Research Article

Public Sector Advisory Services for Rice Productivity: A Case Study of Farmers' Awareness in Tehsil Shakargarh of Pakistan

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Abstract | Fine rice of Pakistan is globally famous and its demand is increasing at the national and international level because of the long kernel, strong aroma, and grain elongation at the time of cooking. This crop also serves as a source of livelihood for the majority of the farming community residing in the rice zone. Public sector advisory services are considered as a pillar for agricultural crop productivity; therefore, the present study was designed to explore the role of public sector advisory services for rice productivity as perceived by the farming community in the Narowal District. A multi-stage sampling technique was used for this study; firstly, one tehsil out of three tehsils *i.e.* Narowal, Shakargarh, and Zafarwal was selected, secondly, 6 union councils were selected, and then two villages from each union council and 10 farmers from each village were selected randomly. Thus, a total sample comprised of 120 rice growers. A well-structured interview schedule was used for data collection. Descriptive statistics *i.e.* frequency, mean and standard deviation were applied through Statistical Package for Social Sciences (SPSS). Results showed that the use of farmers' training as an extension method for promoting rice production technology was rated first. Weeds problems were ranked first among the problems faced by farmers for rice production. The data also showed that insect pests and disease problems were ranked the second problem. The study suggested that the public sector advisory services providers must address different hurdles hampering the successful development and execution of the latest rice production strategies. Furthermore, the public sector advisory services providers must develop strategies to make farmers aware of the latest rice production technologies.

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Introduction

In Pakistan, rice (*Oryza sativa L.*) is the second most important crop as a staple food after wheat and also the most important product for export after cotton. Its share in agriculture is nearly 3%, however, its share in the GDP has been recorded as 0.6%. It was cultivated on an area of 2810 thousand hectares with a production of 7202 thousand tonnes in 2018-19, significant decrease has been observed in rice cultivation area and production as compared to the previous year. This declining trend was due to decreased cultivation

area, dry weather, and water shortage (GoP, 2019). Regardless of various problems in rice cultivation, Pakistani basmati rice gained increasing demand at the national and international market because of its quality characteristics like long kernel, strong aroma, and a most importantly high degree of grain elongation at the time of cooking (Shahzadi *et al*., 2018). Rice crop plays a great part in the reclamation of saline soils providing the opportunity for agriculture productivity, where no other crops could grow (Zelensky, 1999). Generally, it is perceived that un-accessibility and non-availability of technical and latest knowledge regarding different farm activities were the most important factors responsible for lower production of rice (Muhammad and Garforth, 2007). Rice crop was observed sensitive to climate change; therefore, climate change adaptation strategies for crop productivity should be streamlined in various cropping zones (Ednhofer *et al*., 2014; Siddiqui *et al*., 2012).

Extension and advisory services in agriculture are indispensable and it offers more than just expert assistance in the improvement of production and processing; it also enables a flow of information and transfer of knowledge and scientific findings. Extension services are performed to regulate and establish farmers' organizations; functioning according to goals, and ways to execute outreach activities by the extension field staff (Tborn, 2011). The major function of agriculture extension is to educate farmers and enable them to solve agricultural problems. Finding the best suitable solutions for the problems and the practical performance of these solutions is the functional objective of agriculture extension (Rivera and Qamar, 2003). Agricultural extension and advisory services are very important in the development of rural knowledge and innovative systems and influence rural household decisions, especially in the developing countries which are generally more in need of such guidance services (Alex and Zijp, 2002). Public sector extension services are important actors to stimulate the development of agricultural production. Therefore, agricultural extension services must be designed to improve farming skills among farmers and sensitize them to acquire new knowledge and technologies to improve farm productivity (Qamar, 2005).

Increased investment in extension and crop productivity requires a certain radical change in the existing behavior patterns of the farmers (Saeed, 2011; Sikkema, 2017) and the working strategies of extension personnel. Recommended practices and production technology for crop productivity are not adopted by farmers (Mwangi and Kariuki, 2015; Aslam, 2016) due to diversified problems faced by rice growers like; inadequate education, lack of technical knowledge, poor quality & scarcity of water (Rehman *et al*., 2015; Ashfaq *et al*., 2003; Ahmad and Yohannes, 2010), improper soil fertility, lack of capital, irrigation water, credit facility, unavailability of latest & suitable varieties and lack of access to latest farm practices causes low productivity (Ahmad, 2011; Hussain, 2010; Aydin *et al*., 2010; Sheikh, 2010). Similarly, lack of insurance mechanism and inadequate marketing system are causes of decline in rice production (Rao, 2011; Khan, 2010; Bashir *et al*., 2010). Extension field staff should assess various needs of farmers to improve rice productivity, the major emerging needs of rice growers are training for rice production, disease & pest management, and fertilizer & pesticides application (Babu *et al*., 2011).

Considering the above scenario the present study was conducted to explore the role of the public sector extension and advisory services for rice productivity among the farming community particularly in District Narowal. Indeed a lot of research has been accomplished in the context of rice production though, researchers paid very little attention to examine awareness among the farming community regarding public sector extension and advisory services for rice production technologies. Moreover, it is also important to assess various methodologies used by extension field staff for the promotion of rice production technologies. The research objectives of current study are to:

1. Profile various sources of information being used by the farmers for rice production
2. Assess awareness of the farmers regarding rice production technologies
3. Investigate methodologies used by EFS for promotion of rice production technologies
4. Enlist problems faced by farmers regarding rice production

Materials and Methods

Current study was conducted in District Narowal, which is one of leading rice-producing districts. District Narowal has three tehsils *i.e*. Narowal, Shakargarh, and Zafarwal, all rice growers of the district were considered as a population of this study. A multistage

sampling technique was used for this study. In the 1st stage one tehsil was selected (that was Shakargarh), in the 2nd stage, 6 union councils (UCs) were selected out of 32 union councils of Shakargarh tehsil. In the 3rd stage, 2 villages were selected from each UC randomly. In the 4th and final stage, 10 farmers were selected from each village based on simple random sampling. Thus a total sample of 120 rice growers was selected for data collection. An interview schedule was prepared considering the objectives of the present study. The interview schedule was composed of various sections including; basic demographic attributes, farmers' sources of information for rice production technologies, farmers' awareness regarding rice production technologies, methodologies used by extension field staff for promotion of rice crop production technologies and farmers' problems related to rice production. Three level likert scale was used for different statements of this study and rank order was calculated on the basis of mean values. Face-to-face interviews were conducted with farmers to collect data. Farmers were approached at their homes and farms keeping in view their convenience. The collected data were statistically analyzed with the help of the Statistical Package for Social Sciences (SPSS). Descriptive statistics *i.e.* frequency, percentage, standard deviation, and ranking were calculated to interpret discussion.

Results and Discussion

Demographic attributes

The data shown in Figure 1 depicts that half (50%) of the farmers were lying in the age group of 26 to 50 years. Furthermore, only 0.8% of the farmers were up to 25 years of age and nearly half (49.2%) of the farmers were above 50 years of age. Education is an important and vital instrument for bringing about desirable change in the behavior of any individual (Khan, 2005). It is an important aspect that plays a dynamic role in developing a positive attitude among the respondents regarding innovation. Therefore, it is believed that the higher the level of education of the farmers, the better will be the output in terms of change in behavior (Rajan, 1991). The data in figure 1 indicates that half (50%) of the farmers had completed middle level of education whereas little above one-fourth (28%) of the farmers' group was matriculated. Only 1% of the farmers were illiterate which shows the improved educational level in rural areas of Pakistan. Some (8%) of the farmers had a primary level of education while 13% of the farmers were above matric.

Farmers' source of income plays important role in farm management. Hence the data-inquiring sources of income of farmers are presented in Figure 1. This shows that more than half (57%) of the farmers were relying solely on farming. Little more than one-fifth (23%) of the farmers were having farming, as well as some type of job as a source of income, and 14% of farmers, have farming and business as a source of income. The data also shows that some (6%) of the farmers were doing farming as well as job and also some sort of business. The annual income of the farmers is also much important demographical factor, which depicts the financial standards of the individuals. Farmers were inquired about their annual income. The data depicting this aspect of the study is represented in Figure 1, according to which one-fifth (21%) of the farmers had annual income above 0.2. to 0.3 million rupees whereas almost similar percentage (20%) of the farmers were also having annual income above 0.3 to 0.4 million rupees and 21% having above 0.5 to 0.6 million rupees. Almost 9% and 8% of the farmers had an annual income of above 0.8 million rupees and 0.7 to 0.8 million rupees respectively. Only 2% of farmers have an income of 0.1 million rupees or less.

Graphical representation of the data given in Figure 1 indicates that a large percentage (37.0%) of the farmers were cultivating rice on an area up to 5 acres whereas 35% of the farmers were cultivating rice on an area of 6 to 10 acres. Almost 13% of the farmers were growing rice on an area between 11 to 15 acres, and 7% of the farmers were cultivating rice on an area between 16 to 20 acres while 8% of the farmers were cultivating rice on more than 20 acres of land, graphical representation of data is given in Figure 1 for further clarification. The data relating to rice yield depicts that nearly two-fifth (39%) of the farmers were taking rice yield between 31 to 35 monds whereas a little less than one-third (33%) of the farmers were taking rice yield between 36 to 40 monds. Some (8%) of the farmers were also taking rice yield of above 40 monds.

Sources of information

In this section, farmers were asked about their sources of information for rice production technologies. Access to information sources is much important in the adoption process, which can lead to improvement in farmers' knowledge related to agriculture. Access to various information sources is necessary for improving rice productivity. The data depicting this aspect

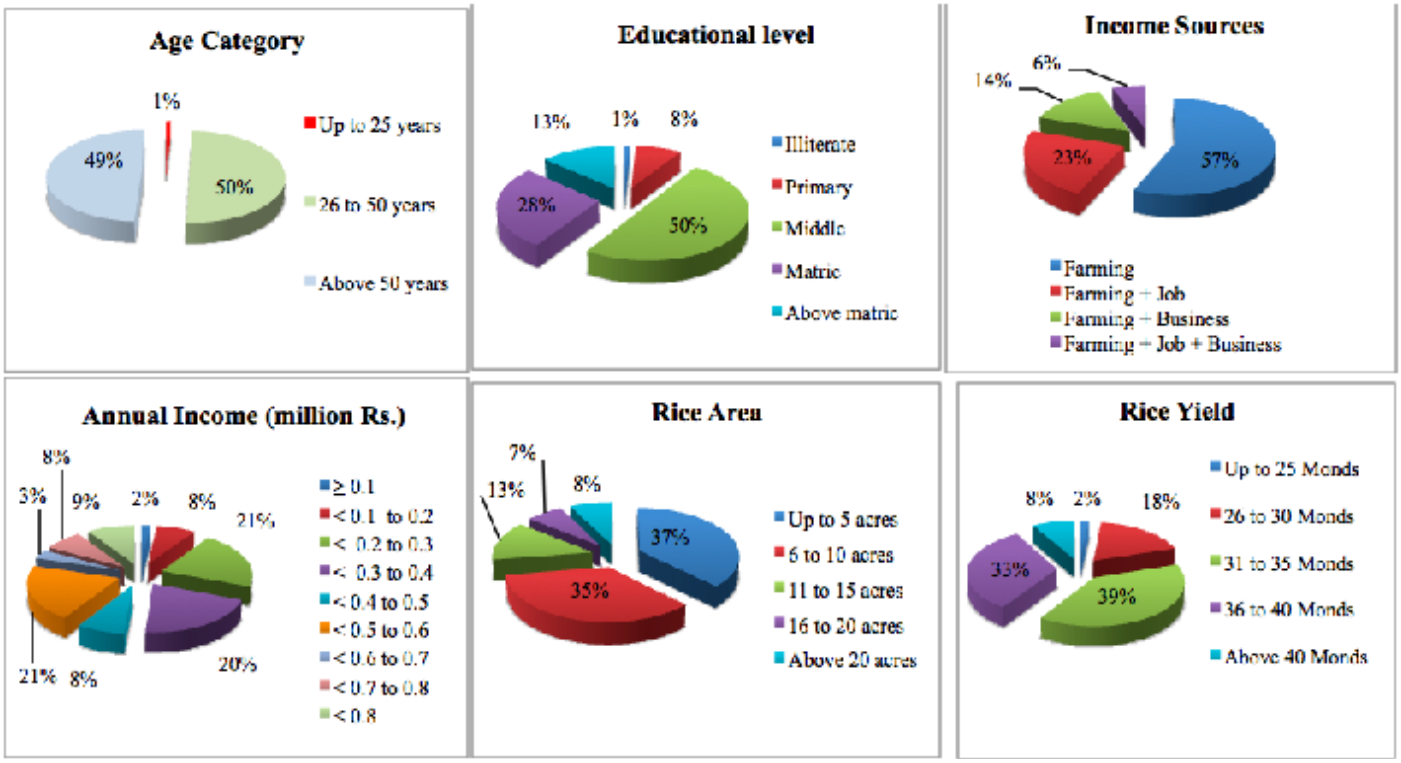

Figure 1: *Respondents demographic attributes.*

Table 1: *Respondents' sources of information regarding rice production technologies.*

Information Sources	Mostly used		Sometimes used		Rarely used	
	f	%	f	%	f	%
Agriculture extension department	71	59.2	38	31.7	11	9.2
Private companies	28	23.3	85	70.8	7	5.8
Pesticide dealer	21	17.5	85	70.8	14	11.7
Fellow farmers	12	10.0	72	60.0	36	30.0
Media (Electronic + Print)	8	6.7	76	63.3	36	30.0
Social media	10	8.3	62	51.7	48	40.0
TV/FM	13	10.8	70	58.3	37	30.8

of the study is given in Table 1 that more than half (59.2%) of the farmers mostly accessed the agriculture extension department for information related to rice production which shows farmers' trust in the agriculture extension department whereas 70.8% of the farmers sometimes accessed private companies for information and a similar percentage of respondents sometimes accessed pesticide dealers for information regarding rice. The table further depicts that fellow farmers were sometimes accessible by 60% of the farmers while media (electronic and print) was sometimes accessible to 63.3% of the farmers. Similarly, 51.7% and 58.3% of respondents sometimes used social media and TV/FM as information sources respectively.

Awareness regarding rice production technologies

Awareness regarding rice crop production technology is much important in improving rice yield by the farming community. Farmers were asked to provide their response according to a three-level Likert scale (0=not at all aware, 1=slightly aware, 2=well aware). The results of farmers' awareness related to different practices in rice production are depicted in Table 2 which shows that more than 40.8% and 40% of the farmers were slightly aware and well aware of the wet method of nursery raising while surprisingly an overwhelming majority (73.3%) of the farmers were not at all aware of the dry method of nursery raising & seed rate. Except a few 15% and 11.7% were slightly aware and well aware about a dry method for nursery raising & seed rate. Respectively huge majority (95.8%) of the farmers were not at all aware of the Rab method of nursery raising & seed rate. More than half of (56.7%) of respondents were not aware at all about sowing time of coarse varieties whereas 35% of the farmers were slightly aware of sowing time for fine varieties. Whereas 52.5 and 42.5% of the respondents were slightly aware and well aware about sowing time of fine varieties respectively. The data further depicts that 88.3% of the farmers were not aware at all about nursery transplantation time for coarse varieties while 45% and 38.3% of the farmers were slightly aware and well aware of nursery transplantation time for fine varieties respectively.

Table 2: *Respondents' awareness regarding rice crop production technologies.*

Rice production technology		Not at all aware		Slightly aware		Well aware	
		F	%	F	%	F	%
Nursery Raising & Seed Rate	Wet method (6-7 kg)	23	19.2	49	40.8	48	40.0
	Dry method (8-10 kg)	88	73.3	18	15.0	14	11.7
	Rab method (12-15 kg)	115	95.8	05	4.20	0	0.00
Sowing Time	Course varieties (20 May-7 June)	68	56.7	42	35.0	10	08.3
	Fine varieties (20 May-20 June)	06	05.0	63	52.5	51	42.5
Nursery Transplantation	Course varieties (20 June-7 July)	106	88.3	09	07.5	05	04.2
	Fine varieties (20 May-20 July)	20	16.7	54	45.0	46	38.3
Fertilizers Application (kg/ acre)	Course varieties (N:P:K-69:41:32)	102	85.0	12	10.0	06	05.0
	Fine varieties (N:P:K-57:32:25)	11	9.2	60	50.0	49	40.8
Weeds Management	Swanky grass	0	0.0	87	72.5	33	27.5
	Dhedan	0	0.0	84	70.0	36	30.0
	Khabal grass	02	01.7	81	67.5	37	30.8
	Sedge family weeds	0	0.0	86	71.7	34	28.3
	Broad leafy weeds	02	01.7	80	66.6	38	31.7
Pest Management	Dark headed stem borer	12	10.0	78	65.0	30	25.0
	White stem borer	10	08.3	73	60.9	37	30.8
	Yellow stem borer	06	05.0	82	68.3	32	26.7
	Plant hoppers	08	06.7	79	65.8	33	27.5
	Leaf hoppers	12	10.0	73	60.8	35	29.2
Disease Management	Blast	05	04.2	93	77.5	22	18.3
	Brown spot	0	0.0	91	75.8	29	24.2
	Stem rot	08	06.7	86	71.6	26	21.7
	Bacterial leaf blight	05	04.2	89	74.1	26	21.7
Harvesting	Manual harvesting & threshing	88	73.3	14	11.7	18	15.0
	Machine harvesting & threshing	42	35.0	36	30.0	42	35.0
	Combine harvesting	96	80.0	14	11.7	10	8.3
Post Harvest Management	Cutting	22	18.4	98	81.6	0	0.0
	Hauling	36	30.0	81	67.5	03	2.5
	Threshing	12	10.0	104	86.7	04	3.3
	Cleaning	23	19.2	93	77.5	04	3.3
	Field drying	26	21.7	93	77.5	01	0.8
	Stacking/ piling	51	42.5	67	55.8	02	1.7

Large percentages (85.0%) of the farmers were not aware at all about fertilizers application for coarse varieties. In addition, 50% and 40.8% of the farmers were slightly aware and well aware of fertilizer application for fine varieties. The data also depicts that 72.5%, 70%, 67.5%, 65.8%, 71.7%, and 66.6% of respondents were slightly aware of weed management of swanky grass, dhedan, khabal grass, sedge family weeds, and broad leafy weeds respectively. The table shows that majority of respondents were slightly aware of pest management of dark-headed stem borer, white stem borer, yellow stem borer, planthoppers, and leafhoppers with 65%, 60.9%, 68.3%, 65.8%, and 60.8% respectively. The table indicates that a huge majority of respondents 77.5%, 75.8%, 71.6%, and 74.1% were slightly aware of disease management for the blast, brown spot, stem rot, and bacterial leaf blight respectively.

The data also depicts that nearly three fourth (73.3%) of the farmers were not aware of manual harvesting and threshing while 35.8% of the farmers were also not aware of machine harvesting and threshing. Large percentage (80%) of the farmers was not aware

of combined harvesting. The majority of (81.6%) the farmers were slightly aware of post-harvest management of cutting while 67.5% of the farmers were slightly aware of hauling as post-harvest management. Awareness about threshing was up to a slight level by 86.7% of the farmers. Almost 77.5% of the farmers were slightly aware of cleaning and field drying as post-harvest management. More than half (55.8%) of the farmers were slightly aware of stacking or piling. Overall results of the study depict that farmers were little or not aware of the latest rice production practices. These results are in coherence with Uddin *et al.* (2017) who stated that farmers were not completely aware of the latest rice production technologies. However, the results also contradicted the findings by Uddin *et al.* (2017) who reported that farmers were least aware of transplantation practices of rice. The results also supported the findings by Uddin *et al.* (2017) who explained that farmers were least aware of fertilizer usage in rice, especially for fine varieties. The results were also contradicted the findings by Amponsah *et al.* (2018) who stated that farmers were fully aware of harvesting practices of rice. Data indicates that extension and advisory services mechanism in the research area is ineffective.

Extension methodologies used by extension field staff

In this section, respondents were asked for their responses about methodologies used by the extension field staff for the promotion of rice production technologies. The data depicting this aspect of the study is given in the Table 3, which, shows that the use of farmers' training as an extension teaching method by EFS for rice productivity was ranked first with a mean value of 3.99 and standard deviation of 0.874. The results are also supported by findings of Ousman (2007), which revealed that if the training is conducted in a well-planned way is much helpful in changing farmers' practices. This also helps in farmer attitude towards innovation. FAO (2000) also stated that training is much important, as it is the facilitation of the learning process. The training process is vital for the adoption of new pest-control methods by farmers. The table also depicts that the use of the discussion method was ranked second extension method promoting rice production technology while the use of lectures as an extension method for promoting rice production technology was ranked third with a mean value of 3.78 and standard deviation score of 0.783. Usage of printed materials for promoting rice production technology was ranked fourth with a mean value of 3.69 and a standard deviation value of 0.786. Usage of demonstration method for promoting rice production technology was ranked fifth with a mean value of 3.64 and standard deviation value of 0.868. Usage of electronic media for promoting rice production technology was ranked sixth with a mean value of 3.58 and a standard deviation value of 0.795. Usage of Robocalls, SMS, MMS for promoting rice production technology was ranked seventh with a mean value of 3.55 and standard deviation value of 0.887. Brainstorming was ranked least due to receiving the least mean value of 2.13 and a standard deviation score of 0.709. The results of the study are supporting the findings by Andrango and Bergtold (2015) who stated that extension field staff least prefer electronic devices like TV and radio during their visits to farmers.

Table 3: *Methodologies used by EFS for promotion of rice production technologies.*

Methods	Mean	S.D.	Rank order
Farmers training	3.99	0.874	1
Discussion	3.83	0.847	2
Lecture/s	3.78	0.783	3
Printed material	3.69	0.786	4
Demonstration	3.64	0.868	5
Electronic media	3.58	0.795	6
Robo calls, SMS, MMS	3.55	0.887	7
Brainstorming	2.13	0.709	8

Farmers' problems for rice productivity

Farmers in the research area were also inquired about various problems being faced for rice production. Table 4 depicts different problems faced by farmers. The weeds problem was ranked first among the problems faced by farmers for rice productivity. This problem received the highest mean value of 3.52 with a standard deviation of 0.673. The data also shows that insect pests and disease problems were ranked the second problem with a mean value of 3.48 and a standard deviation of 0.661. Lack of water resources was ranked third highest problem with a mean value of 3.23 and standard deviation value of 0.796 while the unavailability of subsidies was ranked fourth with a mean value of 3.18 and standard deviation value of 0.806. Lack of credit facilities was ranked least with a mean value of 2.69 and standard deviation value of 0.818. The results of the study support the findings by Nguyen and Singh (2006) who stated that major problems faced by rice growers included technical

problems like disease and weeds management.

Table 4: *Problems faced by farmers regarding rice productivity.*

Problems	Mean	S.D.	Rank order
Weeds problem	3.52	0.673	1
Insects pests and diseases problem	3.48	0.661	2
Lack of water resources	3.23	0.796	3
Unavailability of subsidies	3.18	0.806	4
Lack of research initiative for new varieties	3.14	0.677	5
Unavailability of improved seed	3.08	0.616	6
Lack of implements for land preparation	3.03	0.755	7
Natural calamities	3.03	0.621	7
Costly inputs	3.07	0.753	8
Lack of credit facilities	2.69	0.818	9

Conclusions and Recommendations

The current research was designed to assess awareness among farmers regarding rice production technologies being disseminated by the public sector extension and advisory services providers for rice productivity. The majority of farmers mostly receive information for rice production technologies from the department of agriculture extension and sometimes also receive information from the private sector, dealers and fellow farmers, etc. Farmers' awareness regarding various rice production technologies being transferred by the department of agriculture extension are discouraging as most of the responses indicate that farmers are 'not at all aware' and 'slightly aware' about recommended rice production technologies. 'Farmers training', 'discussion' and 'lectures' are more frequently used methods by extension field staff for promotion of rice production technologies. The most common problems of farmers regarding rice production are 'weed problem', 'insect, pest and disease problem' and lack of 'water resources'.

Following are some recommendations based on the conclusion and findings of the research:

1. Public sector extension and advisory services providers should deliver rice production technologies information more progressively. Moreover, the private sector and dealers should also be provided trainings for effective delivery of information related to rice production.
2. Public sector extension and advisory services providers should confirm awareness among farmers regarding rice production technologies in rice-growing areas and particularly in the research area.
3. The public sector extension department should use interactive learning methodologies to improve learning for farmers and improve rice productivity.
4. Public sector research institutions should conduct various researches based on the problems of the farmers regarding rice production. This will minimize the issues of rice growers and also help to bridge the gap between farmers, research institutions, and advisory services providers.

Novelty Statement

This study highlights farmers' awareness regarding rice production technologies imparted by the public sector agriculture extension department. Moreover, the study recommends advisory services providers use innovative methodologies to disseminate rice production technologies in the research area.

Author's Contribution

Muhammad Yaseen: Conceived the research idea and developed research tool.
Muhammad Sallam Shahzad: Collected field data and prepared initial draft of manuscript.
Farhat Ullah Khan: Conducted data analysis and helped in preparation of research tool.
Muhammad Luqman: Assisted in data analysis, drafted research methodology and reviewed manuscript.
Usman Saleem: Assisted in instrumentation, data collection and reviewed manuscript.
Shoaib Nasir: Assisted in data analysis, proof read and finalized the manuscript.

Conflict of interest
The authors have declared no conflict of interest.

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