

FARMERS' ADOPTION OF RECOMMENDED TECHNOLOGY FOR RICE IN LARKANA DISTRICT OF SINDH PROVINCE OF PAKISTAN

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Abstract

The unrealized potential increase in rice production in Pakistan may be the result of not applying recommended technology. The primary purpose of this study was to identify Larkana district farmers' use of recommended technology for rice production. A survey of 150 randomly drawn rice farmers (92% of land in rice) was conducted using professional enumerators (8% probability of error). Between 73% and 84.5% of the farmers reported applying an appropriate rate of plowings, seed, fertilizer, and irrigation, suggesting that a need to disseminate appropriate technology information exists. Farmers (62.2%) reported that conferences were the most beneficial method of instruction. Radio was rated as the most satisfactory source of information for rice production followed by agricultural extension agents. Farmers (63.5%) valued extension agent farm visits as a service that should be performed. Approximately 25% of farmers rated improving agricultural education programs and access to loan facilities as priorities in planning for improved rice production.

Introduction

Rice (*Oryza sativa*) is one of the principal food grains. It is a staple in diets of the majority of people of Pakistan as well as Asia. Pakistan's annual production was 7.7 million metric tons in 1999 (FAO, 2000). Rice is a major export commodity and contributes approximately 15% to the total foreign exchange earnings of Pakistan (Mallah, 1987). In Sindh, rice is grown in two distinct areas; upper Sindh and lower Sindh, occupying an approximate area of 0.75 million hectares with total production of about 1.58 million tons. In addition, coarse varieties of the rice are also used for bread making purposes by a large number of people in the rice growing tracks of Sindh, while rice husks and straw are mainly used for feeding livestock as dry fodder during the shortage of green fodder.

There are a number of factors that may influence the adoption of innovation (Kashem and Jones, 1988; Zinyama, 1988; Abdelmagid and Hassan, 1996; Igodan, Ohaji, and Ekpere, 1988; Shakyand Flinn, 1985; Nkonya, 1997; Mbata, 1997; and Voh, 1982). These factors include lack of money (poverty) with which to purchase seasonal agricultural inputs such as seed and fertilizer, the lack of basic farming implements, notably the ox-drawn single furrow plough, the lack of draft cattle, farm size, inadequate family labor for agricultural work, level of education, social participation, contact with extension, access to credit, empathy and leadership roles, lack of inputs in the market at the right time, and shortage of irrigation.

In spite of favorable climate, good soil conditions, and availability of irrigation water, the rice yield in Pakistan is far below the yield obtained in advanced rice producing countries. The unrealized potential increase in rice production in Pakistan may be attributed to the fact that farmers are not adopting a full package of rice production technology and still follow traditional methods. It is imperative to communicate appropriate technology to the farmers and motivate them to adopt it. It is therefore essential for national planners and extension educators to know what technology the rice growers are using and what sources of information are used. This base-line information is essential to strategic planning for improvement of rice production.

Purpose And Objectives of the Study

The primary purpose of this study was to identify Larkana District farmers' use of recommended technology for rice production. The specific objectives of the study were to:

1. Identify the proportion of the farmers who apply recommended number of plowings, appropriate seed rate, fertilizer dose, and amount of irrigation,
2. Determine the ranking for the perceived importance of selected sources of information (Agricultural Extension Agents, Radio, TV, and Newspaper) regarding adoption of recommend technologies for rice production, and
3. Determine farmers' opinions regarding services provided by the Extension staff, agricultural education programs, and government plans.

Methods and Data Sources

The study used a sample survey design. Descriptive research "involves making careful description of educational phenomena" (Gall, Borg, and Gall, 1996). The population of this study was all the rice growers of the Larkana district. The total population was more

than 3000 farmers. An appropriate sample size at the 5% sampling error rate was 384 (Wunsch, 1986; Fitz-Gibbon & Morris, 1987; Stockdill, 1993). Due to time and financial constraints, only 150 farmers were randomly drawn and interviewed. As a result, the error rate increased to 8% (Wunsch, 1986). A simple random sampling technique was applied using a random number table (Cochran, 1977, p. 19). A detailed survey guide was developed after the careful study of the objectives and literature. The interview guide was divided into three sections: demographic characteristics, farmers' knowledge regarding new practices of rice (whether they apply recommended number of plowings, seed rate, fertilizer dose, and irrigation water or not) and farmers' perceived value of information sources, and suggestions for adoption of new practices. Trained, professional enumerators conducted the interviews. The responses were recorded on the interview guide. Perception responses regarding helpfulness of selected sources of information (agricultural extension, radio, TV, and newspapers) were gathered on a Likert-type scale ranked 1 to 10 (1 being unsatisfactory, 5 being average and 10 being excellent). Farmers' opinions and suggestions were recorded. Farmers' responses regarding number of plowings, seed rate, fertilizer dose, and irrigation water were compared with the recommended number of plowings, seed rate, fertilizer dose, and irrigation water for rice from *Crops of Sindh* (Khosro, 1994). The wrong answers were coded "0" and right answers were coded "1". The collected data were analyzed using a statistical package, SPSS/PC version 9.0. Descriptive statistics were calculated and one-way ANOVA was performed to test the hypotheses.

Results

Demographic Characteristics of Larkana Rice Farmers

The demographic characteristics of the rice growers in the present study are presented in Tables 1 and 2. Approximately 90% of participants' land holdings were in rice production. The education level of rice farmers is low with 31.8% illiterate and 18.9 % having completed primary education.

Table 1. Demographic Characteristics ($N = 148$)

Characteristic	<i>M</i>	<i>SD</i>
Age	36.0	8.2
Dependent Family Members	6.7	3.3
Total Area Holding – acres	17.1	13.3
Area Under Rice – acres	15.7	12.0
Farming Experience – years	15.5	7.8

Farmers Who Reported Applying Appropriate Number of Plowings of Rice, Seed Rate, Fertilizer, and Irrigation

Between 73% and 84.5 % of the farmers reported applying appropriate number of plowings, seed rate, fertilizer, and irrigation. Results are given in Table 3.

Table 2. Tenancy and Education Data

Characteristic	<i>F</i>	%
Tenancy Status		
Land lord	52	35.1
Peasant proprietor	56	37.8
Tenant	40	27.0
Educational Level		
Illiterate	47	31.8
Primary	28	18.9
Middle	9	6.1
Matric	29	19.6
Intermediate	12	8.1
Graduate	13	8.8
Post graduate	10	6.8

Table 3. Frequency Distribution for Right or Wrong Responses (*N* = 148)

Item	<i>F</i>	%
Plowing the land for rice		
Right (recommended 2-3)	108	73.0
Wrong (out of range)	40	27.0
Appropriate seed rate for rice		
Right (recommended 30-40 kg/hectare)	122	82.4
Wrong (out of range)	26	17.6
Appropriate amount of fertilizer dose for rice		
Right (recommended 1.5-2 bags/hectare)	108	73.0
Wrong (out of range)	40	27.0
Irrigation water rate for rice		
Right (recommended 3-4 inches)	125	84.5
Wrong (out of range)	23	15.5

Rating of Information Sources on Plowing

The mean ratings for the information sources were significantly different as shown in Table 4. To compare the mean ratings, the Least Significance Difference Test was applied. Table 5 shows the results. Agricultural Extension Agents and radio were rated above average as information sources and constituted group 1. TV was rated below average and ranked 2. Newspaper was rated lowest and constituted group 3.

Table 4. ANOVA for Ratings of Selected Information Sources on Plowing for Rice

Source of variance	<i>df</i>	<i>MS</i>	<i>F</i>
Between Group	3	698.5	98.2**
Within Group	588	7.1	

Note. ***p* < .01

Table 5. Comparison of Mean Ratings of Selected Information Sources on Plowing Rice (N = 148)

Source of Information	Group 1	Group 2	Group 3
Agricultural Extension	6.82		
Radio	7.18		
TV		3.68**	
Newspaper			2.89**

Note. Scale of 1 to 10: 1 = unsatisfactory, 5 = average, and 10 = excellent.

** $p < .01$.

Rating of Information Sources on Seed Rate

The mean ratings for information sources were significantly different as reported in Table 6. The mean ratings were compared, and the results are in Table 7. Agricultural Extension Agents were rated slightly above average and ranked 1 among the sources. Radio was rated slightly below average and was ranked 2. TV and radio were rated between average and unsatisfactory. They were groups 3 and 4, respectively.

Table 6. ANOVA for Ratings of Selected Information Sources on Appropriate Seed Rate for Rice

Source of variance	<i>df</i>	<i>MS</i>	<i>F</i>
Between Group	3	198.5	50.1**
Within Group	588	4.0	

Note. ** $p < .01$

Table 7. Comparison of Mean Ratings of Selected Information Sources on Appropriate Seed Rate for Rice (N = 148).

Source of Information	Group 1	Group 2	Group 3	Group 4
Agricultural Extension	5.27			
Radio		4.78**		
TV			3.35**	
Newspaper				2.82**

Note. Scale of 1 to 10: 1 = unsatisfactory, 5 = average, and 10 = excellent.

** $p < .01$

Rating of Information Sources on Appropriate Fertilizer Dose

The mean ratings for information sources were significantly different as reported in Table 8. The mean ratings were compared. See Table 9. Agricultural Extension Agents and radio were rated slightly above average sources and composed group 1. TV and newspaper were rated between average and unsatisfactory, although TV was in group 2, and newspaper was in group 3.

Table 8. ANOVA for Ratings of Selected Information Sources on Appropriate Fertilizer Dose for Rice

Source of variance	<i>Df</i>	<i>MS</i>	<i>F</i>
Between Group	3	313.8	63.9**
Within Group	588	5.0	

Note. ** $p < .01$

Table 9. Comparison of Mean Ratings of Selected Information Sources on Appropriate Fertilizer Dose for Rice (N = 148)

Source of Information	Group 1	Group 2	Group 3
Agricultural Extension	5.51		
Radio	5.55		
TV		3.37**	
Newspaper			2.72**

Note. Scale of 1 to 10: 1 = unsatisfactory, 5 = average, and 10 = excellent. ** $p < .01$

Rating of Information Sources on Irrigation Rate

The mean ratings for information sources were significantly different as reported in Table 10. The mean ratings were compared. See Table 11. The Agricultural Extension Agents were rated average and ranked 1. Radio was rated below average as an information source and constituted group 2. Newspaper and TV were rated between average and unsatisfactory. They were not different and consequently formed group 3.

Table 10. ANOVA for Ratings of Selected Information Sources on Appropriate Irrigation Rate for Rice

Source of variance	df	MS	F
Between Group	3	161.0	48.0**
Within Group	588	3.4	

Note. ** $p < .01$.

Table 11. Comparison of Mean Ratings of Selected Information Sources on Appropriate Irrigation Rate for Rice (N = 148)

Source of Information	Group 1	Group 2	Group 3
Agricultural Extension	4.87**		
Radio		4.18**	
TV			2.70
Newspaper			2.89

Note. A 1 to 10 scale: 1 = unsatisfactory, 5 = average, and 10 = excellent. ** $p < .01$.

Opinion Survey

Frequency distribution and corresponding percentages were calculated for farmers' responses for selected opinion questions. The majority (61.5%) of farmers selected radio as the most useful of selected sources of information about agriculture as reported in Table 12. Regarding the most beneficial education program format, the majority (62.2%) of the farmers responded, conferences for farmers as reported in Table 13. The majority (63.5%) of farmers indicated that Agricultural Extension Agents should visit farms on a regular basis as reported Table 14. Regarding government programs for farmers' benefits, 27.7% of the farmers responded that government should plan and organize agricultural education programs and 22.3% indicated loan facilities should be provided as reported in Table 15.

Table 12. Most Useful of Selected Information Sources about Agriculture

Sources	F	%
Agricultural Extension Worker	42	28.4
Radio	91	61.5
TV	7	4.7
Newspaper	5	3.4
Pamphlet	3	2.0

Table 13. Most Beneficial Education Program Format

Programs	F	%
Conferences for Farmers	92	62.2
Short Courses	26	17.6
Adult Evening or Day Classes	24	16.2
No Response	6	4.0

Table 14. Selected Services Agricultural Extension Agents Should Perform

Services	F	%
Regular Agriculture Farm Visits	94	63.5
Home Visit	6	4.1
Information on New Technology	8	5.4
Group Discussion	3	2.0
No Response	37	25.0

Table 15. The Most Beneficial Government Plans/Programs

Plans	F	%
Certified Seed	17	11.5
Agricultural Education Programs	41	27.7
Loan Facilities	33	22.3
Shortage of Irrigation Water and Fertilizer	3	2.0
Restore the Drainage System	11	7.4
Research on Rice	11	7.4
Women's Health Program	4	2.7
No Response	28	18.9

Conclusions and Recommendations

The conclusions presented are limited to rice farmers in Larkana district of Sindh, Pakistan. Conclusions also are limited by a sample size resulting in a .08 error probability.

Between 73% and 84.5 % of the farmers reported applying an appropriate number of plowings, seed rate, fertilizer, and irrigation. This may appear relatively high, but this study did not determine the patterns of appropriate technology use by farm, nor did it isolate all critical production factors. Given the great potential for even a single limiting practice having major negative impact on rice production, there appears to be a need for more dissemination of information on rice production and additional analysis of utilization of approved production technology.

Most farmers (62.2%) reported conferences were the most beneficial method of instruction. While the alternative responses were limited, conferences should be part of the delivery strategy for new technology.

Agricultural Extension Agents and radio were rated the most satisfactory sources of information for the rice production practices studied and in response to the general question on the most useful sources of information for farmers. Radio was rated most useful by 61.5% of the respondents. This appears to be reflective of the low level of education with over 50% reported as completing primary education or being illiterate. Radio as an oral communication technology is an essential dissemination tool that must be used by extension and others.

Based on responses to an open-ended question, farmers (63.5%) appeared to value extension agents farm visits as a service that should be performed. The benefits of farm visits should be evaluated and utilized in technology dissemination.

Regarding most beneficial government programs for farmers, 27.7% of the farmers responded that government should plan and organize agricultural education programs, and 22.3% indicated loan facilities should be provided. Access to education and financial resources should remain as priorities in planning improved rice production.

Educational Importance

Technology has increased production of many crops. However, a need exists for dissemination of appropriate technology to rice farmers. This study was primarily designed to provide baseline data to extension and others involved in dissemination of recommended practices for rice. The scope of this study was limited and reflection on the data suggests that a more complex analysis is needed to ensure quality data for assessment of educational needs. Based on the effectiveness ratings farmers expressed, extension agents should be able to improve the effectiveness of their contact system with farmers through the increased use of radio. Direct contacts with extension agents appear important to rice farmers suggesting that field-dependent learning styles need to be taken into consideration when planning dissemination efforts and seeking increased adoption rates.

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