABSTRACT

Mobile applications or apps are popular and resourceful media of mass communication these days. Since agriculture is the socio-economic backbone of India and many developing countries, agriculture-related mobile apps hold many possibilities to empower the farmers and other stakeholders alike for sustainable agriculture. The study was conducted to find out the story behind the Android mobile app – riceXpert, developed by ICAR-National Rice Research Institute (NRRI), Cuttack, from inception till the present status of utility, and to analyse the responses and feedback of its users.

A sample of 50 rice farmers of Cuttack district in Odisha was selected through purposive sampling for the present study. An important finding of the study is that the farmers are less aware of the riceXpert mobile app and yet to discover its vast capability. Ignorance about the mobile app, its use and its different features, along with the need for support and guidance were cited as some of the reasons for lesser access. The universal power of smartphones opens up new vistas of effective science communication for specific target groups and to reduce the gender gap therein, through various useful mobile applications.

KEYWORDS: Mobile Applications, RiceXpert, Science Communication, Farmers, Gender Gap, Sustainable Agriculture

Introduction

Achieving the national and global goals requires empowering people with relevant information in time, and providing opportunities to acquire and develop the essential skills for it.

Empowered citizens promote stronger commitment towards partnership and cooperation for achieving sustainability in growth and development in various sectors. The digital revolution worldwide has enormous potential to empower and transform an ordinary person into a confident and responsible global citizen.

With the development of science and technology, something new is being launched in the market almost every day. With just the push of a mobile phone button, keeping in touch with one another and with the happenings outside have become easy for common people. People can access information relevant to their work, study, business, health, housing, family, recreation and future planning. Due to the reliability, availability and connectivity of the mobile phones, the mobile application has emerged as one of the most concerned and rapidly developing medium to reach out to the public.

Though access to technology is easier now, it is necessary that people are cautious regarding the availability and utility of the vast information they access. Like many modern gadgets, mobile phones also have some disadvantages, but the good works that can be accomplished through this technological wonder are too many. Mobile phones have enormous potential to be used as the medium of communication to connect with the disadvantaged and underprivileged sections of the community. Many national and global reports confirm the existence of a gender gap in the study, work, pay, social status, health condition, security, etc. So, through the mobile phones and mobile applications, the governments, various institutions, research organisations can reach out to those unreached groups existing in each society.

Science Communication and Gender Gap

Scientific information has become an integral part of people's lives. Science communication has great potential in shaping the lives of the people and making their decisions more convincing and rational. India has undertaken a large number of initiatives in the field of science communication, and many times carry out innovative approaches to reach out to different target groups. But because of vast population and ignorance of the

common people towards scientific research, effective science communication is a major challenge. Mass education, trained scientific communicators, better utilisation of existing facilities and effective networking with properly defined policies are the possible solutions to carry scientific messages to the common people effectively[1].

When more women work, economies grow. An increase in female labour force participation — or a reduction in the gap between women's and men's labour force participation — results in faster economic growth[2]. Agriculture is the most important source of income in many developing countries. Yet there are less number of women who are agricultural landowners. From planting seeds and saplings, women work hard to feed their families and the whole nation. But they have less access to new developments in agriculture, relevant resources, market updates. Effective science communication is a challenge for every science communicator from the perspective of reducing the gender gap.

Women constitute nearly half of the workforce in sectors like education, health and agriculture. It has to be informative, accurate and unbiased. Approaches should be better, impressive and useful each time. People carrying more than one mobile phone for different purposes is common these days. Access to local, national and global information has become universal. Any person can retrieve any data from any well-connected place in the world. Also, the reduction in prices of both basic handsets and subscription rates of mobile operators has made the dream of owning mobile phones possible for common people.

But it has come a long way since the day in 1973 when John F. Mitchell and Martin Cooper of Motorola demonstrated the first mobile phone in hand, which weighed 2 kilogram[3]. From a voice communication tool now it has been transformed into a multi-media tool. With a cell phone, one can make calls, text messages, email, send and receive directions, go on the Internet, buy things, do online banking, listen to music, click photos, record videos, and much more.

Marshall McLuhan, the Canadian philosopher believed that the introduction of new technologies into a society has a determining effect on the organisation of that society, the perceptions of its members, and the way in which knowledge

and information are stored and shared. The smartphone facilitates many aspects of daily life and can be a very useful and entertaining tool. Nevertheless, possible negative implications and social effects should be considered, like the extreme cases of "smartphone addiction" or less human interaction[4].

The data released in July 2017, by the International Telecommunication Union (ITU), the United Nations specialised agency for Information and Communication Technologies (ICTs), showed that of the 830 million young people online worldwide, 320 million, or 39 per cent, are in China and India. This shows the ease of access and popularity of the online activities among the youth. The report also states that there has been an increase in high-speed fixed broadband subscriptions parallel to the growth in the number of fibre connections. "Digital connectivity plays a critical role in bettering lives, as it opens the door to unprecedented knowledge, employment and financial opportunities for billions of people worldwide," stated Houlin Zhao, ITU Secretary-General.

Mobile broadband is more affordable than fixed broadband in most developing countries. While the Internet user gender gap has narrowed in most regions since 2013, the percentage of men using the Internet remains slightly higher at 50.9, than 44.9, the percentage of women using the Internet in two-thirds of countries worldwide (UN News)[5].

Sustainable Agriculture – Rice Cultivation

Rice is a major food crop for the people of the world in general and Asians in particular. Nearly 90 per cent of the world's rice is produced and consumed in Asian countries. Rice dominates the overall crop production which is measured by the share of crop area harvested of rice. Increased demand for rice is greatest in low-income countries and regions, where cheap carbohydrates to meet energy requirements are still the primary need of consumers (Food and Agriculture Organisation)[6].

Ecosystem deterioration and climate change pose threats to the global food production. Sustainable agriculture has an important role to play in preserving natural resources, reducing greenhouse gas emissions, halting biodiversity loss and caring for valued landscapes. Maintenance of good soil quality,

reduction of soil degradation and soil erosion are the major benefits of adopting sustainable agricultural practices. One major challenge of the much needed sustainable agriculture is awareness among the farmers and all stakeholders about the agricultural practices and the consequences.

Ensuring women's access to and control over agricultural assets and productive resources is important for achieving food security and sustainable livelihoods (Food and Agriculture Organisation of the United Nations (FAO), 2011). Women's knowledge, agency and collective action are central to finding, demonstrating and building more economically, socially and environmentally sustainable pathways to manage local landscapes; adapt to climate change; produce and access food; and secure sustainable water, sanitation and energy services[7]. Hence, the urgent need to reduce the gender gap in the field of rice farming through effective communication.

Mobile Applications in Agriculture Sector

Small and marginal farmers dominate the agricultural scenario in many developing countries. Sustainable agricultural growth and food security in India depend on the performance of these small and marginalised farmers. Women constitute a substantial portion of the agricultural workforce. Access to timely, adequate, correct and relevant information is very important for small farmers to improve productivity sustainably.

In the era of Information and Communication Technology, mobile phones can foster dissemination of required information on new technology, market demand, price information, weather, pest, risk management information, and best practices to meet quality and certification standards among the stakeholders. Communicating agriculture-related information to the farmers in the rural and hilly areas has become easier with the help of cloud computing, integrated information and technology systems, online education and availability of mobile phones. One of the benefits of such connectivity and information flow is that it helps the farmer to make better decisions regarding crop selection and land management. For example, Geographical Information Systems can be used to provide information on pests and animal diseases so that farmers can respond accordingly to the level

of risk. Optimising the use of fertilizer, seeds and water can also be done by communication through the utilisation of mobile technologies. This way, farmers can save money while reducing consumption.

There are many available mobile applications providing agriculture-related information, targeting the farming community. KisanSuvidha, IFFCO Kisan Agriculture, RML Farmer–KrishiMitr, PusaKrishi, AgriApp, Kheti-badi, Krishi Gyan, Crop Insurance, AgriMarket, Agrobase-weed, disease, insect, ApniKheti—Agriculture Information & Social App, FarmRise—Mobile Farm Care, and AgriscienceKrishi are some of the mobile applications available in the agriculture sector.

A Case in Focus – RiceXpert

The mobile App riceXpert has been developed by the ICAR-National Rice Research Institute (NRRI), Cuttack. It is an initiative to promote the knowledge, expertise and activities in the area of rice cultivation among the stakeholders of the agriculture sector. The riceXpert app is designed and developed in android platform. It is compatible with mobile phones having the Android version 4.0.3 and above, which will operate in the online system. This app provides a real-time diagnosis of insect pests, diseases, nematodes, weeds, nutrient deficiencies and toxicities for farmers. The App has other features like rice varieties, agricultural implements, news, expert consultation through e-advisory services module, weather information and customised Pest Solution and Fertilizer Calculator, etc.

Farmers and farm women can use this App as a diagnostic tool in their rice fields and also make customised queries through text, photo or voice and that would be addressed by a panel of experts on a real-time basis and get quick solution along with recommendations of their problem through mobile phone messages. This App also provides a platform for the farmers who have no organised way to sell their products. Farmers can post their price or rice-related products for display to the buyer. The buyer can access the detailed information about the products through the app and get the products at the best prices through direct interaction.

The App is also a very useful tool for researchers, Scientists, Students and village level workers working on rice crop. This application is now available in three languages, namely English and Odia with the recent addition of Hindi, to communicate the

Figure1: Front Screen of riceXpert App

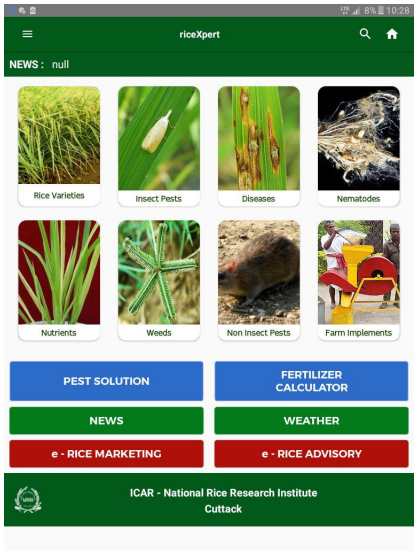

Figure 2: Main Menu of riceXpert App

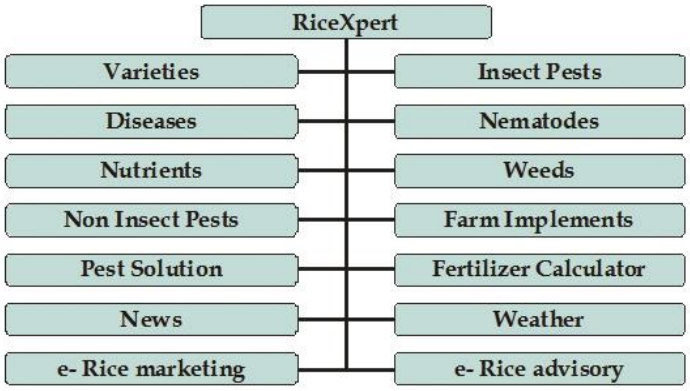

Figure 3: Schematic diagram of different modules of riceXpert app

latest rice technologies to the farmers in a real-time basis. This app was launched on 9 May 2016.

The mobile App riceXpert has been developed to provide information to farmers in real-time on insect pests, nutrients, weeds, nematodes and disease-related problems, rice varieties for different ecologies, farm implements for different field and post-harvest operations. Other components such as information about news, announcement and advisory services, frequently asked questions on the related subject, team involved, etc. are also included.

The app has web-based application systems which facilitate the flow of information from the farmer to the farm scientist and get their instant solution. Farmers can use this App as a diagnostic tool in their rice fields and make customised queries for a quick solution of their problems through text, picture and voice that would be addressed by NRRI experts on a real-time basis.

In the present form of this App riceXpert, we have taken all care to cover most of the concerns faced by the farmers in their rice field with solutions in a static form and also personal queries in a dynamic mode. In the future, we will include more information and other components to make this App more robust and adequate with the help of valuable comments and feedback received from the farmers and rice experts. This mobile App can also be a very useful tool for the researchers, students and village

level workers working on rice crop in different states as well as in the country[8].

Significance of the Study

The global penetration of mobile technology and the growing importance of mobile applications in key areas – health, education, agriculture, infrastructure and transport – have changed the direction and reach of information flow. The mobile phone acts as the main instrument to reduce discrimination and to empower people in almost all walks of life, enhancing their ability to communicate and participate in decision making. The applicability and access to timely information on rice farming can surely enable the rice farmers to lead the way in sustainable farming, along with producing and selling their own goods in a profitable way.

The study was conducted to find out the story behind the Android mobile app – riceXpert, developed by ICAR-National Rice Research Institute, Cuttack, by analysing the present status of utility, and the responses and feedback of its users for further investment and improvement.

Objectives of the study

The following are the objectives of the study:

1) To study and analyse the responses of the sample of farmers towards the use of mobile phones, communication facilities, its relevance and utility.
2) To analyse the responses of the sample rice farmers towards their awareness, ease of access and utility of various educational, recreational and agriculture-related mobile applications available in general android phones.
3) To analyse the responses of the sample rice farmers for the access, relevance, ease of two-way communication and utility of updated information provided in the riceXpert mobile app for improvement in different stages of rice cultivation, storage and marketing of the product.
4) To find out the present status of users who have downloaded the riceXpert mobile app.
5) To analyse the farmers' feedbacks and suggestions on the use of the riceXpert mobile app.

Methodology

The present study is descriptive in nature with qualitative and quantitative methods employed in data collection and analysis.

Limitation of the Study

1) The study was limited to persons actively engaged in rice cultivation in the last five years.
2) The study was conducted in Tigiria block in Cuttack district of Odisha only.
3) The study focuses only on mobile application approach in science communication targeting the agricultural sector.

Sample and Data Collection

The general population for this research paper consisted of all the farmers of the Cuttack district in Odisha.

Sample: For selecting a sample, 50 farmers of Tigiria Block have been identified and selected through Non-Probability Sampling technique (purposive sampling). It was conducted during an awareness and mobilisation programme for the public held at the Tigiria Block office. The selection of the farmers was made intentionally considering the criterion of those actively engaged in rice farming for at least five years.

Data Collection: Data have been collected from these selected 50 farmers for further analysis and interpretation. Few participants submitted their response after the meeting. For getting the responses of the rest of the selected sample of farmers the researcher visited the field area and contacted them later. And for getting the data related to the number of users and the type of their queries on the "riceXpert" mobile app, the researcher visited the National Rice Research Institute, situated at Bidyadharpur, in the outskirts of Cuttack city.

Research Questions

The present study focused on these following research query areas:

1) Five queries were there on owning mobile phones, on the operation of these gadgets, support for access to retrieve

online information and the relevance of the accessed information in their life.

2) Five more queries covered the farmers' awareness of various available educational, recreational and agricultural mobile apps, and the challenges they face in accessing and using the information therein.
3) The next five queries were about their awareness on the availability of the particular "riceXpert" mobile app, the adequacy of information provided through the said app and the applicability of the information on the mobile app.
4) Another set of five queries consisted of the feedback and suggestions regarding the improvement of the mobile app, "riceXpert".

Accordingly, a questionnaire was prepared by the researcher for getting the personal view/opinion of the farmers in the sample for this study. The individual questions were open-ended and had opportunities for the respondents to give their views elaborately as per their personal choices.

Results

The analysis of the responses the interpretations of each major result follow here:

1) From the analysis of the responses, it was revealed that only 20 per cent of the sample farmers had self-owned Android mobile phones for personal use. Another 68 per cent of the respondents had Android mobile phones within their family for easy access and reference. The rest of the farmers stated that they had good occasional access to Android phones in their neighbourhood and with their relatives who are educated for getting the required information.

   Since most of the farmers depend on the younger generation and other educated members of the community, awareness programmes should be arranged for the young generation, especially the student community for the spread of the new initiatives by various organisations and government interventions.
2) Regarding the operation of mobile phones, the majority 72 per cent of the respondents stated they have difficulties

due to English only as the language for communication in most of the popular applications of social media and other areas. The rest stated that with repeated use they have got acquainted with the basic operations with the gadget, but take assistance for further search and actions from the young generation like sons, daughters, and grandchildren in their families.

The people engaged in information technology should try to incorporate the local language in the mobile applications to expand the reach to the common people.

3) The majority 85 per cent of the responses were for the high relevance of the information communicated through mobile phones for staying updated about what is happening outside their place in various sectors. While the rest opined that the communication has average relevance to their lives or their work.

This indicates that farmers understand the relevance of such communication for improvement in their working condition as well as in the output of their hard work. Hence, more contact programmes should be arranged for the farmers so that they can use such applications for their benefit.

4) Again, the majority 82 per cent of the farmers stated that they need support and guidance to develop the required digital skills to be self-reliant in accessing information according to their personal need and choice. The rest opined that they can handle the gadget for personal use.

A large number of people engaged in farming have to be guided by trained officials.

5) Half of the respondents are aware of the 6-8 educational and recreational mobile applications launched for public use, from the print and electronic media, but have rarely used for personal reference. This section of the respondents also stated that they had knowledge of mobile applications for the weather forecast, FM radio, official radio service in regional languages, official television service and newspaper applications.

This result also reiterates the necessity of awareness programmes of the farmers through different media.

6) Surprisingly, a majority 68 per cent of the respondents were not even aware of “riceXpert”, the mobile app developed

specifically for rice farmers. 10 per cent of the farmers had heard about the application from others who are frequently in touch with the agriculture department personnel. Only eleven farmers stated that they had sent queries regarding pest control, diseases, and availability and use of farm equipment through the app and got satisfactory responses from the scientists at the institution. These 11 farmers also stated that the information through the said app is fairly adequate and useful to the rice farming in particular.

Since so many efforts are being done by reputed national research institutes for the farmers by developing the specific mobile applications, it is the responsibility of the communicators, specifically science communicators to spread the good word.

7) The farmers who were not aware of the "riceXpert" or the communication facilities it provides cited some of the reasons for lesser access to the mobile application — ignorance about the mobile app and its different features, need for support and guidance, adequate training of the government personnel posted at village and block level, elected members of Gram Panchayat.
8) The recent status of the number of download of the "riceXpert" mobile app was found from the Institute records and reports prepared by ICAR-National Rice Research Institute, Cuttack.

Table 1: Total downloads of the riceXpert app developed by ICAR-NRRI, Cuttack.
The table depicts the reach of the mobile app in India and some other countries.

'RiceXpert' Download	**Period**	
Country	From 9 May 2016 to till 9 August 2018	Last 7 days as on 9 Aug 2018
India	71%	85%
Philippines	10%	10%
Indonesia	3%	-
Nigeria	2%	-
Pakistan	1%	-
Spain	-	1%

Columbia	-	1%
Burkina Faso	-	1%
Others (76 countries)	13%	2%
Total Download	**16509**	**172**

9) It was found that based on the feedback received from farmers and other stakeholders, the following features have been included and updated by the developers and the scientists:

- ***Pest Solution***: By using this module, farmers can calculate the required quantity of recommended pesticide for their affected area based on their pest (insect pest, disease, and weed) problems through this module. Automatically a prescription will be generated as per their selected pest problem which can be downloaded and printed.
- ***Fertilizer calculator***: Farmers can calculate the required quantity of fertilizer (different grades) for their cropped area, different stages of the rice crop and for different rice types (hybrid)/ecologies (upland, irrigated, rainfed low land, etc.) through this module.
- ***E-rice marketing***: Farmers and other stakeholders buy or sell their surplus rice or rice-related products through this module.
- ***Government Schemes***: Farmers can get the information about the government welfare schemes for farmers like Pradhan Mantri Phasal Bima Yojana, Soil health card, e-NAM, Pradhan Mantri Krishi Sichai Yojana, etc.
- ***Video clips***: Different methods (Dry direct seeded, Wet direct seeded, transplanted) of rice cultivation, proper handling of pesticides, use of implements, etc. are provided in the form of video.
- ***Hindi Version***: Hindi version of the riceXpert app with all the additional features has been developed.
- ***Exposure Visits***: Steps have been taken to provide riceXpert App to all the farmers visiting the Institute. Whenever the farmers and other stakeholders visit the Institute for exposure visitor training, they are being illustrated the use of the riceXpert app. Farmers visiting the institute are provided with a flyer developed in English and local language (Odia).

Discussions

The methodology described was followed by the researcher for making interpretations and analysis of the elicited responses of the sample farmers to have an understanding about the awareness and utility of the riceXpert mobile app. The response of the female farmers also indicated their ignorance about the mobile app and its utility for improving the production as well as the financial condition of the families. It was found that the English language is a hindrance to many for using the mobile app. But it is seen that even if the riceXpert app has the local language of Odia for operating the features, it is yet to be appreciated by the farmers of Odisha.

It is a matter of concern that still a large number of rice farmers are ignorant about this mobile app. And much effort has to be undertaken for making the rice farmers aware of this mobile app and its utilisation in the field of rice cultivation. The result shows that the success rate of the mobile app is not so bright even in the home district of the place of the national institute where it was developed. Farmers' exposure visits to the institute should be arranged for more number of farmers so that they get a glimpse of the work the scientists carry out the whole year, and year after year to improve the practices, the produce and the profit.

Conclusion

Mass media like mobile apps can remove the barriers of distance and isolation and change the approach of common people from traditional to technology-savvy. Science communication for the common people can be made more user-friendly by giving priority to local languages, with the help of properly trained scientific communicators. This particular mobile app, "riceXpert" under the present study has salient features and three languages to its advantage for making it popular and appropriate for use in especially the rural areas of different places. This type of communication should work for wiping out the fears and apprehensions at various stages of their work, which sometimes prevail mainly in people of rural areas. Due to the socio-cultural and economic diversity existing in the country, different modes are used to make science communication interesting and

effective, to connect with the general masses. Development of specialised programmes like mobile applications according to the needs and problems of specific sectors and specific target groups have to be undertaken by people having the essential expertise. It is, therefore, necessary to support the awareness programmes for the farmers, students, officials and all other stakeholders of the agriculture sector at large with the more possible usage of research communication between the scientists and the farmers.

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