Indian Journal of Extension Education

Vol. 42, No. 1 & 2, 2006 (100-102)

Effectiveness of Expert System on Knowledge Retention

N. Balasubramani[1], P. S. Swathilekshmi[2] and K. Chandrakandan[3]

ABSTRACT

Artificial intelligence based computer programmes called Expert System has received a great deal of attention throughout the world, due to its impressive problem solving capability in a variety of fields. For the present study, an expert system named as RUBEXS-04 was designed to simulate the pest and disease diagnosing behaviour. The RUBEXS-04 thus developed was tested for its relative effectiveness over four other different treatments such as human experts without discussion, human experts with discussion, RUBEXS-04 without discussion and RUBEXS-04 with discussion, using the multiple randomized design. The four treatments were allotted to 12 experimental groups to find out the relative effectiveness of the four selected treatments towards knowledge retention. Highest mean retention of knowledge was observed when the subjects were exposed to RUBEXS-04 with discussion (Tr^4). This was followed by the treatments Tr^2, Tr^3 and Tr^1. These four treatments were also found to be significant at one per cent level in respect of mean knowledge retention after 15 days.

As agricultural technology is constantly subjected to metamorphosis over years, today's farmers are swamped with many new cultivars, pesticides and farming techniques. In order to make prudential and accurate decisions, farm managers/extension workers/farmers need speedy access to advices on agricultural problems which should be timely, reliable and consistent.

Information and Communication Technology provides instant access to agricultural information. knowledge based computer programmes or expert system containing "expert knowledge" brings significant change in agriculture, in terms of reduced costs, increased storage, early usage and speedy access. With this background, a study was undertaken with the following objectives:

1. To study the effectiveness of the treatments in terms of knowledge retention among rubber growers.

2. To propose strategies for designing and using expert system for effective technology transfer.

METHODOLOGY

A computer based expert system for rubber protection technologies was developed by employing knowledge engineering methodology and software engineering. An exhaustive knowledge base on 44 items on plant protection technology of rubber crop including leaf, stem, root diseases, non microbial maladies and pests were acquired, and the documented knowledge was analysed and represented in the form of flow chart, which the experts were using to reach a conclusion from specific components in the domain layer. The programming language Visual Basic 6.0 was chosen for designing and developing the Expert System on rubber. This Expert System was named as RUBEXS-04.

[1&3]Ph.D. Scholars, Dept. of Agril. Extension, Tamil Nadu Agricultural University, Coimbatore.
[2]Former Professor, Dept. of Agril. Extension, Tamil Nadu Agricultural University, Coimbatore.

The service area of Rubber Board Regional Office, Mannarkkad, Kerala state, formed the locale of the study. Out of the 60 existing rubber producers societies in the service area, three rubber producers societies were randomly selected. From each society 40 rubber growers were selected randomly. Thus a total number of 120 rubber growers formed the sample for the study.

Four different treatments such as human experts without discussion, human-experts with discussion, RUBEXS-04 without discussion and RUBEXS-04 with discussion were selected. These treatments were tested for their relative effectiveness using the multiple group-randomized design. Each treatment was replicated thrice. Considering 10 respondents per replication, there were 30 respondents per treatment. The 120 respondents formed the subjects for the four treatments. 'Before-After' technique of measurement was used to find out the effect of a particular treatment. Taking into considerations of all the guidelines 21 knowledge items were selected and administered for assessing the knowledge gain and retention of knowledge after 15 days. The difference between the recall score and the pre-exposure score was taken as retention score of the knowledge gained by the individual respondent. Statistical techniques such as simple percentage analysis, paired 't' test, McNemar test and Kruskal Wallis test were used to analyse the data.

RESULTS AND DISCUSSION

Effectiveness of treatments in terms of knowledge retention: The results of four treatments with respect to knowledge level before exposure and retention of knowledge 15 days after the exposure were analysed by applying 't' test. The results are depicted in Table 1.

It could be observed from Table 1 that the highest mean retention of knowledge score of 4.92 (23.43 per cent) was of subjects exposed to Tr^4. This was followed by the treatment Tr^2, Tr^3 and Tr^1 which had the mean retention scores of 1.86 (8.86 per cent), 1.75 (8.33 per cent) and 0.78 (3.71 per cent) respectively. These four treatments were also found to be significant at one per cent level in respect of mean knowledge retention after 15 days.

Proportion of information retained and forgotten by subjects of various experimental groups: The retention of knowledge after 15 days of exposure was assessed and those scores were compared with the quantum forgotten. The mean values and percentages are presented in Table 2. It is observed from the Table that the treatment Tr^4 (RUBEXS-04 with discussion) had the highest retention of knowledge gained (72.35 per cent) followed by treatment Tr^3 (65.64 per cent) treatment Tr^2 (46.85 per cent) and lastly by treatment Tr^1 (Human expert without discussion) with only 28.47 per cent knowledge retention. In other words, the quantum of forgetfulness was higher in treatment Tr^1 (Human expert without discussion) and lowest in treatment Tr^4 (RUBEXS-04 with discussion).

Analysis of variance for different treatments in terms of retention of knowledge: The analysis of variance technique was applied to find out the relative effectiveness of selected treatments in terms of knowledge retention and the results are presented in Table 3.

A perusal of Table 3 revealed that there was significant difference between the treatments with regard to knowledge retention 15 days after exposure to treatments. It was indicated by the significant 'F' value at 1 per cent level of probability.

The critical difference for the treatment was 2.35. The mean score of the knowledge retention of the four treatments were of the order of

$\overline{Tr^4}$	$\overline{Tr^2}$	$\overline{Tr^1}$	$\overline{Tr^3}$
4.92	1.86	1.75	0.78

These results indicate that all the treatments were effective, but distinctly different in terms of knowledge retention. The treatment Tr^4 was found to be superior and most effective in terms of knowledge retention compared to all other three treatments. In Tr^4, RUBEXS-04 was exposed to the group of subjects through Liquid Crystal Display (LCD) projector. It is in line with the latest developments, where the computer is occupying the center stage in the field of communication coupled with the LCD projector might have attracted the attention of subjects compared to the traditional audio-visual aids used by the human experts. The computer literacy among the users is supported by the user friendly software of RUBEXS-04 might have motivated the subjects to learn more. The delivery of message through RUBEXS-04 was through text, pictures and audio which might have enabled the subjects to sustain their interest. The exposure of treatment RUBEXS-04 followed by discussion of about 15-20 minutes would have helped the subjects to clarify most of their doubts, also enriched learning situation, thus promoting better learning and maximum retention of knowledge.

Table 1. Mean knowledge retention after 15 days due to exposure to different treatments

(n = 120)

S.No.	Treatments (n = 30)	Mean knowledge score			Per cent of knowledge retained	't' value
		Before exposure	Immediately after exposure	Mean knowledge retained		
1.	Human expert without discussion (Tr^1)	6.86	7.64	0.78	3.71	-3.746**
2.	Human expert with discussion (Tr^2)	7.26	9.12	1.86	8.86	-2.868**
3.	RUBEXS-04 without discussion (Tr^3)	6.33	8.08	1.75	8.33	-2.174**
4.	RUBEXS-04 with discussion (Tr^4)	8.43	13.35	4.92	23.43	-7.969**

**Significant at 0.01 level

Table 2. Mean knowledge retained and forgotten after 15 days of exposure to treatments (n = 120)

S. No.	Treatments (n = 30)	Mean gain in knowledge	Mean knowledge score	
			Quantum retained after 15 days	Quantum forgotten after 15 days
1.	Tr^1	2.74	0.78 (28.47)	1.96 (71.53)
2.	Tr^2	3.97	1.86 (46.85)	2.11 (53.15)
3.	Tr^3	2.67	1.75 (65.54)	0.92 (34.46)
4.	Tr^4	6.80	4.92 (72.35)	1.88 (27.65)

Table 3. Analysis of variance for knowledge retention between the treatments (n = 120)

Source of variation	Degrees of freedom	Sum of squares	Mean square	'F' value
Treatment	3	423.153	28.210	2.811**
Error	116	1043.772	10.036	
Total	**119**	**1466.925**		

**Significant at 0.01 level C.D. = 2.35

The finding is also in agreement with Sundaraswamy and Rao (1977) who reported that there existed a significant difference between knowledge level immediately after exposure to farm telecast and 15 days after telecast. The results of Kruskal Wallis test also support the results of the ANOVA. This is evident from the highly significant X^2 value.

CONCLUSION

Expert System (RUBEXS-04) with discussion had been most effective in transferring the critical rubber protection technologies to farmers especially in terms of knowledge retention. The result clearly indicates that the expert system do not replace people, but serve as an intelligent assistant, in improving the quality and productivity of decision making in the field. Hence the expert system may be designed for many agricultural technologies and used either as diagnostic tool, as training /education tool, as decision supporting tool or as management tool to ensure speedier and effective transfer of farm technologies.

REFERENCES

Sundaraswamy, B. and M. K. Rao. (1977). *An Evaluation of SITE*. University of Agricultural Sciences, Hebbal, Bangalore.