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Comparative Study of Selected Factors Enhancing Farmers' Knowledge of Identifying Insect Pests and Diseases In Cotton

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Abstract: This study has attempted to determine the farmers' knowledge of identifying insect pests and diseases, as well as perceived contribution of different sources of information enhancing farmers' knowledge. Two-stage cluster sampling was applied to select 150 cotton growers of district Hyderabad, Sindh, Pakistan in 1999-2000. It was concluded that the farmers' average score of identifying insect pests in cotton was 46.0% and diseases in cotton was 22.5%. The most important finding of the study was that Pesticide Agents' performance was better than Agricultural Extension Agents' performance regarding letting the farmers solve insect and disease problem in cotton. Besides, the sources that significantly contributed to enhancing farmers' knowledge regarding identifying: (1) Insect Pests were Farmers' Age, Help from Pesticide Agents, Discussing with other Farmers, Watching Agri. Programs on T.V, and Reading Agri. Literature; and (2) Diseases were Farmers' Age, Help from Pesticide Agents and Watching Agri. Programs on T.V. This study will help extension services improve contact system with farmers through the use of different sources of information such as T.V, literature and personal visits as these sources were found to have a significant impact on farmers' knowledge.

Key words: Factors, farmers' knowledge, insect pests and diseases in cotton

Intoduction

Agriculture is the main contributor to Pakistan's economy. It contributes about 25% to GDP, accounts for 56% of total exports, and employs more than 44% of the labor force. Besides, it is the source of labor for industrial sectors, capital for new business, revenue for the federal and provincial governments, and exports that balance the imports required by other sectors (Economic Survey, 1999-2000).

According to a FAO report, Chaudhry, (1993), Pakistan possesses many natural resources. It has fertile land with a well-developed irrigation system, ideal and diverse climatic conditions, adequate supply of inputs, an abundant human working force, and a sufficient number of agricultural scientists equipped with modern scientific knowledge in the field of agriculture. However, Pakistan has not yet been able to realize the potential yield of various crops. Consequently, per hectare yield is lower than that of many of the agriculturally advanced countries. Furthermore, the average yield of various crops is much lower than the world average.

In order to increase the agricultural production and to uplift the living standard of farmers, the World Bank funded Agricultural Extension and Adaptive Research Project was lunched in 1980. To strengthen the extension activities, the project employed the Training and Visit (T & V) system. Agriculture is a major contributor to the Pakistan's economy and quality of life. Cotton continues to be a major crop enterprise contributing to quality of life. Unfortunately, cotton production varies a great deal from year to year. While many factors contribute to variation, insects and diseases are estimated to cause about a 25% reduction in potential cotton production annually. Pakistan established the Agricultural Extension and Adaptive Research Project in 1981 to strengthen the Extension activities design to increase among other things, production of cotton and related economic activities. While assumptions have been made about the level of knowledge of farmers, their perceptions of helpfulness of agricultural extension in solving their problems and the helpfulness of "mass media," little research exists focused on these factors.

Objectives of the Study: The objectives of the study were to determine to what extent:

1. The farmers are able to recognize insect pests and diseases in cotton,
2. The demographic characteristics and selected sources of information contribute to enhancing farmers' knowledge of identifying insect pests and diseases in cotton.

Materials and Methods

The study was conducted using the sample survey method. The sample survey was necessary due to limited time and money available.

Population and Sample: The population for this study was all the cotton growers of the district Hyderabad, Sindh, Pakistan. Since complete list of cotton growers was not available, therefore, it was difficult to apply simple random sampling method to select a sample. To cope up with this problem, cluster sampling was applied. Cluster Sampling is a very suitable method of selecting a sample when the sampling frame of individual elements is not available. Moreover, it is economical to simple random sampling and stratified sampling. Anderson *et. al.*, (1994). There were 2863 villages, that were considered clusters, in district Hyderabad. Dictionary of villages in Sindh, (1991). Fifteen villages were selected randomly. After making sampling frame of the cotton growers in each village, with help of farmers of the respective villages, 10 cotton growers were selected at random from each cluster. A random number table was used. Cochran, (1977). The sample size was 150 cotton growers. When the population is more than 3000, the sample of 150 was recommended at ± 8% error rate and 0.05 level of significance. Wunsch, (1986). According to a rough estimate, there were more than 3000 cotton growers in the district. Therefore 150 sample was recommended.

Farmers' knowledge of recognizing insect pests and diseases of cotton was measured by asking the names of insect pests and diseases of cotton. Ten Pictures of insect pests and diseased plants as well as specimen of diseased plants were shown to the farmers and their names were asked. The correct number of answers was recorded on the scale from zero to ten.

Selection of Insect Pests and Diseases: To select the insect pests and diseases of cotton, help was sought from the Professor, Faculty of Crop Protection, Sindh Agriculture University, Tando Jam, and the Area Sales Officers in Pesticide Companies, as well as related literature. The recommended names of insect pests, diseases are given as under:

Names of Insect Pests:

(1)American boll worm (2) Aphid
(3) Boll weevils (4) Cotton mites
(5) Fall army Worm (6) Jassid
(7) Pink boll worm (8) Red cotton bug
(9) Spotted boll worm (10) White fly

Names of Diseases:

(1) Angular leaf spot (Bacterial disease)
(2) Bacterial Boll rot (3) Boll rot "tight loc"
(4) Cotton Leaf Curve Virus
(5) Leaf crumble symptoms (Viral disease)
(6) Leaf symtoms showing chlorosis
(7) Mosiac (Viral disease)
(8) Root rot of cotton (9) Stem canker
(10) Under surface leaf with Areolate Mildew

Statistical Analyses: The collected data were tabulated and analyzed. Objective 1 was achieved using Descriptive Statistic. Mean, standard deviation and standard error were calculated for farmers' knowledge of identifying insect pests and diseases. Objective 2 was achieved using inferential statistics. Stepwise regression was applied to know the contribution of factors to enhancing farmers' knowledge. The probability of significance of the t-values of each slope was set at 0.05.

To achieve Objective 2 on the basis of inferential statistics, hypotheses were formulated.

Hypotheses Formulation:

Notations used:

H_0 = Null Hypothesis
H_A = Alternate Hypothesis
β = Parameter (Slope) of linear regression

H_0 = There is no significant contribution of demographic characteristics or different selected sources of information to the farmers' knowledge of identifying insect pests and diseases in cotton:

$$\beta_1 = \beta_2 = \beta_3 = \beta_4 \ldots\ldots\ldots = 0$$

H_A = At least one demographic characteristic or selected source of information significantly contributed to enhancing the farmers' knowledge of identifying insect pests and diseases in cotton.

$$\text{at least one } \beta \neq 0$$

Results and Discussion

The collected data were analyzed using SPSS 7.5 Version. The farmers' average score regarding recognizing insect pests and diseases were estimated and are reported as under:

Farmers' Knowledge Regarding Recognizing Insect Pests and Diseases in cotton: Table 1 reveals that farmers' average score regarding recognizing insect pests was 4.6out of 10 while the standard error of the mean was 0.18. The table shows that the farmers' average score was 2.25 out of 10 regarding recognizing the diseases in cotton and standard error of the mean was 0.18.

Table 1: One Sample Statistics: Farmers' Knowledge

Level to which farmers recognize insects pests	N	Mean	Std.D. Mean	Std. Error
Level to which farmers recognize insects pest	150	4.6	2.17	0.18
Level to which Farmers recognize disease	150	2.25	2.15	0.18

To know the relationship between farmers' scores and selected factors viz. farmers age, farmers' education level, farming experience, farm size, help from Agriculture Extension Agents, Pesticide Agents, discussing with other farmers, watching agricultural programs on T.V, listening agricultural programs on radio and reading agriculture literature, stepwise regression was applied. Using the SPSS/PC 7.5 Version, based on the probability criteria 0.05 or less for the slopes of each independent variable, significant variables were selected.

Perceived Contribution of Selected Factors to Enhancing the Farmers' Knowledge Regarding Identifying Insect Pests in Cotton: Stepwise regression suggested the following best subset of independent variables that contributed to enhancing the farmers' knowledge regarding identifying insect pests. The model was as under:

$$Q_1 = 1.479 + 0.0473 \text{ (Farmers Age)} + 0.193 \text{ (Help from Pesticide Agent)} + 0.126 \text{ (Discussing with other Farmers)} + 0.145 \text{ (Watching Agricultural Programs on T.V)} + 0.362 \text{ (Reading Agricultural Literature)} \ldots\ldots (1)$$

The above model reveals that Farmers' Age, Help from Pesticide Agents, Discussing with Other Farmers, Watching Agricultural Programs on T.V, and Reading Agricultural Literature had significantly positive effect on the farmers' knowledge regarding identifying the insect pests in cotton crop. Table 2 represents the significance level of independent variables. Since P-values for the test-statistics were less than the significance level, 0.05, variables were considered significant. Therefore, null hypothesis that factors have no contribution to enhancing the farmers' ability regarding identifying insect pests ($\beta_1 = \beta_2 = \beta_3 = \beta_4 \ldots\ldots\ldots = 0$) was rejected. The alternative hypothesis that at least one factor has significant contribution to enhancing the farmers' ability (at least one $\beta \neq 0$) was accepted.

To check the model adequacy, the model summary and ANOVA are presented in Table 3 and 4, respectively. Fifty-nine and five tenth percentage of variance in farmers' scores regarding identifying the insect pests was accounted for by the five independent variables. Table 4 shows that the F-value was 44.730 and the significance value for the model was 0.000, which is less than significance level 0.05. Therefore, it was concluded that the model was fit.

Table 2: Significant Coefficients for Farmers' Scores Regarding Identifying Insect Pests

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
	Beta	Std. Error	Beta		
Constant	1.479	0.440		3.360	0.001
Farmers Age	0.0473	0.010	0.270	4.967	0.001
Help from Pesticide Agent	0.193	0.047	0.265	4.086	0.000
Discussing with other Farmers	0.126	0.057	0.128	2.321	0.022
Watching Agri. Programs on T.V	0.145	0.063	0.162	2.290	0.033
Reading Agricultural Literature	0.362	0.070	0.405	5.180	0.000

Table 3: Model Summary for Farmers Scores Regarding Identifying Insect Pest

Model	R	R square	Adjusted R Square	Std. Error of the Estimates
5	0.780	0.608	0.595	1.35

Table 4: Anova for Farmers Scores Regarding Identifying Insect Pests

Model	Sum of Square	d.f.	Mean	F	Sig.
Regression	407.754	5	81.551	44.730	000
Residual	262.539	144	1.823		
Total	670.293	149			

Table 5: Significant Coefficients for Farmers Scores Regarding Identifying disease

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
	Beta	Std. Error	Beta		
Constant	0.395	0.532		0.743	.459
Farmers age	0.041	0.011	0.258	3.656	.000
Help from Pesticide Agent	0.295	0.073	0.295	4.039	.000
Watching Agri. Programs on TV	0.519	0.111	0.343	4.689	.000

Table 6: Model Summary for Farmers Scores Regarding Identifying the Disease

Model	R	R square	Adjusted R Square	Std. Error of the Estimates
3	0.564	0.318	0.303	1.62

Table 7: Anova for Farmers Scores Regarding Identifying the Diseases

Model	Sum of Square	d.f.	Mean	F	Sig.
Regression	169.462	3	56.487	21.461	.000
Residual	363.221	138	2.632		
Total	532.683	141			

Contribution of Selected Factors to Enhancing the Farmers' Knowledge Regarding Identifying Diseases in Cotton

Stepwise regression suggested the following best subset of independent variables that contribute to enhancing the farmers' knowledge regarding identifying diseases in cotton. The model was as under:

Q_2 = 0.395 + 0.041 (Farmers Age) + 0.295 (Help from Pesticide Agent) + 0.519 (Watching Agricultural Programs on T.V)..... (2)

The above model shows that Farmers' Age, Help from the Pesticide Agents, and Watching Agricultural Programs on T.V had significant positive contribution to farmers' knowledge regarding identifying diseases in cotton crop. Table 5 represents the significance level of independent variables. Since P-values for the test-statistics were less than the significance level, 0.05, variables were considered significant. Therefore, null hypothesis that factors have no contribution to enhancing the farmers' ability regarding identifying insect pests ($\beta_1 = \beta_2 = \beta_3 = \beta_4 \ldots\ldots = 0$) was rejected. The alternative hypothesis that at least one factor has significant contribution to enhancing the farmers' ability (at least one $\beta \neq 0$) was accepted.

The table shows that P-values for the t-statistics were less than the established significance level 0.05. To check the model adequacy, the model summary and ANOVA were calculated and are presented in Table 6 and 7, respectively.

Thirty and three-tenths percentage of the variance in farmers' scores regarding identifying diseases was accounted for by three independent variables. Table 7 shows that the F-value was 21.461 and the significance value for the model was 0.000 that was less than significance level 0.05. Therefore, it was concluded that the model was fit.

Conclusions

This study was conducted to determine the farmers' knowledge of identifying insect pests and diseases in cotton as well as perceived contribution of different sources of information to enhancing farmers' knowledge. For this study, cluster sampling was applied to select 150 cotton growers of district Hyderabad, Sindh, Pakistan.

It was concluded that on the average farmers could recognize 4.60 insect pests out of 10. Regarding identifying diseases in cotton, farmers could recognize 2.25 diseases out of 10. If we may assume 100% accuracy is the desired knowledge level for major problem, we can conclude that the ability to recognize selected major insect pests and diseases is not adequate. Selected perceived sources that significantly contributed to enhancing farmers' knowledge regarding identifying insect pests were Farmers' Age, Help from Pesticide Agents, Discussing with other Farmers, Watching Agricultural Programs on T.V, and Reading Agricultural Literature. Moreover the sources that significantly contributed to enhancing farmers' knowledge regarding identifying diseases in cotton were Farmers' Age, Help from Pesticide Agents and Watching Agricultural Programs on T.V.

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