Effect of Extension on Technical Knowledge and Adoption of Farming Practices in Sugarcane Industry

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ABSTRACT. Low level of adoption of recommended farming practices has partly been responsible for low cane and sugar yield obtained by sugarcane farmers. The objective of this study was to investigate the effectiveness of extension communication at farmer level in relation to farmers' knowledge and adoption of farming practices in the settler schemes of Sri Lankan sugar industry. Data were collected primarily from a stratified random sample of 97 farmers from Pelwatte and Sevanagala.

Farmers were solely dependent on their Agricultural Assistants/Field Assistants (AA/FA) for the information and services. More attention had been given to marketing and input coordination activities and less attention to farmer education in the main methods of extension communication practised, namely AA/FA's field visits and farmer's office visits. The majority of farmers attributed high credibility to the AA/FAs as well as higher rating for AA/FA's role and input services. The highest proportion of all the farmers had medium knowledge and adoption levels and about half of the rainfed farmers was in the high knowledge and adoption category. The median adoption level of the settlers (PSI) was significantly lower than the rainfed and irrigated groups.

The current extension communication activities were not significantly related to farmer's knowledge except for the irrigated farmers. Instead farmers' experience and formal education were significantly related to their knowledge level. The farmers' adoption was significantly related to the knowledge level and activities related to the input services. The use of extension contact along with group methods to reduce knowledge gap between farmers and to increase overall knowledge level will help to increase farmers' adoption level.

INTRODUCTION

The sugar sector at present provides only about 15% of the national requirement and is operating at low overall productivity and profitability. This is due to many interlinked technical, management, economic and institutional problems coupled with lack of a policy aimed at the development of this sector. One of the major current problems is low cane and sugar yields obtained which are well below their technical potential. The cane yield in Sri Lanka during the last 10 years averaged about 58 tons ha^{-1}; but the potential cane yield has been identified as 140 tons ha^{-1} under irrigated condition and 70 tons ha^{-1} under rainfed condition (Keerthipala, 1997). The sugar recovery rates in India (over 10%)

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are much higher than in Sri Lanka (Central Bank of Sri Lanka, 1999). Low level of adoption of recommended farming practices has resulted in the above situation (Keerthipala, 1997; Central Bank of Sri Lanka, 1999). According to CADMAR (1996), low adoption could also be attributed to low level of farmers' knowledge, inefficiency of input services and lack of coordination between farmers and extension staff. Under the present extension approach of the sugar industry, all services are provided by industry staff for settler farmers who are bound to sell their harvest to particular industry so that the industry could deduct from the same the cost incurred for the services along with an interest. Hence, farmer decision making on adoption mainly depends on extension service and effectiveness of extension communication at farmer level, farmer education, coordination of input services, information dissemination *etc.*

The primary objective of this study was to investigate the effectiveness of extension communication at farmer level in relation to farmers' knowledge and adoption of farming practices in the settler schemes of Sri Lankan sugar industry.

METHODOLOGY

Sample

This study was conducted in Pelwatte and Sevenagala sugar industry areas. A farmer survey was conducted in 2000 with 97 farmers from Pelwatte and Sevanagala sugar industry areas, which cover a population of approximately 5000 farmers. The sample was selected from the list of registered cane farmers of each industry randomly after stratification based on the localities/mode of operation.

Farmers included in the survey were mainly placed in three groups according to their locality and their mode of operation, and sample sizes are given in Table 1.

Table 1.   Groups and composition of the farmer sample.

The farmer group	Total	Sample
Irrigated settlers - Sevanagala	2280	34
Rainfed settlers - Sevanagala	1297	30
Settlers - Pelwatte	1650	33
Total	5227	97

Data collection

Both primary and secondary data were collected through sample surveys and from office records by the first author. A pre-tested structured interview schedule was used to gather data from farmers. The schedule consisted of questions dealing with four main areas: general information, farmers' knowledge, adoption of farming practices and farmers' perception on extension activities.

Variables and their measurement

Age of a respondent was defined as the period of time from his birth to the time of his interview and was measured in years. Education was measured by the highest year of schooling completed by the male head of the family. Sugarcane farming experience was defined as the period of time from the respondent's first involvement in sugarcane cultivation up to the survey and was measured in years.

Adoption of practices refers to the utilisation and application of recommended practices during the last cropping year. Extent of adoption refers to the level to which a particular practice was adopted and measured by using the adoption scale. The scale was tested for the reliability using SPSS and Alpha=0.70.

Farmer's technical knowledge refers to the farmer's knowledge of eight areas of recommended farming practices and measured by responses to the questions asked in the knowledge test. The scale was tested for the reliability using SPSS and Alpha=0.81.

Social participation was defined as the degree to which an individual participated voluntarily in different organizations in the community and whether he held executive positions. The extent of participation was measured by summing up involvement in community organizations as an executive member, committee member, ordinary member or none, with a weight of 4, 3, 2, 1, respectively.

The field visit of Agricultural Assistant/Field Assistant (AA/FA) was measured by asking respondents how often, during the last cropping year, they had been contacted by AA/FA with respect to their agricultural activities. The frequency of contact was classified as frequently, occasionally, rarely and never. The weighting scores ranged from 4 for "frequently" to 1 for "never". Measuring the frequency of farmers' office visits also followed the above procedure.

Extension communication was measured by scores obtained by farmers for the use of the main four communication methods: frequency of AA/FA's field visits, frequency of farmer's office visits, number of group discussions attended during the last cropping year and the number of training classes attended during the last three years.

Credibility of the AA/FA refers to the farmer's perception of the trustworthiness of FA/AA. Credibility was measured by using Likert type attitude scale, which comprised of ten statements - five positive and five negative. The scale had a reliability value of Alpha=0.70.

Farmer's perception of the role performed by AA/FA refers to farmers' perception on the usefulness of the role of AA/FA as a catalyst, solution giver, group promoter, and information seeker, educator and resource linker. Role perception was measured separately and altogether using three-point attitude scale. This was done by checking following categories: very useful, useful, and not useful. The weighting scores applied to the categories ranged from 3-1, with very useful receiving a score of 3 and not useful receiving a score of 1. The scale was tested for the reliability using SPSS and Alpha=0.77.

Input services refer to farmers' perception on input services in relation to timely availability, adequacy and quality of each item of the input services separately and altogether, and was measured by using three-point attitude scale. This was done by checking following categories: always, sometime, never. The weighting scores applied to the categories ranged from 3-1, with always receiving a score of 3 and never receiving a score of 1. The scale was tested for the reliability using SPSS and Alpha=0.84.

Training received referred to the number of training programmes relevant to sugarcane farming, attended by the respondent during the last five years.

Statistical Package for Social Sciences (SPSS) was used to analyze the data. Spearman correlation analysis was used to establish the level of relationships between the variables. To identify the most significant independent variable and the degree of association between the dependant variable and the combined effect of all the appropriate independent variables, stepwise multiple regression analysis was employed. The mean differences of selected variables among farmer groups were tested using ANOVA, t-tests and Mann-Whitney test.

RESULTS AND DISCUSSION

Information dissemination to farmers

Farmers were solely dependent on their AA/FA for the information and services. The other information sources such as mass communication and other farmers. were negligible. The AA/FA's farm or home visits and the farmer's office visits were the main methods of information dissemination. Group meetings were also reported by about 40% of the irrigated and rainfed farmers in Sevanagala Sugar Industries (SSI). Method demonstration and circulars were identified by about 33% of settlers in Pelwatte Sugar Industries (PSI). Training programmes were not generally used to improve farmer knowledge.

Frequency and pattern of AA/FAs' field visits as well as farmers' office visits were different among the three farmer groups and between the four quarters of a cropping season. The highest frequency of AA/FA visits and farmer's office visits was reported in the fourth quarter in all the groups and was related to harvesting and marketing aspects. In the first quarter also, both types of visits relating to land preparation, planting, fertilizer application and weed management were reported in lesser frequency compared to the fourth quarter. Visits during the other two quarters were negligible except AA's field visits to the irrigated group (as reported by 40% of irrigated farmers).

Farmers' perception of extension communication

More than 80% of farmers perceived that AA/FA was very useful as a catalyst and resource linker while more than 70% perceived the role of AA/FA as a solution giver, educator and an information seeker useful. However, majority of farmers (more than 70%) perceived that AA/FA was not useful as a group promoter. The farmers generally attributed high credibility to the AA/FAs as well as higher rating for input services.

Knowledge of farming practices

Mean scores of the farmer groups were less than 50% of the maximum obtainable scores and median knowledge was significantly higher in the rainfed group compared to other groups *viz.*, irrigated and settlers (Mann-Whitney test, z = –2.548, –4.312, p<0.001). The highest proportion of all the farmers had medium knowledge level and 43% of rainfed farmers had high level of knowledge. It was observed that the irrigated farmers had given priority for paddy cultivation than sugarcane. Thus has diluted their commitment for sugarcane cultivation when compared to rainfed farmers. Perhaps this could be one of the reasons for the knowledge gap between rainfed and irrigated farmers of SSI.

Adoption of farming practices

About 50% of irrigated and settler farmers had medium level overall adoption while majority of rainfed farmers was in the high overall adoption category. The median adoption level of the settlers (PSI) was significantly lower than the rainfed and irrigated groups (Mann-Whitney u test; z = –4.676, –4.035, p<0.001).

Factors related to farmers' technical knowledge

Only two personal/situational variables namely sugarcane farming experience and formal education were positively and significantly related to the farming knowledge (Table 2). The outcome supports the finding of Amarasinghe (1993) and Mahaliyanaarachchi and Sivayoganathan (1996) regarding the significant relationship between education level and the knowledge of settler farmers and tea small holders respectively. This implies that sugarcane farming experience and formal education enhanced individual farmer's ability to understand farming practices properly.

Social participation was also found to be positively and significantly related to the farmer's level of technical knowledge (Table 2). Bandara and Sivayoganathan (1996) also reported similar relationship between social participation and farmers' knowledge of integrated pest management.

Multiple regression analysis revealed that only two independent variables were significant predictors of farmer's knowledge level. These were sugarcane farming experience and farmer's formal education level. The computed coefficient of multiple correlation (R) value of these two independent variables together and the dependent variable was 0.337 and R^2 was 0.293. Thus, 29.3% of the variation in the farmer's

knowledge level could be accounted for by the combined effect of the two independent variables (Table 3).

Table 2. Correlation matrix of 12 selected variables (total sample).

Variable	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
X1 = Age	X										
X2 = Education	-0.161	X									
X3 = Fanning experience	0.124	-0.039	X								
X4 = Social participation (Score)	-0.279	0.258	0.019	X							
X5 = Fanners' office visits (frequency)	0.149	-0.061	0.149	0.189	X						
X6 = AA/FAs' visits (frequency)	-0.010	-0.059	0.010	-0.163	0.167	X					
X7 = Perception of AA's role (score)	-0.068	-0.071	-0.068	-0.071	0.091	0.226*	X				
X8 = Input services (score)	-0.001	0.069	0.011	0.069	0.087	0.258*	0.322**	X			
X9 = Extension communication	-0.034	0.018	-0.034	0.018	0.306**	0.548**	0.152	0.359**	X		
X10 = Credibility of AA (score)	0.032	0.088	0.032	0.088	0.021	0.163	0.451**	-0.067	0.155	X	
X11 = Knowledge (score)	-0.161	0.271**	0.262**	0.381*	0.017	-0.198	-0.076	0.004	-0.004	0.034	X
X12 = Adoption (sscore)	0.081	0.298**	0.081	0.209	0.083	-0.073	0.130	0.113	0.122	0.118	0.552**

Significant at *p<0.05 and **p<0.01

Table 3.   Stepwise multiple regression of sugarcane farming knowledge by selected independent variables for total sample.

Step	Variable entered	Multiple R	Coefficient of determination R^2	Per cent of variation
1	Farming experience	0.175	0.148	14.8
2	Formal education	0.337	0.293	29.3

As the factors affecting knowledge could vary under different localities as well as modes of operations, analysis were done to identify the most significant factors in each group.

In the irrigated group, formal education and group meetings were the only variables that showed positive and significant relationship with the farmer's knowledge level (r = 0.338, 0.377 respectively and p<0.01). Formal education accounted for 20.3% of the variation in the farmer's knowledge level. This was the only variable that significantly predicted farmer's knowledge level according to the multiple regression analysis (R = 0.450 and R^2 = 0.203).

In the rainfed group, farming experience was positively and significantly related to the knowledge level (r = 0.438, p<0.05) and it accounted for 25.8% of the variation in the knowledge level according to the multiple regression analysis (R = 0.450 and R^2 = 0.258).

In the settler group, three personal variables were positively and significantly related to the knowledge level. They were formal education, sugarcane farming experience and social participation (r = 0.405, 0.398 and 0.381 respectively, p<0.01). As in the total sample, formal education and sugarcane farming experience were significant predictors according to the multiple regression analysis and the computed coefficient of multiple correlation (R) value of these two independent variables and the dependent variable was 0.581 and R^2 was 0.337. In other words, 33.7% of the variation in knowledge was accounted for by the combined effect of these two variables.

Whereas this study was confined to the activities during two year period, most of the farmers were trained on sugarcane farming at the very beginning of their sugarcane farming career. Present communication activities concentrate more on input services and marketing than in improving knowledge. This could perhaps be a reason for the absence of relationship for variables related to communication activities.

Factors related to adoption

Technical knowledge level of farmers was positively and significantly related to their adoption level (Table 2). Similar results had been reported by Kashem and Hussain (1992) and Wirasinghe (1977). Formal education was also positively and significantly related to adoption. This is in consistence with the finding of Hossain and Crouch (1992).

The variables regarding farmer's exposure to extension communication activities viz., extension communication score and farmer's perception score on the role and credibility of AA/FA were not significantly related to the adoption level of farmers in the total sample. But, the multiple regression analysis revealed that three independent variables including farmer's perception on AA/FA's role were significant predictors of farmer's adoption level. The others were technical knowledge level and farming experience. The computed coefficient of multiple correlation (R) value of these three independent variables and the dependent variable was 0.613 and R^2 was 0.376. Thus, 37.6% of the variation in adoption was accounted for by the combined effect of these three variables (Table 4).

Table 4.   Stepwise multiple regression of adoption level by selected independent
variables for total sample.

Step	Variable entered	Multiple R	Coefficient of determination R^2	Per cent of variation
1	Knowledge	0.404	0.164	16.4
2	Farmer's perception of the AA's role	0.528	0.274	27.4
3	Farming experience	0.613	0.376	37.6

In the irrigated sector, the multiple regression analysis revealed that only two independent variables were significant predictors of farmer's adoption level. These were knowledge and the frequency of farmer's office visits. The computed coefficient of multiple correlation (R) of the two independent and the dependent variables was 0.692 and R^2 was 0.479. Thus, 47.9% of the variation in the farmer's adoption was accounted for by the combined effect of these two variables.

In the rainfed sector, two independent variables viz., knowledge and input services were significant predictors of farmer's adoption level according to the multiple regression analysis. The computed coefficient of multiple correlation (R) value of these two independent variables and the dependent variable was 0.639 and R^2 was 0.409. Thus, 40.9% of the variation in the farmer's adoption level was accounted for by the combined effect of the two variables.

In the settler group, knowledge was positively and significantly related to the adoption level (r = 0.370 and p<0.05). The credibility and farmer's perception of AA/FA's role were also positively and significantly related to the adoption level (r = 0.611 and 0.461 respectively and p<0.01). According to the multiple regression analysis, two independent variables viz. knowledge and input services were significant predictors of farmer's adoption level. The computed coefficient of multiple correlation (R) value of these two independent variables and the dependent variable was 0.613 and R^2 was 0.376. Hence, 37.6% of the variation in the farmers' adoption level is accounted for by the combined effect of these two variables.

CONCLUSIONS

These results clearly showed that present extension communication activities were not significantly related to farmer's knowledge except for the irrigated farmers where group activities had shown significant relationship to the farmers' knowledge. Instead farmers' experience and formal education significantly related to their knowledge level.

The farmers' adoption was significantly related to the knowledge level. Also, the input service related activities such as office visits by irrigated farmers and perceptions of

212

input services by rainfed farmers and FA's role performance by settler farmers had positive relationship to farmer's adoption level. The majority of farmers, however, had medium level knowledge and adoption.

The main methods of extension communication namely AA/FA's field visits and farmer's office visits had given more attention to marketing and input coordination activities and less attention to farmer education. This has created a situation where the personal factors are playing dominant role with respect to technical knowledge. To improve the knowledge gained at the very beginning of the farming career, farmers have to depend on their experience and their educational capacities for effective utilization of the extension services as an educational source. So, it is important to make use of AA/FA's individual contacts along with group methods efficiently in order to enhance the knowledge of farmers. This will help achieve higher levels of adoption of farming practices in sugarcane cultivation under the present extension service.

REFERENCES

Amarasinghe, A.P. (1993). Evaluation of sugarcane farming practices and identification of training needs of small holder sugarcane farmers. Unpublished Final Year Research Report, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka. pp. 74-78.

Bandara, R.M.G. and Sivayoganathan, C. (1996). Factors associated with knowledge, attitude and adoption of integrated pest management practices in rice cultivation. Trop. Agric. Res. 8: 47-54.

CADMAR. (1996). Report on the sugar sector, Colombo.

Central Bank of Sri Lanka. (1999). Annual report, Colombo.

Hossain, S.M.A. and Crouch, B.R. (1992). Patterns and determinants of adoption of farm practices: Some evidence from Bangladesh. Agric. Systems. 38: 1-15.

Kashem, M.A. and Hussain, A. (1992). Adoption behaviour of sugarcane growers. Ind. J. Ext. Edu. 24(1 and 2): 92-95.

Keerthipala, A.P. (1997). Sustainability of small holder sugarcane-based production in Sri Lanka. Unpublished PhD thesis, University of Aberdeen, UK. pp. 162-179.

Mahaliyanaarachchi, R.P. and Sivayoganathan, C. (1996). Factors affecting technical knowledge of tea small holders in Sri Lanka. Trop. Agric. Res. 8: 38-46.

Wirasinghe, S. (1977). Adoption of high yielding rice farming practices by the rice farmers in the Ampara district, Republic of Sri Lanka, Unpublished MSc thesis, University of Philippines, Los Banos. pp. 1-56.