Study of Role and Awareness of Information Technology in Agriculture in State of Maharashtra

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***Abstract*—Today, Agriculture is considered the most important but highly deprived sector. Most of the farming community belongs to the rural part of the country. Though the Farming domain of Agriculture sector is supported by number of Government schemes and initiatives, there are many challenges faced by farmers in order to produce a good harvest and enjoy a descent living. These challenges begin from the point of selection of the right crop, buying the required seeds and fertilizers, ensuring healthy and market ready crop, till the point of finding the right market to ascertain that the produce is sold in the market at the best price. It is difficult for a farmer to predict the climatic changes as this is the most important factor in ensuring the proper growth of the crop. Also, at any given point in time, most of the farmers are unaware about alternate crop solutions to deal with the erratic climate changes. Getting proper good quality seeds and fertilizers at reasonable rates is also a challenge. Once the crop is ready for market, selling the produce directly to the customer, or through a path least handled by middle men will require substantial hard-work from the farmers end. The method of least handling by middle-men would permit the farmer to sell their produce at a price that will be appreciated by the customer and beneficial to the farmer. To add to the challenge most of the farmers are not vey educated.**

However, to minimize these challenges in order to help the farmers to produce profitable harvest Information Technology can be applied in a big and systematic way. The much needed role and use of Information Technology for in this Agriculture sector would be done through the use of easily available technology options, without hindering the normal working of the farming community. The seamless application of Information Technology would help the less educated and to some extent technologically un-savvy Farming community to produce the needed economically beneficial crop.

The study would help to understand the role of Information Technology in the current scenario of the Farming domain in Agriculture for the State of Maharashtra. The level of awareness amongst the farmers about the various Government schemes available for farmers in general and those through the use of Information Technology will also be studied. The research proposes to understand and analyze the barriers if any in implementation of the Information Technology schemes and how these barriers can be resolved. The study involves research of various ways and means of seamless use of Information Technology for a technology un-savvy farming community.

Keywords*—*Agriculture, Farmers, Farming sector, Information Technology (IT), Information Technology applications, Crops, State of Maharashtra, Government schemes

I. INTRODUCTION

India ranks second in the world in farm produce. Indian economy depends substantially in Agriculture, thus indicating the importance of Farmers and Agriculture. Nearly 58 percent of the rural population in India depends on Agriculture as a primary source of living. India is the second largest producer of fruits in the world and the largest producer, consumer and exporter of spice and spice products.

It is however observed that the hands that toil to uplift the economy of our Nation, i.e. the Farmers, are unable to progress or benefit substantially even as the Government rolls out various innovative schemes. Not to mention, a country whose major population is occupied in producing food, has nearly 44% of underweight children below the age of 5 and 72% of infants and 52% of married women having anemia. This indicates the challenge faced by Farming community and rural inhabitants (including landless laborers) to ensure nutritional balance, especially in this part of population of our nation.

India is regarded as an Agriculture nation, as major part of the population is involved in producing food. However, there are various challenges faced by the farming community as follows:

- Changing climatic conditions and not so easily available alternate crop solutions, make it difficult for

farmers to surpass the challenge and yet produce an economically beneficially produce.

- Procuring good quality seeds and fertilizers at cost-effective rates.
- Selling the produce at a price which is economically beneficial to the farmer and his customer, with least involvement of middle-men.

The above challenges can be solved to a considerable extent by the involvement of Information Technology applications represented as software programs (web based and mobile based) which are easily assessable on computer and hand held devices. These refer to web based and mobile based applications which can be easily used by farmers.

Information Technology is basically the use of computer or mobile devices for storing, retrieving transmitting and manipulating data which is beneficial to the user. Various applications can be made available to the farmers so as to aid them in overcoming the challenges faced by them during farming. The application of Information Technology by itself should be seamless and should not become a challenge to the farmers but a means of enhancing their productivity.

In this research under study, Information Technology will be applied in the form of software applications which can be easily accessed by the farmers. These applications will help the farmers to use necessary information required to solve their challenges to some extent. The applications will also help the farmers by providing relevant and authentic data required in making appropriate decisions at various steps during farming process.

II. Definition of the Problem

Use of seamless Information Technology applications which can be easily used by farmers will enhance the scope of solving challenges faced by them during farming to a considerable extent. Information Technology applications in agriculture will help in:

- Forecasting climatic changes.
- Making proper decisions based on the unfavorable conditions during farming
- Providing relevant and easily available information on aspects like buying seeds, fertilizers and various other farming instruments from reliable vendors at cost effective rates.
- Providing a marketing platform to the farmer to sell their produce at a price which is cost effective to the farmers and their customers.
- Information about various other farming models, methods and schemes so as to help the farmer to make best use of their farm land to gain maximum capital benefits.
- Provide success stories to encourage and enhance the productivity of the farmers.

III. Aims and Objectives

This research study aims at understanding the current awareness and use of Information Technology applications amongst farmers in the State of Maharashtra.

Objectives of the research involve the study of:

- Level of awareness amongst the farmers about the easily available and seamless Information Technology applications in Agriculture to overcome few or all the challenges faced by them during farming.
- Level of use of various Information Technology Application schemes by farmers which are offered by the Government.
- Challenges faced by farmers when using the currently available Information Technology applications.
- The availability of necessary infrastructure to support the Information Technology application schemes offered by the Government.
- Study the currently available Information Technology applications in the field of Agriculture specifically applicable for farmers and find areas of enhancement for the benefit of farmers.

IV. Review of Literature

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With almost one billion small-scale farmers worldwide, extension is urgently seeking for the best ways to support these farmers in terms of information, technology, advice, and empowerment. There has been an emergence of innovative extension approaches including: fee-for-service in New Zealand and Denmark; inclusive village level public extension service in China; market-driven empowerment through farmer groups and privatization in Uganda; farmer field schools in Asia and more recently in East Africa; farmer training centers and specialized extension agents in Ethiopia; client-oriented agricultural extension in Latin America and the Caribbean; and more recently, ICT-based agricultural extension and advisory services in Asia and Africa (Davis and Asenso-Okyere, 2010).

In Mozambique, CTA (2006) and Jenson et al. (2004) have shown that farmers with access to market information obtain higher farm prices. The Mozambique agricultural marketing service (SIMA) collects and disseminates nation-wide and provincial data on market prices, product processing and availability through a variety of media including text messages, email, internet, national and rural radios, television and newspapers.

According to the study conducted by Torero and Braun in 2006, states that the access to ICT can have a tremendous positive impact on sustainable development and poverty reduction. Extension services help to disseminate information regarding the technology relevant for their geographical areas and cropping system and generate awareness among farmers by recommending the appropriate quantity and quality of inputs and their timely use.

Reuters Market Light (RML) is a most highlighted example of an ICT initiative in agriculture in India. RML sends four SMS messages a day to its subscribers at an annual subscription of Indian Rupees 800 (Hardikar, 2010). Farmers receive information about the weather, crops, and current and projected commodity prices at different markets. Farmers are provided information and they are left to make their own decisions. While these approaches are ICT driven, an approach by Digital Green also in India uses ICTs to support existing extension services provided by NGOs.

Digital Green partners with NGOs to promote a video-based process for disseminating technology and agricultural practices. The videos are made with local resource people from the community and are shown to farmer groups established by the partner NGOs. Through the video farmers see what their fellow farmers have done and so it does not take much to convince them to adopt the technology or improved practice. Assessment of adoption practices in the pilot program of Digital Green shows a higher adoption rate through this video-based process than through T&V-style extension approaches (Gandhi et al. 2009).

Fafchamps and Minten (2011) studied the benefits that Indian farmers derive from SMS based markets weather and crop advisory information. Using a controlled randomized experiment in 100 villages of Maharashtra, they did not find statistically significant effect of treatment on the price received by farmers, on crop losses resulting from rainstorms, or on the likelihood of changing crop varieties and cultivation practices.

Raj et. al. (2011) conducted action research in Nagapattinam district in the state of Tamil Nadu, India using intervention of mobile technology (SMS and interactive voice response system) and individual web pages. Through this action research, a system was designed, developed and implemented at the farm level to find out whether providing customized crop cultivation and nutrient management practices to farmers could improve livelihoods.

In India, Rizvi (2011) studied the impact of using LifeLines, a mobile-based advisory service for farmers, in the lives of users by comparing intervention and control group experiences which were collected through sample surveys complemented by participatory rural appraisal tools such as focus group discussions. The study found that there was an increase in the yearly income of the farmers after they received information through LifeLines services. The annual average income of users of LifeLines was about 37% more than the control group. For 67% of the intervention group, there was an increase in savings and earnings because of increased productivity and disease control (Rizvi, 2011).

Study conducted by Yu n Zhang, Lei Wang, Yanqing Duan in the year 2016 states that the success of the future development and deployment of Agriculture information dissemination systems will need the elements of technology, supporting environment, and people working together.

Attaining sustainable agricultural development is a worldwide strategic concern. ICT application in agriculture has enormous potential to achieve significant economic, social and environmental benefits. It stresses the role of unified communication and integration of telecommunication, intelligent management systems and audio-visual systems in IT (Jain, Kumar , & Singla, 2011). Benefits of ICT include preservation of proper ties of information during its processing, exchanging and managing, capability to record text, drawings, audio/video, process descriptions, etc., in digital formats, production of exact duplicates of required information at a lower cost, transfer information and knowledge rapidly over large distances through networks, processing large information rapidly using predefined algorithms.

Bibhu Santosh Behera, Babita Panda, Rudra Ashish Behera, Narayan Nayak, Anama Charan Behera and S.Jena (2015) conducted a study on Information Communication Technology Promoting Retail Marketing In Agriculture Sector in India and concludes that IT helps farmers for taking timely decisions on crop product diversification strategies and positioning of the same in right market to get optimum revenue. The educational and professional institutions should take for guiding the latest information using IT as a tool and make it available to the farmers. The need of the day is to harness the vast potential of agriculture in Indian economy. The role of Information Technology to develop agriculture and quality of life in rural area is well established. IT can help an average Indian farmer to get relevant information regarding agro inputs, crop production technologies, agro processing, market support, agro-finance and management of farm agri-business. The agricultural extension mechanism is becoming dependent on IT to provide appropriate and location specific technologies for the farmers to furnish timely and proficient advice to the farmers IT can be a best mean not only to develop agricultural extension but also to expand agriculture research and education system.

V. METHODOLOGY

The research is survey based and will be conducted in the State of Maharashtra in India to estimate the level of awareness and use of Information Technology applications by farmers to overcome the various farming challenges faced by them.

The literature review does not support sufficient data to understand the use of Information Technology by Farmers in the Indian scenario. Hence, Quantitative approach will be implemented to understand the same. Survey method will be used to get data. Administration of Questionnaire and Face-to-face Interviews with the prospective respondents – Farmers will be conducted to get appropriate information.

The target population was the faculty members, students of agriculture colleges and farmers belonging to the State of

Maharashtra from the districts of Nashik and Nandurbar in the North, Thane and Ahmednagar in the East, Nagpur and Akola in the West and Kolhapur and Ratnagiri in the South will be the prospective respondents. Before the start of the survey the respondents will be made aware about the study and its relevance to them.

A well designed pretested questionnaire was administered amongst the respondents so as to gather knowledge about the role and awareness of IT in Agriculture in the state of Maharashtra. The questionnaire was designed in the local language (Marathi) for the farmers. The Questionnaire had majorly objective responses. Only 400 farmers, 27 faculty members and 76 agricultural students were able to submit information by answering the questionnaire.

An initial consent was acquired from the dean to carry out the well designed survey. A written communication was sent across to various departments, so as to carry out the survey department wise. Before the start of the survey the respondents were made aware about the study and its relevance to them in their respective domains. A proper date and time was decided to conduct the survey so as to get the desired and relevant responses.

VI. Result and Discussion

A study was conducted in the State of Maharashtra from the districts of Nashik and Nandurbar in the North, Thane and Ahmednagar in the East, Nagpur and Akola in the West and Kolhapur and Ratnagiri in the South.

A view of 400 farmers, 27 faculty members and 76 agricultural students was taken, to conduct this study of "Role and Awareness of IT in Agriculture in the state of Maharashtra." through questionnaire.

A. Farmers Perspective:

To understand the role and awareness of Information Technology by the farmers, it was found that the farmers are mostly using mobile phones for accessing agricultural information. 88% of the farmers are using mobile phones for accessing agricultural information and very few farmers are using laptops and desktops for accessing the information.

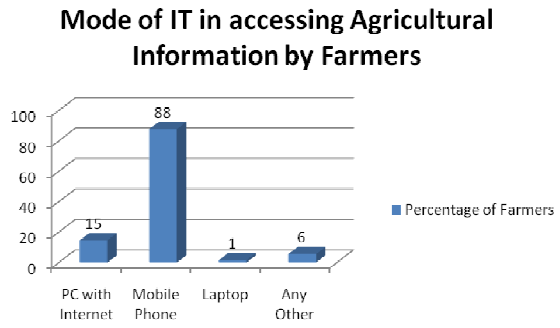


Fig. 1. Mode of IT in accessing Agricultural Information

As shown in fig. 2, most of the farmers are using smart phones, which may be utilized in getting an information about the agriculture, recent trends and advancements in the agriculture sector.

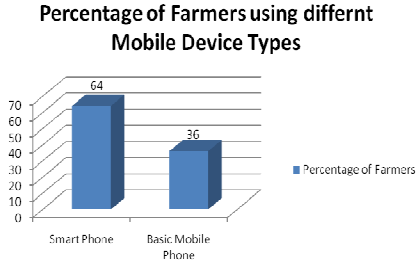


Fig. 2. Percentage of Farmers using differnt Mobile Device Types

It was found that 51% of the farmers believe that IT may help in reducing the cost in agricultural operations. Fig. 3 depicts that there is no adverse change in the mindset of the farmers that the advancement in IT will help them in increasing the productivity, marketing, fertility etc which leads to decrease in cost reduction in agricultural operations.

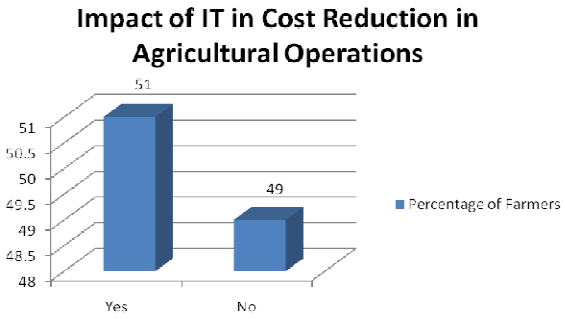
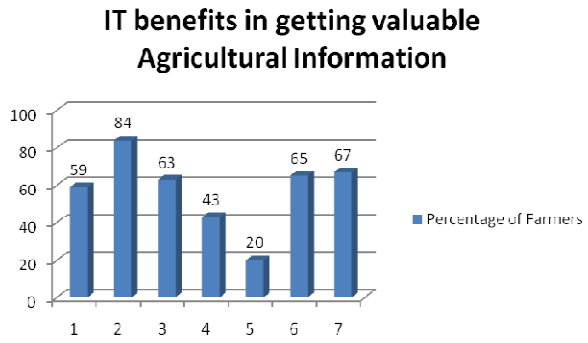


Fig. 3. Impact of IT in Cost Reduction in Agricultural Operations

Information Technology helps in getting infomration about about the curent trends, policies and other related information including market price of Agriculture commodities, weather conditions, Government support prices, information about fertilizers, seeds, pasticides, new cultivation pracices adopted or introduced by Agriuulture Universities, and emerging crop diseases etc. [Fig. 4]



where,

1 – Market prices of Agriculture commodities

2 – Changes in weather conditions

3 – Changes in Government support prices

4 – Changes in seasonal requirements in terms of fertilizers, pesticides, seeds, etc

5 – Advances in agriculture policy measure towards agriculture development

6 – New cultivation practices introduced by agriculture universities

7 – Emerging crop diseases

Fig. 4. IT benefits in getting valuable agricultural information

Government of India has launched many mobile apps for farmers and agriculture market. The objective of these apps is to supply information concerning the most recent agriculture trends, equipment, technologies and strategies being employed.

As shown in fig. 5, most of the farmers are not aware about the Government apps available. Few farmers are aware about the Government apps, only 22% farmers know Kisan Suvidha, 15% know AgriMarket and a very few farmers knows the other apps. It is necessary to make them aware about these apps and the way they might be useful in enhancing their business.

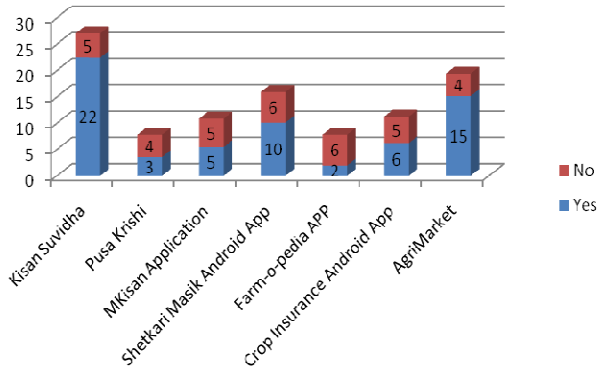


Fig. 5. Percentage of Farmers having awareness about Government Apps

The study also states that the farmers are agreeing about the importance of Mobile apps in providing information about recent agriculture trends, equipment, technologies etc to enhance their productivity. [Fig. 6]

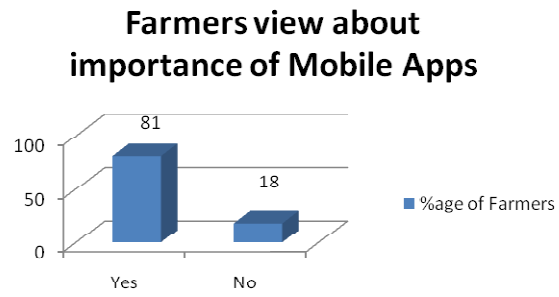


Fig. 6. Farmers view about importance of mobile apps

The survey also states that the farmers are facing several problems in using these mobile apps. The major problem they are facing in poor network. Study states, 72% of the farmers are facing network problems while using Mobile Apps. The Government has to take positive steps in enahncing the network coverage so that everyone gets advantage of using Internet for browsing websites to educate themselves about latest trends and also to use various apps available in the market. Some of the problems faced in addition to the Poor network are: [Fig. 7]

- Display of contents in the App was not clear
- Information displayed in the App is not relevant
- Farmers does not have smart phone
- Information in the App is outdated
- App information is incorrect

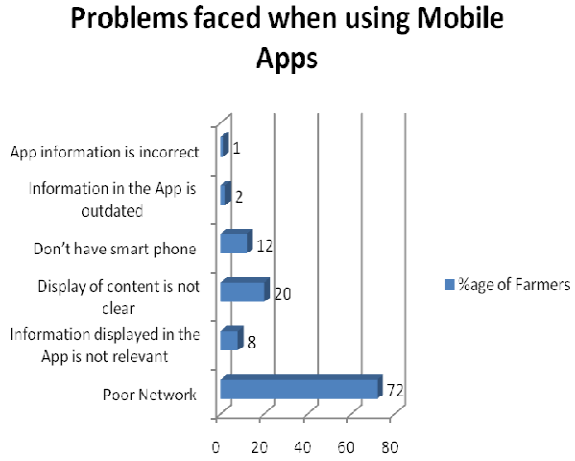


Fig. 7. Problems in using mobile apps by farmers

B. Faculty Members Perspective:

As shown in Fig. 8, it has been observed that the faculty members are aware about the Government Apps. Approximately, 50% of the faculty members are aware about the Agriculture Apps available. Still it needs to educate them

about the apps so that they will transfer the knowledge to the students and farmers in the vicinity.

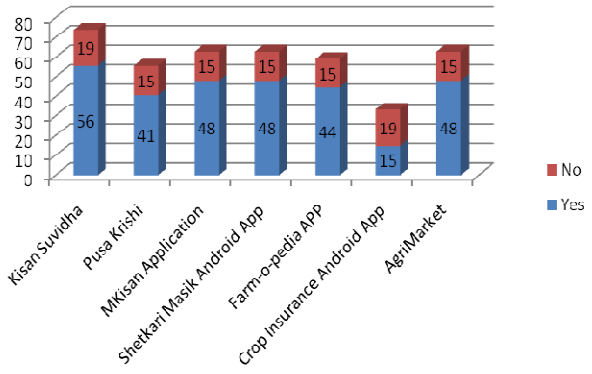


Fig. 8. Percentage of Faculty members having awareness about Government Apps

The study states that approximately everyone understands the importance of mobile apps and its impact on farming [Fig. 9], so we need to take necessarry steps to educates the targeted population i. e. farmers, faculty and students which helps in getting guidance from all aspects.

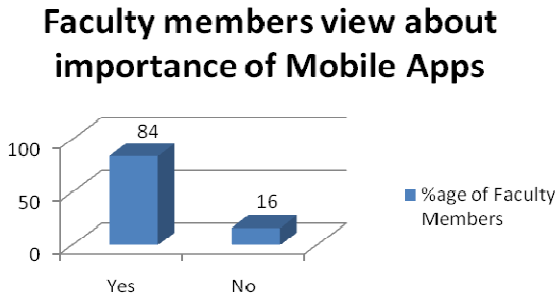


Fig. 9. Faculty members view about importance of mobile apps

There are lots of Agriculture Apps avilable including Government apps, but faculty members even thought that the mobile apps are not used properly because of infrastructural constraints e.g. poor network. The information in the app must be regulary updated with time and weather conditions and should be correct and relevant which is verified from the experts from the Industry. [Fig. 10]

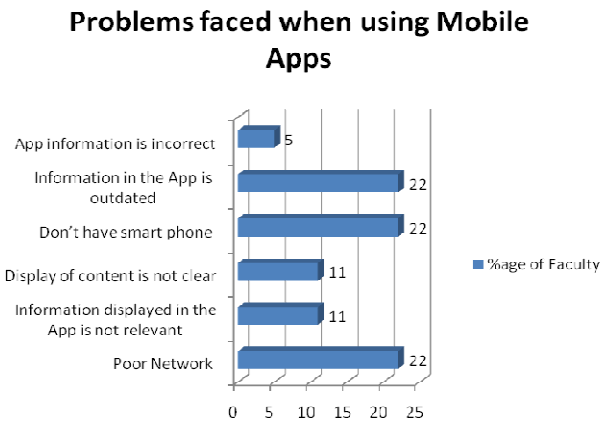


Fig. 10. Problems faced when using mobile apps

C. *Agricultural Students Perspective:*

Government is continuously taking positive steps in the production of agricultural produce and also had launched apps, but the Graduate or Post Graduate level students are not aware about these apps. It was found from the study that most of the students are unaware about the availability of such apps except one or two. [Fig. 11]

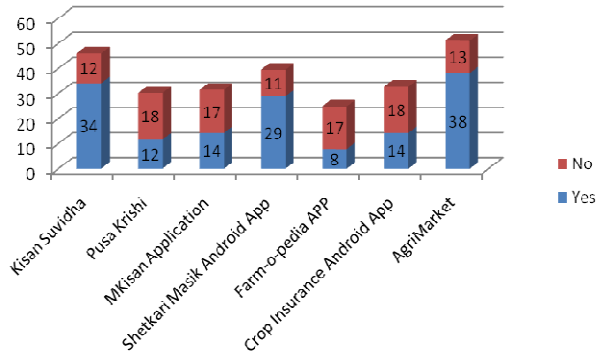


Fig. 11. Percentage of Agricultural students having awareness about Government Apps

Student fraternity also understands the importance of apps in their profession [Fig. 12]

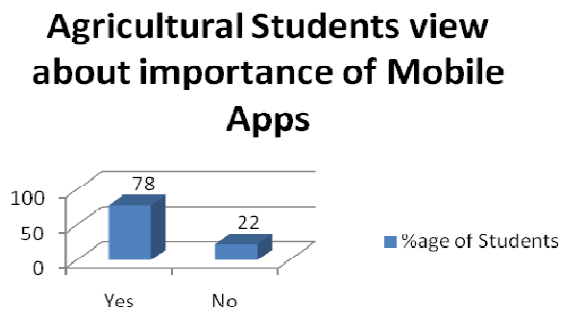


Fig. 12. Agricultural Students view about importance of mobile apps

Students also states that there is a major issue of network in using mobile apps [Fig. 13], so the network providers have to take ncecessarry steps in installing mobile towers with the approved frwuency bandwidth.

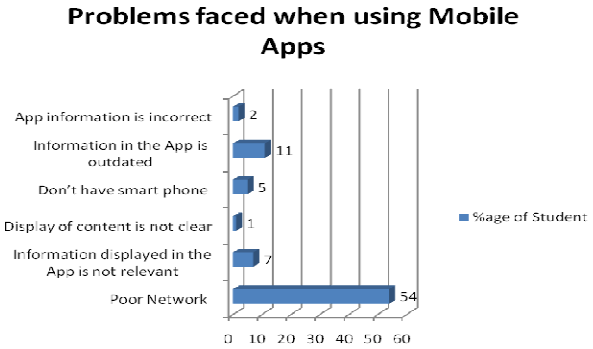


Fig. 13. Problems faced when using mobile apps

VII. Conclusion

Information Technology can be used in the agriculture sector to enhance the productivity (food produce) and to empower farmers in taking quality decisions by various ways and means i.e. by taking guidance from the experts through agriculture website or mobile apps.

Farmers require timely and reliable sources of information inputs for taking decisions quickly. At present, the farmer depends on trickling down of decision inputs from conventional sources which are slow and unreliable even though various sources of getting information are available with the farmers through online sources, websites, mobile apps etc.

Government has to take initiative in promoting various guidance centers, websites and mobile apps available for the farmers. It needs to develop a suitable system, to cater to the information needs of Indian farmer. User friendly systems, particularly with content in local languages, can generate interest in the farmers and others working at the grassroots. It is possible to create dedicated networks or harness the power of Internet to make these services are available to all parts of the country.

The rapid changes in the field of information technology makes it possible to develop and disseminate required electronic services to rural India. Government or other agencies has to take initiative in understanding existing bottlenecks which needs to be addressed immediately.

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