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Research Paper

Analyzing the Agro based mobile apps and farmers' quality performance

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Abstract: ICT and Agro based mobile apps in the direction of facilitating scientific and sustainable agriculture, seem very promising. Timely & scientific information dissemination is effective through agro based mobile apps. Packed with many features and services like; Package of Practices information, market value information, calculator facilities, farmers' community platform, e commerce, etc., provision all these features for the farmers helping them in making timely decisions and walking the path of scientific agriculture is appearing to be possible. Using these features from agro based mobile apps look promising that they create a considerable impact on the farmers' quality performance leading to higher productivity, ensuring environmental protection. This study aims to investigate the usage and impact of agro based mobile apps and the features in these apps by examining the quality performance of the farmers who have used the mobile apps. 405 farmers who have used the agro based mobile apps were targeted for the study and were surveyed using a structured questionnaire. Data was analyzed for the association between the variables using chi square test and the strength of the relationship was assessed using the Cramer's V values. The study revealed that there is significant association between the factors of agro based mobile apps and farmers' quality performance of the farmers' of using the features from the agro based mobile apps and based mobile apps and farmers' approace. And hence it is concluded that there is an impact of using the features from the agro based mobile apps on the performance of the farmers in terms of quality.

Key Words: Package of Practices, Farmer, Quality Performance, Agro Based Mobile Apps, Agricultural Apps, Scientific agriculture, Information dissemination, ICT,

1. INTRODUCTION:

Agriculture is the backbone of India and human existence. The need for food is growing drastically with the growing population and increasing need for quality food. This need is exerting pressure on the farmers to produce more food. Increase in usage of chemicals and deforestation for expanding agriculture is increasing which is a matter of concern. It is opined that elevating productivity in the available land by optimal usage of chemicals is the only ecofriendly solution to deal with the above mentioned crossroad situation. ICT (Information and Communication Technology) in this regard is the best way to facilitate scientific and timely information for eco-friendly & sustainable agriculture. Specifically agro-based mobile applications (apps) are the promising aid for information dissemination in the hands of semiliterate and literate farmers who possess smartphones. Agro-based mobile apps are a breakthrough in this area. They facilitate farmers with timely, scientific & reliable information and provide platforms to facilitate many activities in the process of agriculture which can be used to increase productivity, reduce unnecessary expenses and provide platforms to the farmers to join farming communities and interact with other farmers. These apps are loaded with most relevant features like; Package of practices, Calculator facilities, Market value information services, News and updates, Pest and Disease Management services, Farmers' community services, Weather Forecasting services, E – Commerce service, etc,. Agro based mobile apps will facilitate the farmers to make timely and scientific decisions in the entire process of cultivation starting form selecting the right variety of seeds for cultivation to following the right time and method of harvesting the crop. Majority of the Agro-based mobile apps are equipped with many features in them which guide and facilitate the farmers in the entire process of cultivation. There are articles that state, following scientific information provided in the agro based mobile apps, the farmers can get benefited in different ways like; improving the quality of the performance, reducing the amount of wastage, reducing the amount of chemical usage, increasing the quality and quantity of the produce, decreasing the harm to the environment, reducing unnecessary expenses and loss, etc,.

In this paper, the features of agro based mobile applications including Package of Practices information, Calculator facilities, Pest and Disease Management services, Market Value Information, News and Updates, Farmers' Community service, Weather Forecast information and E-Commerce service facilities that form the apps are analysed and the benefits they provide to the farmers in terms quality performance; emphasizing on reduced defect rates, reduced



usage of chemicals, reduced amount of inferior quality of the produce, reduced amount of inferior quantity of the yield, reduced weed growth and reduced rate of disease and pest infections are examined.

This paper focuses on examining the impact of usage of the agro based mobile apps and its features and finding out the relationship between the usage of these features and the quality performance of the farmers in Kalyana Karnataka region, in Karnataka state, India.

2. PROBLEM STATEMENT:

ICT plays a prominent role in increasing food production in the available land with optimum usage of chemicals and ensuring the quality of food and concern towards environment. Agro based mobile apps are seeming very promising in delivering timely and scientific information facilitating sustainable agricultural practices. As there are many features in agro based mobile apps and they seem very promising towards helping farmers throughout the process of agriculture to support decision making, resulting in improved performance of the farmers. But the question of which features among all the features in the apps contribute more to the performance of the farmers of Kalyana Karnataka region? remains unanswered. The farmers' (users of apps) performance in terms of quality performance like; the rate of defects, frequency of wrong decisions, usage of chemicals, quality and quantity of yield, rate of infections, etc., in Kalyana Karnataka region are to be studied.

This study tries to answer the following questions;

Up to what extent the different features from agro based mobile apps are associated with the farmers' quality performance?

What is the impact of usage of each feature on the performance of the farmers in terms of 'quality performance'?

2.1. OBJECTIVES:

- 1. To inspect the association between the agro based mobile apps and farmers' quality performance.
- 2. To measure strength of the relationship between the usage of every feature of agro-based mobile apps and the farmers' quality performance.
- 3. To examine the impact of usage of agro based mobile apps on the farmers' quality performance.

2.2. HYPOTHESIS:

Main Hypothesis:

H0: Agro based mobile apps have no significant impact on farmers' quality performance

H1: Agro based mobile apps have significant impact on farmers' quality performance

Sub Hypotheses:

Ha0: POPs have no significant impact on farmers' quality performance Ha1: POPs have significant impact on farmers' quality performance

Hb0: Calculators have no significant impact on farmers' quality performance Hb1: Calculators management information have significant impact on farmers' quality performance

Hc0: Pest and disease management have no significant impact on farmers' quality performance Hc1: Pest and disease management have significant impact on farmers' quality performance

Hd0: Market value information have no significant impact on farmers' quality performance Hd1: Market value information have significant impact on farmers' quality performance

He0: News and updates have no significant impact on farmers' quality performance He1: News and updates have significant impact on farmers' quality performance

Hf0: Weather forecast have no significant impact on farmers' quality performance Hf1: Weather forecast have significant impact on farmers' quality performance

Hg0: Farmers' community have no significant impact on farmers' quality performance Hg1: Farmers' community have significant impact on farmers' quality performance

Hh0: E Commerce have no significant impact on farmers' quality performance



Hh1: E Commerce have significant impact on farmers' quality performance

3. METHODOLOGY:

Type of the study: Impact Study – The relationship and impact of the 'Agro based mobile apps' and the 'Quality performance' of the farmers.

Population: Farmers from Kalyana Karnataka region who are using agro based mobile apps

Sample size: 405

Sampling Techniques: Convenient Sampling

Data Analysis and Hypothesis Testing: Chi-Square test and Cramers' V values

Data Collection Instrument: Structured Questionnaire in which the responses are collected using 5 point likert scales;

For collecting the responses on the Independent variables (features) 5 point likert scale is used with the following scales: 1: SD – Strongly Disagree, 2: D – Disagree, 3: N – Neutral, 4: A – Agree, 5: SA – Strongly Agree

For collecting the responses on the dependent variable (Quality performance) 5 point likert scale is used with the following scales: 1: SII – Significantly Increased, 2: SLI – Slightly Increased, 3: NC – No Change, 4: SLD – Slightly Decreased, 5: SID – Significantly Decreased

4. **RESULTS:**

To test the research hypothesis, Chi-Square test was used to inspect the association between the variables and Cramer's V value was calculated to measure the strength of the relationship between the variables to infer the impact of the features on the quality performance.

Sl No	Null Hypotheses	Chi square test	Result
H10	Agro-based mobile apps has no significant	$\chi^2 = 123.854$	H10 rejected
	impact on farmers' quality performance	P = .000	
H1 _{0a}	Package of Practices (POP) feature has no	$\chi^2 = 305.225$	H1 _{0a} rejected
	significant impact on farmers' quality performance	P = .000	
H1 _{0b}	Calculator (CALC) feature has no significant	$\chi^2 = 177.188$	H1 _{0b} rejected
	impact on farmers' quality performance	P = .000	
H1 _{0c}	Pest and disease management (PDM) feature has	$\chi^2 = 331.950$	H1 _{0c} rejected
	no significant impact on farmers' quality	P = .000	
	performance		
$H1_{0d}$	Market Value Information (MVI) feature has no	$\chi^2 = 224.765$	H1 _{0d} rejected
	significant impact on farmers' quality performance	P = .000	
H1 _{0e}	News and Updates (NU) feature has no significant	$\chi^2 = 135.877$	H10e rejected
	impact on farmers' quality performance	P = .000	
$H1_{0f}$	Weather Forecast (WF) feature has no significant	$\chi^2 = 219.378$	H10f rejected
	impact on farmers' quality performance	P = .000	
H1 _{0g}	Farmers' Community (FC) feature has no	$\chi^2 = 166.018$	H10g rejected
	significant impact on farmers' quality performance	P = .000	
H1 _{0h}	E-Commerce (EC) feature has no significant	$\chi^2 = 353.669$	H1 _{0h} rejected
	impact on farmers' quality performance	P = .000	

Table 1 showing the results of the hypotheses test

H0: Agro-based mobile apps have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of agro based mobile apps and farmers' quality performance is 123.854 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Agro-Based Mobile Apps) has an impact on the dependent variable (Quality performance)



Ha0: Package of practices have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of Package of Practices (POP) and farmers' quality performance is 305.225 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Package of Practices) has an impact on the dependent variable (Quality performance)

Hb0: Calculator facilities have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of Calculator (CALC) and farmers' quality performance is 177.188 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Calculator) has an impact on the dependent variable (Quality performance)

Hc0: Pest and disease management facilities have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of Pest and disease management (PDM) and farmers' quality performance is 331.950 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Pest and disease management) has an impact on the dependent variable (Quality performance)

Hd0: Market Value Information have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of Market Value Information (MVI) and farmers' quality performance is 224.765 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Market Value Information) has an impact on the dependent variable (Quality performance)

He0: News and Updates have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of News and Updates (NU) and farmers' quality performance is 135.877 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (News and Updates) has an impact on the dependent variable (Quality performance)

Hf0: Weather Forecast Information have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of Weather Forecast (WF) and farmers' quality performance is 219.378 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Weather Forecast) has an impact on the dependent variable (Quality performance)

Hg0: Farmers' Community facilities have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of Farmers' Community (FC) and farmers' quality performance is 166.018 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (Farmers' Community) has an impact on the dependent variable (Quality performance)

Hh0: E Commerce facilities have no significant impact on farmers' quality performance

The table indicates that, χ^2 value of E-Commerce (EC) and farmers' quality performance is 353.669 and p value is 0.000 which is less than the alpha value (0.05). Therefore we reject the null hypothesis and conclude that Agro-based mobile



apps usage has a significant association with farmers' quality performance. Since there is a significant association between the variables, it can be inferred that the independent variable (E-Commerce) has an impact on the dependent variable (Quality performance)

Overall by the data it is very much evident that there is a significant relationship between the variables by which it can be inferred that the independent variables are creating an impact on the dependent variable. Studying the strength of the relationship was done using the Cramers' V values on each factor that formed the independent variable. Using the values that denote the strength of the relationship, the magnitude of impact that is created by each factor and the independent variable on the dependent variable is inferred below.

STRENGTH OF RELATIONSHIP BETWEEN THE VARIABLES:

Table 10: The strength of relationship between every independent variable (POP, CALC, PDM, MVI, NU, WF, FC & EC) and farmers' quality performance

Cramer's V values						
Independent Variables	Dependent Variable (Farmers' Quality Performance)					
Package Of Practices Information (POP)	.868					
Calculator Facilities (CALC)	.661					
Pests and Disease Management (PDM)	.905					
Market Value Information (MVI)	.745					
News & Updates (NU)	.579					
Weather Forecast information (WF)	.736					
Farmers' Community facility (FC)	.640					
E Commerce facility (EC)	.934					
Agro - based mobile apps	.758					

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Tal	ble	2	Showing	the str	ength of	' the	relationshir	o between	the study	variables
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As the chi squared results showed that there is a significant association between all the independent and dependent variable, further the Cramer's V value was found out to measure the strength of the relationship between each independent variable and the dependent variable. The above table shows that the feature E Commerce facility (EC) led the independent variables with the Cramer's V value of .934 which shows that EC has a very strong relationship with farmers' quality performance and a very strong impact can be inferred in this case, followed by Pest and Disease Management (PDM) at Cramer's V value of .905 which also shows a very strong relationship between PDM and farmer's quality performance. The third strongest relationship was found between Package Of Practices Information (POP) and farmers' quality performance with a Cramer's V value of .868 followed by Market Value Information (MVI) with .745 and Weather Forecast (WF) with .736 Cramer's V values. Other IVs; Calculator Facility (CALC), Farmers' community facility (FC) and News and Updates (NU) showed a moderate relationship with .661, .640 and .579 Cramer's V values respectively.

Overall the strength of the relationship between the independent variable (Agro based mobile apps) and the dependent variable (Farmers' Quality performance) is considered to be more than moderate and strong, with a Cramers' V value of .758.

5. DISCUSSION:

From the above study it can be inferred that all the independent variables are significantly associated with the quality performance of the farmers of Kalayana Karnataka region. And the Cramer's V values have revealed the strength of the relationship between the variables under study. Below is the further discussion about the inferences that can be made based on the study results.

Very strongly related variables:

Commerce facility (EC), Pest and Disease Management (PDM) and Package Of Practices Information (POP) are the features (factors forming independent variables) that showed very strong relationship with the quality performance of the farmers in Kalyana Karnataka region. The study revealed that among the farmers under the study



who used the agro based mobile apps for accessing the information about the Commerce facility (EC), Pest and Disease Management (PDM) and Package Of Practices Information (POP) have highly benefited by being able to increase their quality performance in terms of reduced defect rates, reduced usage of chemicals, reduced amount of inferior quality of the produce, reduced amount of inferior quantity of the yield, reduced weed growth and reduced rate of disease and pest infections. As the results showed a significant association and a very strong relationship among the variables discussed above, It can be inferred that the above said features have a very significant impact on the farmers' quality performance.

Moderate to strongly related variables:

Market Value Information (MVI), Weather Forecast and Calculator Facility (CALC) are the features (factors forming Independent variables) that showed moderate to strong relationship with the quality performance of the farmers in Kalyana Karnataka region. The study revealed that among the farmers under the study who used the agro based mobile apps for access the information about Market Value Information (MVI), Weather Forecast and Calculator Facility (CALC) to calculate the amount of chemicals required to treat the infections and the amount of fertilizers required for the crop have benefited by being able to increase the quality performance in terms of reduced defect rates, reduced usage of chemicals, reduced amount of inferior quality of the produce, reduced amount of inferior quantity of the yield, reduced weed growth and reduced rate of disease and pest infections. As the results showed a significant association and a moderate to strong relationship among the variables discussed above, It can be inferred that the above said features also have a significant impact on the farmers' quality performance.

Low to Moderately related variables:

Farmers' community facility (FC) and News and Updates (NU) are the features (factors forming Independent variables) that showed low to moderate relationship with the quality performance of the farmers in Kalyana Karnataka region. The study revealed that among the farmers under the study who used the agro based mobile apps for access the latest News and Updates information about agriculture and joining the farmers' community have benefited by being able to increase the quality performance in terms of reduced defect rates, reduced usage of chemicals, reduced amount of inferior quality of the produce, reduced amount of inferior quantity of the yield, reduced weed growth and reduced rate of disease and pest infections. As the results showed a significant association and a low to moderate relationship among the variables discussed above, It can be inferred that the above said features also have a significant impact on the farmers' quality performance.

6. CONCLUSION:

The study says that there is an association between the agro based mobile apps and farmers' quality performance and the strength of association in case agro based mobile apps as a whole and farmers' quality performance is more than moderate and nearly strong with Cramer's V value of .758. However Commerce facility (EC), Pest and Disease Management (PDM) and Package Of Practices Information (POP) showed a very strong association. These features stands out in the association with farmers' quality performance and has a very significant impact. Followed by Market Value Information (MVI), Weather Forecast (WF), Calculator Facility (CALC), Farmers' community facility (FC) and News and Updates (NU). The farmers of the region under study perceived such features form the agro based mobile apps as very crucial and they have considerably used these apps and as a result their quality performance has also got strongly positively impacted. As timely and reliable information and platforms facilitating the process of agriculture are very vital part of agricultural growth and significant part of upgrading farmers' performance, using agro based mobile apps for such information and platforms supporting the agricultural processes in the region has moderately increased the performance of the farmers in terms of their quality performance.

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