

## Diffusion and Adoption of Agri-Expert Systems Among Extension Professionals in Kerala



### Agriculture

**KEYWORDS :** Expert system, Diffusion, Adoption, Agriculture

**Modem Ravi Kishore**

P.G scholar, Department of Agricultural Extension, College of Agriculture, Vellayani, Trivandrum, KERALA-695522

**Dr. Allan Thomas**

Assistant Professor, Department of Agricultural Extension, College Of Agriculture, Vellayani, Trivandrum, KERALA-695522

### ABSTRACT

*The paper focuses on the diffusion-adoption stages in terms of extent of use of expert system technology vis a vis extension professionals in Kerala. A survey was conducted among three targeted segments of Kerala extension professionals to evaluate questions about the stage of respondent in using agri-expert systems for the benefit of farming community and effective agriculture decision making. The study was conducted among a sample 100 extension professionals actively involved in the field of agriculture. A pre tested and structured questionnaire was administered to collect data. The Diffusion-Adoption Model was employed to categorize extension professionals by stage in the technology adoption process. Based on the stage of adoption, respondents were categorised into different adopter categories which leads to comparison with Roger's adopter categorisation.*

### INTRODUCTION

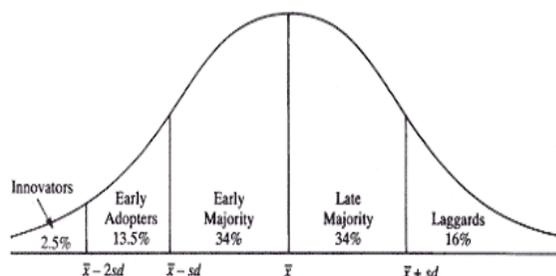
Expert system is branch of Artificial Intelligence which deals with helping Non-Expert to find solution to complex problem in a more Expert-Like fashion (Waterman, 2004). Expert Systems use human Knowledge to solve problems that normally would require human intelligence. Expert Systems represent the expertise knowledge as data or rule within the database. These data and rule can be called upon when needed to solve problems. Extension professionals constantly encounter and are well aware of the impacts that technological innovations have on individuals. A major technology invading the clientele of Extension professionals today is the agri-expert system. Major shifts are underway in the way information is accessed by agricultural extension agents, including a diversification of channels through which receives information (Abdel-wahed, 2007). Expert systems are used mainly as extension tools in contrast to research activity. Their extension role presents several fundamental obstacles to their successful adoption in agriculture. They cannot be considered successful just because of correct mimicking as they must also be employed by at least some of the potential users (Plant and Stone, 1991). Appropriate participation of the agricultural Extension Service in the adoption-diffusion process for the Computer and Internet by Agricultural extensional agents is a debated issue (Risdon, 1994). Chetsumon (2005) reported that adoption of expert systems appears to depend on the system attributes, the support of the systems, and user characteristics. With a view to enhance the capability of extension professionals in utilizing agricultural expert systems for the benefit of farming community for decision making in various aspects of agriculture, a systematic appraisal of existing expert systems in agriculture vis a vis their diffusion among the extension professionals was studied.

### MATERIALS AND METHODS

A survey was conducted among three targeted segments of Kerala extension professionals to evaluate questions about the stage of respondent in using agri-expert systems for the benefit of farming community and effective agriculture decision making. The study was conducted on a sample 100 with a minimum of 40 extension professionals primarily consisting of Agricultural Officers (AO's), 30 front line extension professionals of KVK's (Krishi Vigyan Kendra's) and NGO's (Non-Governmental Organization's) actively involved in the field of agriculture and 30 Scientists involved with extension programmes of Kerala Agricultural University, ICAR (Indian Council of Agricultural Research) Institutes and Commodity Boards.

The Diffusion-Adoption model was employed to categorize extension professionals by stage in the technology adoption process. Rogers (1958) developed a sequence of stages to describe the adoption process. The adoption stages offers a logical progression of five sequential stages for the adoption of the expert

system by extension professionals viz, awareness, interest, evaluation, trial and adoption. Since the adoption of an agricultural innovation followed a normal curve, Rogers developed classifications of adopters by calculating the mean for the curve and then, by adding or subtracting the standard deviation, divided the curve into five segments. The segments assigned to these categories were: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards (Figure 1).



**Fig 1. The classic adoption curve indicating a small number of individuals adopting the innovation early, followed by the majority of adopters and laggards**

The purpose of the analysis discussed here is to apply the diffusion-adoption model to the use of agri-expert system (with special reference to KAU- Fertulator and e-Crop Doctor) by extension professionals and to determine the extent of their adoption of expert systems for decision-making. Subsequent analysis attempts to identify extension professionals at each adoption stage. The test constituted 5 questions which were provided with Yes or No choices. The respondents were asked to tick mark the correct answer. Based on the stage, respondents were classified into five stages accordingly. Based on the stage of adoption respondents were categorized into innovators, early adopters, early majority, late majority and laggards for adopter categorization using percentiles, as measure of check.

### RESULTS AND DISCUSSION

The completed and returned questionnaires from our sample of respondents revealed that 10% were at awareness stage who had just known about the expert system, 19% were at interest stage, 32% were at evaluation stage, 24% were at trial stage and 15% were at adoption stage in using expert systems for decision making. (Table 1)

**Table 1. Categorisation of respondents based on their stage in adoption process.**

Sl. No.	Statements	EP from SDA (N=40)	FLEP from (KVK & NGO's) (N=30)	Scientists (N=30)	Total (N=100)
		No.	No.	No.	No.
1	Name any expert systems you know or you have used (Awareness stage)	3	4	3	10
2	Have you got the interest to get training on use of expert systems? (Interest stage)	6	5	8	19
3	Are you aware about the advantages and disadvantages of expert systems? (Evaluation stage)	11	11	10	32
4	Have you used expert system to determine the usefulness for further adoption? (Trial stage)	12	6	6	24
5	Are you solving farmer's problems mainly through the use of expert systems? (Adoption stage)	8	4	3	15

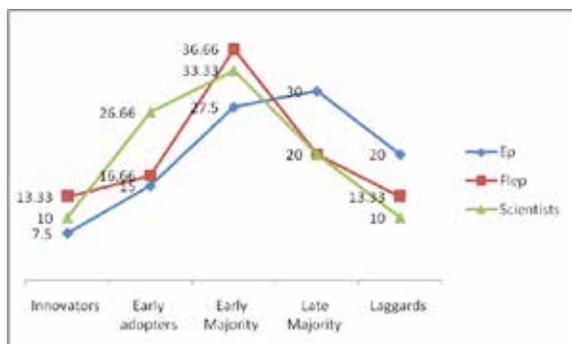
EP- Extension Professionals; SDA- State Department of Agriculture; FLEP- Front Line Extension Professionals; KVK- Krishi Vigyan Kendra; NGO- Non Governmental Organisations.

Based on the stage of adoption respondents were categorized into innovators, early adopters, early majority, late majority and laggards for adopter categorization using percentiles, as measure of check. (Table 2)

**Table 2. Adopter categorisation of respondents with reference to usage of KAU expert systems**

Category	Extension professionals N=40		Front line extension personnel N=30		Scientists N=30		Total	
	No	%	No	%	No	%	No	%
Innovators (>P80)	3	7.5	4	13.33	3	10	10	10
Early adopters (P80-P60)	6	15	5	16.66	8	26.66	19	19
Early Majority (P60-P40)	11	27.5	11	36.66	10	33.33	32	32
Late Majority (P40-P20)	12	30	6	20	6	20	24	24
Laggards (<P20)	8	20	4	13.33	3	10	15	15
Percentiles under each class of respondents	P <sub>20</sub> -9.33, P <sub>40</sub> -20, P <sub>60</sub> -40, P <sub>80</sub> -66.66		P <sub>20</sub> -6.66, P <sub>40</sub> -20, P <sub>60</sub> -40, P <sub>80</sub> -66.66		P <sub>20</sub> -20, P <sub>40</sub> -40, P <sub>60</sub> -40, P <sub>80</sub> -66.66			

Scrutiny of the Table 2 revealed the respondent's stage in the different adopter categories. It could be evident from the table that 10 per cent of the sampled respondents belonged to innovators category followed by early adopter category (19%), early majority category (32%), late majority category (24%) and laggards (15%). A detailed and careful perusal of table and figure 2 further revealed that the extension professionals of FLEP from KVK and NGO's belonged to innovator category with the highest percentage (13.33%) when compared to Scientists and Extension Professionals of SDA. A similar pattern was observed in case of early adopter and early majority categories.



**Fig.2. The adoption curves indicating the three categories of respondents distribution**

Observing the 'extension professionals' stage in the diffusion-adoption process, 7.5 per cent of the sampled respondents belonged to innovators category followed by 15 per cent to early

adopters' category, 27.5 per cent to early majority category, 30 per cent to late majority category and 20 per cent to laggards' category. In case of 'front line extension personnels' stage in the diffusion-adoption process, 13.33 per cent of the sampled respondents belonged to innovators category followed by 16.66 per cent to early adopters' category, 36.66 to early majority category, 20 per cent to late majority category and 13.33 per cent to laggards' category. In case of 'scientists' stage in the diffusion-adoption process, 10 per cent of the sampled respondents belonged to innovators category followed by 26.66 per cent to early adopters category, 33.33 per cent to early majority category, 20 per cent to late majority category and 10 per cent to laggards category.

A detailed and careful perusal of table and figure 2 further revealed that in all the three categories, the innovators, early adopters and early majority were with high percentage and the late majority and laggards were low in percentage when compared to the Roger's standard adopter categorization except extension professionals wherein laggards were high. This might be because respondents were more interested in using e-agricultural extension technology for solving farmer's problems and they perceived that relatively less expertise needed for using expert system. Based on studies of characteristics that determine success of this KAU expert system innovation, it is identified that it is expedient to emphasize the following information for communication through expert system to facilitate adoption with special reference to innovators, early adopters and early majority.

- Expert systems were more relatively advantageous
- End-users wishes and needs that the innovation is oriented towards.

- Overall benefit provided by the innovation.
- Exclusiveness and value of exclusiveness of the innovation.
- Economy, affordability and durability of the innovation.
- Complexity or the degree of ease of use of the innovation.

Traditional way of advising recommendations was time consuming as it had to consider many variables such as varieties, spacing, area, package of practice recommendations etc. for giving specific fertilizer recommendation or pesticide/fungicidal or herbicidal recommendations. With the advent of KAU expert system these recommendations could be made within seconds through confirmative option selections. Also, system being available offline, net connectivity was not a problem for its use when compared to many crop specific and online expert systems. These qualities reaffirmed the innovation characteristics with special reference to KAU expert systems. According to Ortt et al (2004) the diffusion curves for breakthrough communication technologies have historically taken a decade or more to accelerate after the first introduction. However, in this study diffusion and adoption of KAU expert systems viz. 'KAU fertilizer and e-crop doctor' took place relatively faster than other communication technologies which is slightly in deviation to the finding by Ortt et al (2004) and is actually a positive aspect of this expert system. However, expert system needs to be further popularised through an 'awareness/hands on- training' to further scale up the use of expert system for the assistance of farming community.

### CONCLUSION

This article reveals the different adopter categorisation of respondents with reference to usage of agri-expert systems. Current technology estimates suggest that more extension professionals are connecting to the expert systems for farm information. The findings confirm that more respondents belonged to innovators category with special reference to use of KAU expert system when compared to Roger's standard. Even though a fair percentage of respondent's belonged to innovator/early adopter/early majority category, there was still a gap observed between laggards and innovators. This gap should be reduced by imparting proper training for augmenting the usage of 'agri- expert systems' among users for effective decision making for the ultimate benefit for farming community with precise, correct and timely information.

### REFERENCE

- Abdel-wahed, M. A. M. 2007. A Futuristic Study on the e-extension in Egypt. Ph.D. Thesis, Agricultural Extension, Faculty of Agriculture, Assiut University, Egypt. | | Chetsumon, S. 2005. Attitudes of extension agents towards Expert systems as decision support tools in Thailand. Ph.D. Thesis, Lincoln University, Thailand. | | Donald A. Waterman. 2004. A guide to Expert Systems; Pearson Education, 419p. | | Ortt, J. and Schoormans, J. P. L. 2004. The Pattern of Development and Diffusion of Breakthrough Communication Technologies. *European Journal of Innovation Management*, 7(4): 292. | | Plant, R.E. and Stone, N.D. (1991). Knowledge-based systems in agriculture. New York: McGraw-Hill, 364p. | | Risdon, P. (1994). Transferring technology through the Internet channel. *Journal of Extension* [On-line], 32(1). Available at: <http://www.joe.org/joe/1994june/a1.html> [12-02-14] | | Rogers, E. 1958. Categorizing the adopters of agricultural practices. *Rural Sociology* 23:345-354. |