Juice quality parameters were not much influenced by the treatments. However, sugar yield varied significantly due to variations in cane yield registering the maximum sugar yield of 15.8 t ha^{-1} and minimum of 9.2 t ha^{-1} in the control treatment. Application of $FeSO_4$ (1%)+ $ZnSO_4$ (0.5%) at 45th and 90th DAP through foliar spray was superior to all other treatments. The role of micro nutrient enriched pressmud in improving iron and zinc availability in soil was quite observed. Iron and zinc enriched pressmud application @ 7.5 t ha^{-1} improved the soil micro nutrient availability recording 17.7ppm iron and 3.97ppm zinc as compared to the initial status (Fe-13.7 and Zn-1.50ppm). Use of enriched pressmud might have supplied the micro nutrients especially zinc enhanced their availability to crops.

Similar trend of results were obtained in the ratoon crop and second plant crop and the results showed that foliar application of $FeSO_4$ (1%)+$ZnSO_4$ (0.5%) at 45 and 90 days after planting along with pressmud 5t ha^{-1} recorded the maximum cane yield of 134.3 t ha^{-1} and 141.8 t ha^{-1} and sugar yield of 14.9 t ha^{-1} and 16.2 t ha^{-1}.

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Extension education strategies for converting non-cotton growers into cotton growers in Tamil Nadu

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Abstract : The purpose of extension education is to change the behaviour of the people in terms of their knowledge, attitude and skill on any subject. At present Tamil Nadu State is facing huge deficit in cotton kapas. To meet the deficit, the State Government is spending large amount in importing kapas from other areas to meet our industries need. To overcome the above deficit, Govt. has to increase the cotton area, production and productivity in future. To achieve the above set goals, converting non-cotton growers into cotton growers is one of ways to increase the cotton area, productivity and production. Hence, the study was performed in Salem district of Tamil Nadu. By employing snow ball sampling technique 72 non-cotton growers were selected from the three taluks of the above district. Multiple group random design was used in this study. Three treatments *viz.* Lecture + Field Visit + Discussion Forum (T_1), Lecture assisted with Slide show + Demonstration + Discussion Forum (T_2), Lecture + Video + Discussion Forum (T_3) was developed and executed to assess the respondents knowledge gain, knowledge gain related to skill and symbolic adoption behaviour in the study for developing appropriate extension education module. And these treatments were replicated thrice in all the selected taluks. For assessing the treatment effects, before and after technique was used. It was found that T_2 and T_1 were effective among all the non-cotton growers in terms of knowledge gain, knowledge related to skill and symbolic adoption behaiour in cotton cultivation. Based on the above experimental result the best extension education module was proposed to the Government Agency, NGO's and Private for converting non-cotton growers into progressive cotton growers in the State. *(Key Words: Non-cotton growers, Extension education module, Knowledge gain, Knowledge related to skill, Symbolic adoption behaviour).*

A wide range of extension education methods are used for promoting agricultural development through differential educational approaches. The extension worker, who intends to achieve desired changes and improvement in the behaviour of rural people, needs the help of some tools and devices. These tools and devices, which he/she uses to impart knowledge to the learners, can be termed as extension education methods. The extension workers and scientists for the benefit of farming community can handle all the extension education methods through organized and unorganized training programmes. At present, Tamil Nadu production is about 4.5 lakh bales of cotton, as against a requirement of 28 lakh bales. The deficit is made good by supplies from other areas. Transportation charges alone cost about Rs.300 per bale (Kairon, 1999). Therefore, a larger raw material base within the state would not only bring the prices down, but would also help to save a substantial sum in transportation. While increasing the area under cotton cultivation is an easy way of enhancing the production of the commodity, a better means would be to achieve the same objective by increasing productivity. This condition necessitates to formulate appropriate extension education strategy to impart knowledge and knowledge related to skill aspects in cotton cultivation to the non cotton growers for converting them in to cotton growers in Tamil Nadu.

Materials and Methods

Salem District of Tamil Nadu was purposively selected for this experimental study. A sample of 72 respondents from the Omalur, Attur and Namakkal taluks of Salem district were selected through snowball sampling technique as well as by using secondary sources of information. Multiple group randomized design procedure was adopted in this experiment. Treatments were selected based on the discussion with scientists, extension workers and progressive farmers. There were three treatments and each were replicated thrice. Treatment 1 (EEM-1) = Lecture + Field Visit + Discussion Forum, Treatment 2 (EEM-2) = Lecture with Slide + Demonstration + Discussion Forum, Treatment 3 (EEM-3) = Lecture + Video + Discussion Forum. Hence three experimental groups i.e., each 24 respondents per taluk were drawn randomly for the experimental study. In each taluk, three extension modules were assigned randomly to the non-cotton growers. Before - After technique of measurement was adopted to find out the effectiveness of the extension education modules in terms of knowledge gain, knowledge gain related to skill and symbolic adoption. Based on this methodology the results were obtained and the findings were discussed by using appropriate statistical analysis. The selected non-cotton growers were replicated in the following manner.

EEM-1	t_1 A_1	t_2 C_2	t_3 B_3
EEM-2	t_3 C_3	t_1 C_1	t_2 B_2
EEM-3	t_1 B_1	t_3 A_3	t_2 A_2

EEM-1 to EEM-3 = Extension Education Modules (treatment) 1 to 3

t_1 = Attur taluk t_2 = Omalur taluk t_3 = Namakkal

A_1 to A_3 = First group of 24 respondents (3 replications of 8 Nos. each) drawn randomly from the selected taluks

B_1 to B_3 = Second group of 24 respondents (3 replications of 8 Nos. each) drawn randomly from the selected taluks

C_1 to C_3 = Third group of 24 respondents (3 replications of 8 Nos. each) drawn randomly from the selected taluks

$$A_1, C_2, B_3 \xrightarrow{t_1} K \xrightarrow{TK_1} K_1 \rightarrow SA_1 \rightarrow 8+8+8 = 24$$

$$C_3, C_1, B_2 \xrightarrow{t_2} K \xrightarrow{TK_2} K_2 \rightarrow SA_2 \rightarrow 8+8+8 = 24$$

$$B_1, A_3, A_2 \xrightarrow{t_3} K \xrightarrow{TK_3} K_3 \rightarrow SA_3 \rightarrow 8+8+8 = 24$$

Total respondents = 72

Where, K = Pre-exposure knowledge
TK_1 = Treatment 1 through EEM-1
TK_2 = Treatment 2 through EEM-2
TK_3 = Treatment 3 through EEM-3
K_1 to K_3 = Post-exposure knowledge level
SA_1 to SA_3 = Immediate post exposure symbolic adoption behaviour

After selecting the subjects for each treatment, their initial knowledge level and knowledge related skill and other data regarding independent variables were collected. Then the subjects were exposed to the subject matter (knowledge level/ knowledge related skill) through different treatments. The selected extension education modules were employed in Tamil version. Immediately after exposure, the subjects were allowed to participate in the discussion forum with the trainer. This session was followed by the assessment of knowledge and knowledge related skill gained by the subjects. The difference in the knowledge level and knowledge related skill before and after exposure was taken as knowledge and knowledge related

skill gained by each subject. The mean knowledge gain and knowledge related skill gain of subjects for each treatments were compared by applying analysis of variance techniques to draw suitable inferences. After the exposure of the subjects to the treatments pertaining to the knowledge and knowledge related skill, the subjects were assessed for the symbolic adoption behaviour.

Results and Discussion

Effectiveness of the treatments in terms of knowledge gain among non-cotton growers

The knowledge aspects of the selected subject matter areas were also exposed to the non-cotton growers through three different treatments. The data in Table 1 revealed that all the three selected treatments were able to create significant knowledge gain among the non-cotton growers. The non-cotton growers gained maximum knowledge from the treatment TK_2 (12.64) followed by treatment TK_1 (10.36) and treatment TK_3 (6.28) which showed 50.56, 41.44 and 25.12 percentages of knowledge gain among the non-cotton growers respectively.

The significant knowledge gain among non-cotton growers might be due to exposure to the treatments. This might be due to that the non-cotton growers showed keen interest to know the cotton cultivation aspects and also they had intention to cultivate cotton crop in their field to change their traditional crop rotation. Hence, majority of the non-cotton growers had gained significant knowledge from the conducted experiments. It could be concluded that all the selected three treatments were found to be effective in terms of knowledge gain. All the respondents involved in the experiment gained significant knowledge on cotton technologies from the above three treatments.

Relative effectiveness of different treatments in terms of knowledge gain among the non-cotton growers

To find out the relative effectiveness of three different treatments in terms of knowledge gain among the non-cotton growers, the analysis of variance was carried out. The results are presented in Table 2.

It is evident from Table 2 that, there existed significant difference in the effectiveness of the treatments in imparting knowledge as indicated by the significant F value at 1.00 per cent level of significance. The relative effectiveness of the three treatments in respect of knowledge gain among non-cotton growers again showed significance difference. The critical difference for the treatments

Table 1. Mean knowledge gain among the non-cotton growers due to exposure to the treatments (n=24 per treatment)

Sl.No.	Treatments	Mean knowledge gain		Mean knowledge gain	Percentage of knowledge gain	't' value
		Before exposure	Immediately after exposure			
1.	TK_1	6.16	16.52	10.36	41.44	9.54**
2.	TK_2	7.90	20.54	12.64	50.56	15.23**
3.	TK_3	9.25	15.53	6.28	25.12	12.72**

** Significant at 0.01 level

Table 2. Analysis of variance of non-cotton growers knowledge gain between treatments (n=72)

Source of variance	Degrees of freedom	Sum of Square	Mean square	F
Treatment	2	565.53	282.76	
Error	69	2182.79	31.63	8.94**
Total	71	2748.32	38.72	

SEd = 1.6236 CD (0.05) = 3.24 CV = 56.80%

** Significant at 0.01 level

was 3.24. The mean score of the three treatments were found to be in the order of

TK_2	TK_1	TK_3
12.64	10.36	6.28

All the three treatments were effective, but distinctly different in terms of imparting knowledge in cotton technologies among the non-cotton growers. It could be inferred that the treatment TK_2 and treatment TK_1 were found to be effective and on par and superior methods to transfer knowledge. TK_3 was again found to be not effective as that of the TK_1 and TK_2 in transfer of knowledge to the non-cotton growers. The non-cotton growers showed keen interest to know the cotton technologies and also they clarified their doubt with scientists and extension workers while employing the treatments of field visit, lecture and slide presentation and demonstration among them. Hence treatment TK_2 and TK_1 were found to be effective methods and on par with each other in terms of imparting knowledge to the subject. The finding is in line with the finding of Subramanyan (1976) and Selvaraj (1981) who reported that use of combination of extension education methods were found to be effective in terms of knowledge gain.

It could be concluded that all the selected three treatments were effective but distinctly different in terms of imparting knowledge. In general, the treatment TK_2 was found to be an effective combination of extension education method in terms of imparting knowledge gain to all types of subjects. The treatment TK_1 and TK_2 were found to be equally effective and on par with each other in terms of imparting knowledge to the cotton growers and non-cotton growers on cotton technologies.

Effectiveness of the treatments in terms of knowledge gain related to skill among non-cotton growers

From the Table 3, it could be revealed that all the three treatments were distinctly different in terms of knowledge gain related to skill aspects among the non-cotton growers as indicated by highly significant 't' value. The mean knowledge gain related to skill aspects were maximum among the non-cotton growers who were exposed to the treatments TK_2 and TK_1 with the scores of 9.29 and 8.88 respectively which resulted in 46.50 and 44.40 percentages of knowledge gain related to skill aspects among the above treatment. This was followed by the TK_3 with a score of 4.84 which represented 24.20 per cent of knowledge gain related to skill aspects. Non-cotton growers had gained maximum knowledge related to skill aspects from the demonstration and field visit. Again the society believed the scientist and extension workers always in terms of availing

Table 3. Mean knowledge gain related to skill aspects due to exposure to the treatments among the non-cotton growers (n=24 per treatment)

Sl.No.	Treatments	Mean knowledge gain related to skill		Mean knowledge	Percentage knowledge	
		Before exposure	Immediately after exposure	gain relatd to skill	gain related to skill	't' value
1.	TK_1	5.36	14.24	8.88	44.40	9.54**
2.	TK_2	5.97	15.26	9.29	46.50	15.23**
3.	TK_3	6.18	11.02	4.84	24.20	12.72**

** Significant at 0.01 level

Table 4. Analysis of variance of non-cotton growers knowledge gain related skill between treatments (n=72)

Source of variance	Degrees of freedom	Sum of Square	Mean square	F
Treatment	2	304.86	152.43	
Error	69	718.46	10.412	14.63**
Total	71	1023.32	14.41	

SEd = 0.9315 x CD (0.05) = 1.83 CV = 42.47%

** Significant at 0.01 level

technology. Scientist and extension worker had effectively done the demonstration on skill practices while field visit and clarified their doubts and convinced the subjects to go for cotton cultivation by employing the principle of learning by doing. Hence, the non-cotton growers also gained maximum knowledge related to skill aspects from the treatments TK_1 and TK_2 as in the case of cotton growers. It could be concluded that the subjects in overall and the subjects in particular were gained maximum knowledge related to skill aspects from the treatment Lecture with Slide + Demonstration + Discussion Forum which showed the how to do practice of cotton crop and showed the results through slide and clarified their doubts in discussion forum, hence the treatment has emerged one of the important extension education methods for imparting knowledge related to skill aspects among the non-cotton growers.

Relative effectiveness of different treatments in terms of knowledge gain related to skill aspects among the non-cotton growers

From the Table 4, it could be found that all the three treatments were found to be significantly different in terms of imparting knowledge related to skill aspects among the non-cotton growers as indicated by significant F value in the table. The critical difference was 1.83.The mean scores of the above three treatments were observed among the non-cotton growers in the order of

TK_2	TK_1	TK_3
9.29	8.88	4.84

All the above three treatments were effective but significantly different in terms of imparting knowledge related to skill aspects on cotton crop among the non-cotton growers. It could be observed that the treatment TK_2 and TK_1 were found to be effective and on par with each other in terms of imparting knowledge related to skill aspects. Likewise, the treatment TK_3 again found to be least important in imparting knowledge related to skill aspects among the non-cotton growers. Again, the finding is in line with the findings of Subramanyan (1976) and Selvaraj (1981). From the above analysis it could be concluded that were gained maximum knowledge related to skill aspects from the treatment Lecture with Slides + Demonstration + Discussion Forum (TK_2) and Lecture + Field Visit + Discussion Forum (TK_1).

Symbolic adoption behaviour of the non-cotton growers due to the exposure to the different experiments in cotton cultivation

Table 5. Distribution of the non-cotton growers according to their symbolic adoption behaviour due to exposure to the experiments on cotton

(n=72)

Category	Number	Per cent
Low	7	9.72
Medium	51	70.83
High	14	19.45

It could be opined from the above findings that majority of the respondents were belonged to medium level of symbolic adoption behaviour followed by high and low levels due to exposure of the different treatments. All types of farmers had accepted the cotton technologies mentally and supposed to adopt in future in the intention of increasing cotton area and yield. The introduced treatments among the respondents effectively influenced their behaviour and made them feel the worthiness of the technologies. In addition, adoption of their local technologies resulted in poor yield which resulted in discontinuance of cotton cultivation. The above factor might have contributed altogether that majority of them adopted the cotton technologies mentally. This finding is in line with the finding of Murugesan (1996) who reported that all the respondents accepted the technologies symbolically.

Relative effectiveness of the treatments in terms of symbolic adoption behaviour among non-cotton growers

The relative effectiveness of the treatments in terms of symbolic adoption behaviour among the non-cotton growers was found through analysis of variance test and the results are presented in Table 6.

The non-significant 'F' value indicated that there was no significant difference between the three treatments in influencing the symbolic adoption behaviour of the cotton technologies among the non-cotton growers. This might be due to the fact that the presentation through these treatments have transferred the technology and inducing the non-cotton growers symbolic adoption evenly. The critical difference was observed 2.89.

The mean scores of the three treatments with respect to symbolic adoption are presented below.

Table 6. Analysis of variance of non-cotton growers symbolic adoption behaviour between treatments (n=72)

Source of variance	Degrees of freedom	Sum of Square	Mean square	F
Treatment	2	57.86	28.93	
Error	69	1734.13	25.13	1.1511 NS
Total	71	1791.99	25.24	

SEd = 1.4472 CD (0.05) = 2.89 CV = 18.07%

NS = Non-significant

TK_2	TK_1	TK_3
28.6	26.68	26.68

It could be revealed that all the three treatments significantly superior to each other and on par in respect of its effectiveness in terms of symbolic adoption among the non-cotton growers. It could be concluded that all the three treatments had convinced the non-cotton growers evenly about the cotton technologies for which they were exposed to. Likewise, the non-cotton growers also convinced and accepted to cultivate cotton crop in future due to effect of these treatment. The finding is in line with the findings Srishkumar (1979), Nagaraja (1980) and Raghavendra (1981) who reported that there was no significant association between extension methods and symbolic adoption behaviour of farmers. It could be inferred from the results that no significant difference was observed between the treatments TK_1, TK_2 and TK_3 in terms of symbolic adoption behaviour among the non-cotton growers. Among the three treatments tested TK_2 had highest symbolic adoption score.

Strategies for converting non-cotton growers in to cotton growers in Tamil Nadu

The effective extension education modules includes various dimensions of training on preferred by the respondents. Most of the respondents preferred the training programme on cotton cultivation to be conducted by cotton scientists/progressive farmers, and preferred to get trained in groups. Institutional type of training conducted through lecture with slide and demonstration + discussion forum(T_2), Lecture, Field visit and discussion forum (T_1) at Krishi Vigyan Kendra during August-September for a duration of one day will be preferred to get reference book/booklet was preferred by most of the respondent. The developed extension education module again simulated (test verified) in different situations among the non-cotton growers. It was found that the simulated extension education module proved its effectiveness in terms of knowledge gain, knowledge gain related to skill and symbolic adoption behaviour in different situations. Based on the above experiment, it is suggested that the Treatment 1 (EEM-1) = Lecture + Field Visit + Discussion Forum, Treatment 2 (EEM-2) = Lecture with Slide + Demonstration + Discussion Forum, may be used to teach the cotton technology to the non-cotton growers. From this effort definitely government can change them in to cotton growers. Provided Government have to announce some special programme on cultivation of cotton in waste land areas, special package programme for new cotton growers, special cotton advisory board for non-cotton growers and minimum support price for cotton kapas to boost the non-cotton growers to convert into cotton growers in the future. According to the local situation the above test verified module may be used by the extension agency in all the areas with slight modification for promoting cotton cultivation among all type of growers.

To fulfill the objectives of Technology Mission for Cotton and Cotton Council (Tamil Nadu Chapter) the extension agencies have to intensify their efforts to increase the area, production and productivity of cotton to bridge the gap between demand and supply of cotton kapas. In addition to that the above set research identified the appropriate strategies for non-cotton growers to adopt cotton technologies and make them into continued cotton growers in the state. Based on the three-extension education module, the proven effective extension module may be followed among the transfer of technology agencies and other related agency. The module may be used separately based on the purpose i.e., for transfer of knowledge, knowledge related to skill and adoption of cotton technologies among the non-cotton growers in Tamil Nadu. If the government will use above methodology definitely the state will flourish with huge cotton kapas.

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Performance of cotton cultivation in Tamil Nadu – an empirical study

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Abstract: In 1996-97 the maximum area of 9.16 million hectare was achieved leading to a production of 17.5 million bales. Over the last 40 years this was the record production. In spite of achieving the maximum production in 1996-97 the area and production came down to 8.7 million hectares and 16.8 million bales respectively during 1999-2000. To know the reason for this decline trend in cotton cultivation in Tamil Nadu the present study was proposed and conducted at Salem District of Tamil Nadu. By employing snowball sampling technique 144 farmers were selected in this study. The well structured and pre-tested questionnaire was used for collecting the relevant data. By adopting percentage analysis, suitable inferences was made from the collected results. It was found that the majority of the respondents (64 %) reduced their acreage under cotton from their potential cotton area and one – fourth of the respondents had reduced their area under cotton to the extent of 26–50 per cent of their total potential cotton area. Among the reasons for the decline, more pests and diseases, high cost of cultivation, income not to commensurate with cost of production, reduction in yield year after year and no remunerative prices were the most important reasons for decline of cotton cultivation as expressed and ranked I to V by the majority of the respondents. It is suggested that the policy maker, chief executives and field level workers may take this research findings in positive way and work to restore the situation as soon as possible to enrich our farming community wealth and health by producing quality kapas. *(Key words:* Performance of Cotton, Extent of Decline of Cotton, Research for Decline of cotton).

India has the distinction of having the largest area under cotton cultivation but its productivity per hectare is extremely low. Although cotton production in the country has increased from 2.2 million bales in 1947 to 16.8 million bales in 2000. In 1996-97 the maximum area of 9.16 million hectare was achieved leading to a production of 17.5 million bales. Over the last 40 years this was the record production. In spite of achieving the maximum production in 1996-97 the area and production came down to 8.7 million hectares and 16.8 million bales respectively during 1999-2000, at the same time they were found to be the second best set over the last more than four and half decades. In Tamil Nadu, cotton is cultivated in 1.848 lakh