Information Efficiency of Agricultural Expert System

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ABSTRACT

This research paper focuses on the assessment of the information efficiency of agricultural expert system-'Diagnos-4', developed by Kerala Agricultural University based on the perception of extension personnel. The extension personnel working in Palakkad district of Kerala were selected for the study. Out of two groups, first group was exposed to Agricultural Expert System alone (T1) and the other group were exposed to Agricultural Expert System with human expert (T2). Information Efficiency Scale was developed and standardized using the dimensions such as retrievability, relevancy, practicability, information content and knowledge gain by the extension personnel. The combination of Agricultural Expert System and human expertise showed the higher degree of information efficiency between the treatment groups of extension personnel. Extension personnel rated retrievability of information from the Agricultural Expert System was least and hence the path way of retrieving information required improvement. Extension personnel as prospective users needed an orientation in using the Agricultural Expert System before introducing it among them.

Keywords: *Agricultural expert system; Extension personnel; Information efficiency;*

In India, most of the Agricultural Research Institutes are involved in the development of Agricultural Expert System (AES) to satisfy the information needs of the users of agricultural technologies. The researchers who are involved in developing Agricultural Expert System generally conduct validation studies to ensure the precision of knowledge base provided in the system. Whereas the research studies at the users' level in assessing the performance of the system are limited, socio-personal factors responsible for utilization of the system among the users are mostly a forgotten area.

Kerala Agricultural University developed an Agricultural Expert System for diagnosing pests and diseases of nine major crops of Kerala called 'DIAGNOS-4' which has drawn tremendous attraction among extension personnel. The modified version of it has been released recently for the benefit of all the stakeholders involved in agricultural development. A number of questions could be raised before introducing the system among the users. What was the information efficiency of the proposed system? Whether the system would satisfy the information needs of extension personnel involved in agricultural development? In the absence of a human expert, how far the Agricultural Expert System satisfied the information requirements of extension personnel? With this background, a study was conducted to analyze the information efficiency of Agricultural Expert System as assessed by the extension personnel.

METHODOLOGY

'Diagnos-4' is the Agricultural Expert System, specially designed software for tackling the problems in transfer of technologies related to plant protection aspects of nine important crops of Kerala. Since extension personnel are expected to use the 'Diagnos-4', the study was conducted among the extension personnel in the Palakkad district of Kerala, India. The sample of the study constituted sixty extension personnel. The respondents were selected purposively who were mainly dealing with the cultivation of rice, coconut and banana as major crops. They were divided into two groups. First group was exposed to Agricultural Expert System alone (T1) and the other group was exposed to Agricultural Expert System with human

expertise (T2) on the plant protection technologies of rice, coconut and banana crops.

Information Efficiency Scale was developed for the study and standardized using the dimensions such as retrievability, relevancy, practicability, information content and knowledge gain by the respondents.

Retrievability: It was operationalised as finding out the required information without much effort. It was the extent to which the information was easily drawn from the Agricultural Expert System.

Relevancy: In this study relevancy was defined as the opinion of the respondents about the suitability of the information provided in Agricultural Expert System to the users' situation. It was assessed whether the AES was able to provide information suitable to the users' resources and appropriate to the users' needs.

Practicability: The dimension of practicability was measured whether the information provided in the AES was adoptable in the real situation and feasible to the users.

Information content: Information content was measured as the extent to which the information on the subject matter was covered in the AES. It was assessed whether the provided information was complete and understandable to the users.

Knowledge gain: Knowledge gain was the quantity of information gained by the respondent before and after exposure of each treatment. A standardized knowledge test was conducted among the respondents to assess the information gain from the Agricultural Expert System.

The scores obtained by each dimension were worked out to form total score. Thus Information Efficiency Index was calculated as follows:

$$\textbf{Information Efficiency Index} = \frac{\textbf{Obtained total score}}{\textbf{Maximum possible score}} \times 100$$

Information Efficiency Index calculated for each respondent was used to categorize the respondents separately who assessed the AES as high, medium and low as follows:

High efficiency	:	Above mean + 1 Standard deviation (SD)
Medium efficiency	:	Between mean $\pm$ 1SD
Low efficiency	:	Below the mean – 1 SD

RESULTS AND DISCUSSION

Information Efficiency Index (IEI) of Agricultural Expert System as assessed by extension personnel is presented in the Table 1. It is observed that the IEI of AES was 71.60 as assessed by the extension personnel. The extension personnel who were exposed to AES alone rated it with an IEI of 68.64 and who were exposed to AES + human experts assessed the expert system with an IEI of 74.56. Even though the combination of AES and human expertise showed the higher degree of information efficiency between the treatment groups, the IEI rated by the extension personnel who were exposed to AES alone was appreciable; this indicated that it could be effectively used in the absence of human experts. This finding is in concomitant with the findings of *Anandaraja (2002)* and *Balasubramanian et al., (2005)*.

Knowledge gain was the noticeable component that showed a wide difference between the T1 and T2 groups. The reason might be that the influence of human experts prompted the extension personnel to rate AES with higher IEI. Among the dimensions of IEI, practicability of information was assessed as the maximum mean score percentage of 86.00 by T2 group and 84.00 by T1 group of extension personnel. It indicated that the management measures given in AES were highly adoptable and feasible in the field situation. Relevancy of the information was assessed as almost same by both the groups. From the above result, it could be interpreted that both groups were satisfied about the relevancy of the information provided in AES. They agreed that the presented information was suitable to the users' resources and appropriate to the end users.

Information content was rated with the mean score percentage of 68.74 and 78.21 by T1 and T2 group, respectively. They were of the opinion that the content would become adequate if some more information on biological control measures were to be added. They also suggested to include a ready reckoner for working out the dosage of inputs to be used in an available area. Retrievability was assessed with the mean score percentage of 61.76 and 68.16 by T1 and T2 group of extension personnel, respectively. It was assessed as the lowest mean score percentage among the dimensions of IEI. Therefore, options should be found out to improve the retrievability of AES such as including easily accessible pathways and guiding icons without any confusion. Few respondents suggested to include single click and avoid double click in all the links to avoid tediousness in opening the required pages. Improved software programmes may be used to enhance the retrievability of expert system.

Table 1. Treatment wise Information Efficiency Index of AES as assessed by extension personnel

S. No	Dimensions	AES alone T1 (n=30)	AES+HES T2 (n=30)
1	Retrievability	61.76	68.16
2	Relevancy	79.33	80.00
3	Practicability	84.00	86.00
4	Information content	68.74	78.21
5	Knowledge gain	49.35	60.44
	Mean	68.64	74.56
	Overall mean:	71.60	

Table 2. Category wise Information Efficiency Index of AES as assessed by extension personnel

S. No	Category	Number	Percentage
1	High	10	16.00
2	Medium	43	73.00
3	Low	7	11.00

Table 2 presents category wise IEI of AES as assessed by extension personnel. It could be inferred that 16% of the extension personnel rated the afore-said expert system with high IEI, 73% of them rated medium IEI and the remaining 11% rated it with lower IEI value. It showed that majority of them favoured for the information efficiency of selected expert system and relatively lower percentage of extension personnel rated it as low information efficient. These findings are in agreement with the findings of *CLAES (2006)*. The reason might be that AES was built with the accumulated expertise of several human experts and the presentation of the message systematically with attractive colours and photographs which involve both the senses of hearing and seeing. The delivery of information systematically through text, pictures and audio were tailored in such away that users could retrieve information at their own pace. The pictures and attractive colorful presentation would have attracted the attention of the respondents and made them more receptive to the exposed idea. The principle of 'seeing is believing', holds good, because 'one picture was worth more than thousand words'. More over the sense of seeing and hearing might have created enough impact of providing more information. This finding derives support from the results of *Balasubramanian (2004).*

CONCLUSION

The IEI rated by the extension personnel who were exposed to AES alone indicated that it could be effectively used in the absence of human experts. Among the dimensions of IEI, practicability of information was assessed most favourably by both the groups of extension personnel. It showed that the management measures given in AES were highly adoptable and feasible in the field situation. Retrievability was assessed with the lowest mean score percentage by the extension personnel. Majority of the extension personnel rated AES with medium information efficient.They also urged to include more of biological control measures and also to include all micro nutrient deficiency symptoms and recommended control measures. Extension personnel rated retrievability of the information from the AES was the least efficient. During the introduction stage extension personnel needed orientation training in using expert system before its being used efficiently by them.

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