

Research Article

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Effectiveness of a Mobile Paddy Expert System in Pest Diagnosis

R. Janarthanan¹ and M.Senthil kumar²

ABSTRACT

'Crop doctor' is a component in a mobile applica on developed by Tamil Nadu Agricultural University (TNAU) for diagnosing pest and diseases in paddy and aids in availing management solu ons. The study was conducted among paddy growers in Tamil Nadu through an 'after only' experimental design to find out the diagnos c usability of 'Crop doctor' in Paddy Expert System mobile applica on of TNAU in diagnosis of pest and disease in paddy. Diagnos c Usability of crop doctor component among the respondents revealed that overall effec veness of the mobile applica on was found to be at 73.20 percent.

Keywords: ICT ; Android Mobile application; Usability study; Paddy; TNAU

INTRODUCTION

Mobile phone possession among Indian farmers is increasing. However, internet access in rural areas remains low (NSSO 2018). Indian Council of Agricultural Research has released a wide range of mobile applications for farmers utilization (Singh et.al. 2018). However, the practical usability of mobile applications remains unknown.

This study was taken up with the objective to study the effectiveness of crop doctor in TNAU (Tamil Nadu Agricultural University) Paddy Expert system mobile

application for its usability among the respondents and to find out the relationship between the profile characteristics of the respondents and the effectiveness of Crop doctor in terms of usability. The study was carried out using a pre tested, well-structured interview schedule and the data were analysed and presented.

METHODOLOGY

The present study was conducted for assessing the diagnostic usability of Crop doctor in Paddy Expert system mobile application of TNAU, among paddy cultivating farmers owning smartphones.

¹Department of Agricultural Extension, TNAU, Coimbatore - 641 003

²Directorate of Extension Education, TNAU, Coimbatore - 641 003

Respondents were selected in three paddy growing districts of Tamil Nadu i.e., Villupuram (45), Kancheepuram (26) and Thiruvarur (82) with the help of Krishi Vigyan Kendra (KVK) and Department of Agriculture, Tamil Nadu. A sample size of 153 respondents was derived using Purposive Random sampling method by following 'after only' experimental design. Diagnostic usability is an integrated measure to measure the usability of crop doctor and the procedure for the study was adopted with suitable modifications, (Lewis, 2014). This was studied using standardized three components viz. diagnostic effectiveness, diagnostic efficiency and overall user satisfaction. Diagnostic effectiveness was recorded using the completion of diagnosis and it was calculated by:

$$\text{Diagnostic effectiveness} = \frac{\text{No.of.symptoms diagnosed successfully using Crop doctor}}{\text{Total no.of.symptoms given for diagnosis using Crop doctor}} * 100$$

Four tasks set for assessing were, operative task for assessing the skill to operate crop doctor successfully for any symptom randomly and followed by diagnosis of two insect and two disease diagnosis viz., Brown Plant Hopper, Stem borer, Brown spot and Blast disease. Diagnostic efficiency was measured upon

completion of task and was recorded based on the standard time scale in two intervals fixed and the overall user satisfaction was calculated using method adopted by Simorangkir et.al., (2018). The scores were recorded using five-point continuum of Likert scale. Overall user satisfaction was calculated by dividing actual score and the ideal score and the result is converted to per cent through multiplication with hundred. The collected data were tabulated and analysed using percentage analysis, multiple linear regression and Pearson correlation coefficient.

For this study, only 'crop doctor' of the Paddy expert system mobile app developed by TNAU, was chosen and studied. 'Crop doctor' works on the principle of picture identicalness by matching the field affected picture on comparison with the prestored picture in the application.

FINDINGS AND DISCUSSION

Diagnostic Usability

Among the allotted five tasks, the results revealed that majority (87.58 %) of the respondents were successful in navigating the Crop doctor (Table 1). Farmers were able to operate the Crop doctor by following the guidelines instructed in the application and its displayed language i.e., Tamil. Among the

subsequent tasks high level of diagnostic effectiveness (76.47 %) was found in the identification of stem borer. The least diagnostic effectiveness was observed in the identification of blast as only half of the respondents (52.95 %) diagnosed correctly. The hindrance for diagnosis in insect pests was due to the complexity in the stages of

variation in damage which doesn't exactly match with the available symptoms in Crop doctor. This could have led to an incomplete or wrong diagnosis. In addition, from the above findings, it was observed that identification of blast found to be very difficult by the respondents due to the complexity in the appearance.

Table 1. Distribution of Respondents according to the Diagnostic Effectiveness

S. No.	Name of the task	No.	Percentage (n=153)	Overall effectiveness (%)
1	Crop doctor operation	134	87.58	73.20
2	Stem borer diagnosis	117	76.47	
3	Blast diagnosis	81	52.95	
4	Brown spot diagnosis	115	75.16	
5	Brown Plant Hopper diagnosis	113	73.85	

Overall User Satisfaction of the Respondents

Satisfaction of the respondents was measured using the five-point continuum of Likert scale. The data collected were analysed by using method followed by Simorangkir et.al., (2018) Based on the above method, a respondent is measured for three contexts viz., User interface, picture identicality and ease of use. Based on this, the overall user satisfaction was calculated and the categorized results are presented in Table 2.

Table 2. Distribution of Respondents according to Overall User Satisfaction

Sl. No.	Category	No.	Percentage (n=153)	Overall satisfaction (%)
1	High satisfaction	60	39.22	78.69
2	Medium satisfaction	57	37.25	
3	Low satisfaction	36	23.52	
	Total	153	100.00	

The overall user satisfaction of the respondents in utilizing the crop doctor for paddy pest diagnosis was 78.69 per cent. Further it could be inferred that 76.47% of the respondents were found to have high and medium level of satisfaction and only 23.52 % of the respondents had expressed low level of satisfaction.

Influence of Independent Variables on Usability

Multiple regression analysis was applied to find out the influence of

independent variables to the usability among the respondents. The R^2 value was 0.516. The R^2 value has shown that all the variables contributed for 51.60 per cent variation in usability of the crop doctor among the respondents. Therefore, the equation was worked out and given below.

$$Y_1 = -0.32 + 0.098 (X_1) + 0.004(X_2) + 0.143(X_3) - 0.010(X_4) + 0.067 (X_5) + 0.117 (X_6) + 0.085 (X_7) + 0.113 (X_8) + 0.233 (X_9) + 0.244 (X_{10}) + 0.085 (X_{11}) + 0.079 (X_{12}) + 0.080 (X_{13})$$

Table 3. Relationship between the Independent Variables and Usability of the Respondents (n=153)

Sl.No.	Variables	'r' Value	Regression co-efficient(B)	Standard error	't' value
1	Age (X1)	0.315**	0.098	0.050	1.965
2	Educational status(X2)	0.389**	0.004	0.037	0.096
3	Area under paddy cultivation (X3)	0.069 ^{NS}	0.143	0.073	1.955
4	Experience in paddy cultivation (X4)	-0.205*	-0.010	0.048	-0.208
5	Information seeking behaviour (X5)	0.418*	0.198	0.067	2.949**
6	Trainings undergone related to ICT (X6)	0.39**	-0.180	0.117	-1.536
7	Mobile application operational ability (X7)	0.571**	0.317	0.085	3.726**
8	Extent of use mobile phone (X 8)	0.265**	0.102	0.113	0.905
9	Awareness on Agricultural mobile application (X9)	0.322**	-0.129	0.233	-0.553
10	Utilization of agricultural mobile application (X10)	0.39**	0.259	0.244	1.060

Sl.No.	Variables	'r' Value	Regression co-efficient(B)	Standard error	't' value
11	Attitude towards based extension services (X11)	0.426 ^{NS}	0.046	0.085	0.538
12	Innovativeness (X 12)	0.53**	-0.060	0.079	-.0762
13	Progressiveness (X13)	0.510**	0.245	0.080	3.051**

F value = 11.413

^{NS} - Non significant

** Significant at one percent level of probability

R² Value = 51.60

*Significant at five per cent level of probability

Results inferred that mobile application operational ability, Information seeking behaviour and Progressiveness had contributed at one per cent level of probability. The remaining variables did not contribute to usability among the respondents. It is notable that one-unit increase *ceteris paribus* in the following independent variables viz., Mobile application operational ability (X7), Information seeking behaviour (X5) Progressiveness (X 13), would increase the Diagnostic usability level by 3.276, 2.949 and 3.051 units respectively.

CONCLUSION

'Crop doctor' can be more farmer friendly if farmers are trained for its utilization. Content of the mobile application has to be revalidated and steps can be taken to ensure time to time updating of pictures.

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