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TRAINING NEED ASSESSMENT OF RICE FARMERS REGARDING WEEDS AND THEIR MANAGEMENT IN PUNJAB, PAKISTAN

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ABSTRACT

The training needs of rice growers in Punjab, Pakistan were assessed regarding the production technology used in growing rice. Total 332 rice growers were selected through random sampling technique from tehsil Nowshera Virkan, district Gujranwala and interviewed accordingly through a face-to-face interview technique. Data were analyzed using Statistical Package for Social Sciences (SPSS). Findings indicated that farmers had adequate awareness about the weeds and their management. The demonstration was the most effective technique as used by the extension field staff to create awareness among farmers about weeds management. Social media and electronic media use were appeared least effective. This indicates that farmers were more convenient with the traditional technique of creating awareness. Regarding training needs, Rice farmers had maximum training needs regarding chemical control and identification of rice weeds. Resourceful, cost-effective, and timely weed management options are pivotal to making rice crops profitable. Thus, Agriculture Department, Punjab should be aimed at empowering the rice farmers technically, to train them through both conventional approaches (i.e. demonstration plots) and technology-led approaches (i.e. Information Communication Technologies (ICTs), social media and electronic media).

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INTRODUCTION

Rice is a significant food crop and cash crop as well. Rice is the second important food crop in Pakistan after wheat and it is the second leading exportable commodity after cotton. Rice crop adds up 3.5% to value-added in agriculture and 0.7% share in Gross Domestic Product (GDP) comes from the rice crop. Usually, two types of rice crops i.e. Basmati and Coarse are cultivated inside Pakistan. However, for the last few years, coarse rice is being cultivated on large scale as compared to Basmati. During 2020-21, the rice crop was sown on 3335 thousand hectares of land, almost 9.9% higher than the area under cultivation during the previous year. Pakistan witnessed a record production of 8.419 million tonnes showing 13.6% of production growth during 2020-21 (Government of Pakistan, 2021). Punjab and Sindh provinces are major rice cultivating provinces in Pakistan accounting for 56 and 39% of total rice production, respectively (Government of Pakistan, 2013). The area, production and yield of the rice crop for the last five years is tabulated in Table 1.

Despite escalated production growth of rice in Pakistan, the current average yield of rice is recorded as 2.88 tons per hectare instead of the potential average yield of 5.20 tons per hectare. This indicates a yield gap of almost 45% between obtained and potential yield. The current

yield of the rice crop is also 61% lower than the yield being obtained around the world (Aslam et al., 2016). There are several reasons behind the low yield of rice in Pakistan. According to Briscoe and Qamar. (2009), growing rice in Pakistan has become a serious challenge for food security whereas, on other hand, shrinking water resources and increasing population are some noteworthy challenges. The groundwater is annual falling by 0.3 m per year (Hussain, 2002) and over time due to exhaustive exploitation and utilization of groundwater has decreased by more than 7m (Kahlown *et al.*, 2007). Among other reasons, shortage of technically sound labour, agronomic and socio-economic obstacles the production of rice is lower than the potential (Baloch *et al.*, 2005; Chaudhary *et al.*, 2001; Farooq *et al.*, 2011).

Table 1. Area, production and yield of the rice crop from 2016-2021.

Year	Area		Production		Yield	
	000 Hectare	% Change	000 Tonns	%Change	Kgs/Hec.	%Change
2016-17	2724	-	6849	-	2514	-
2017-18	2901	6.5	7450	8.8	2568	2.1
2018-19	2810	-3.1	7202	-3.3	2563	-0.2
2019-20	3034	8.0	7414	2.9	2444	-4.6
2020-21	3335	9.9	8419	13.6	2524	3.3

Source: Economic Survey of Pakistan 2020-21.

Rice is an important food crop of Pakistan even more than wheat because despite large cultivated area the yield of the wheat crop is considerably lower as compared to other countries such as France, China and the United States (Ozpinar, 2006; Rehman *et al.*, 2015; Rehman *et al.*, 2016; Rehman *et al.*, 2019). Extensive tillage and weeds infestation are regarded as key causes of low yield causing a decline by 50-80%. This extensive tillage was even inadequate to manage weeds (Mohanty *et al.*, 2006). Production of rice is also majorly hit by the weed's infestation. According to Sureshkumar *et al.* (2016) weeds cause, 15-20% yield loss in rice crops and in some cases the damage caused by the weeds were higher than 50%, depending upon the intensity and species of the weeds. Ramzan (2003) have reported 48, 53 and 74% rice yield reduction in transplanted, direct seeded in flood conditions and direct seeded in dry soil, respectively.

Rice farmers use many controls measures to alleviate weeds including chemical, cultural, mechanical and biological control methods. However, chemical control is often preferred by farmers because of its quick results. Ismail and Abdullah (2020) agreed that weeds in rice fields can be alleviated effectively through the use of herbicides, although the chemical-based control does not offer a sustainable solution. Nevertheless, chemical control has become the need of an hour. Chauhan (2012) found that through proper use of herbicides both pre-emergence and post-emergence weeds can be suppressed in the rice field. In another case, improper use of herbicide not only increases the resistance in weeds but also deteriorates the environment and human health (Adhikari *et al.*, 2019). Powles and Yu (2010) arbitrated that the indiscriminate use of herbicides in the rice field is endangering the agroecosystem and hampering the diversity and producing resistance in weeds. The use of a single herbicide many times can surely change the weeds community composition in a very short time (Singh, 2008).

Chemical control is perceived as the most effective, quick and economical way to get rid of weeds. Therefore, the use of herbicides is gaining widespread acceptance among rice growers. In this context, it is dire needs to continuously explore the farmers level of awareness about the weeds and their respective control. Unless the farmers are not equipped with the latest knowledge and imparted with the training, the judicious use of chemicals cannot be ensured to increase rice production.

METHODOLOGY

A cross-sectional survey research design was adopted for this study. When two or more variables are likely to correlate, the cross-sectional research design is regarded as most suitable to determine the results (Setia, 2016). Punjab, the largest province of Pakistan in terms of agriculture was selected as the study area. The Punjab province is famous for its outstanding potential for rice crops along with other major and minor crops.

Punjab province comprises thirty-six districts and, in each district, agriculture is regarded as a prominent source of income for the farm families. This study was conducted in the district of Gujranwala which is graced as the rice-growing area where rice of worth mentioning quality is not only produced but also is exported. The district of Gujranwala lies in eastern Pakistan and the district is ancient and the hub for culture and tourism. The district is also regarded as a hub for trade. Therefore, agriculture in the district is full of potential. The latitude and altitude coordinates of the district are 32.166351, 74.195900. The total area of Gujranwala is 3622Sq Kms and the 5th populous district of Pakistan contains a population of 2.027 million. Half of the population is rural in the districts. Further, the district is subdivided into 5 tehsils (sub-districts) named Gujranwala Saddar, Gujranwala City, Kamoke, Nowshera Virkan and Wazirabad. Each tehsil in the selected district is famous for rice production. Almost all the farmers are engaged in rice farming and the patterns of demography are homogenous in the district. Therefore, considering the time and other resources it was decided to restrict the study to one tehsil which could be a true representative of the entire district. Each tehsil was given an equal chance to be selected. The names of each tehsil were written on pieces of paper and using the blindfolded technique the name of a tehsil was drawn. Nowshera Virkan was the tehsil drawn and to be used in the study as a specified study area.

To select a sample for the study, a list of farmers from selected tehsil was collected from the Assistant Director of Agriculture (Extension) office, Tehsil Nowshera Virkan. The list is comprised of 2450 rice growers. Through random sampling technique, 332 rice growers were selected as respondents at 95% confidence level and 5% confidence interval. The interview schedule was used as the data collection instrument. The interview schedule was prepared in the line with the objectives and pre-tested on 30 rice growers from tehsil Gujranwala Saddar. Data were collected using face to face interview technique. Collected data were analyzed using Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Descriptive statistics were applied to the collected data for meaningful interpretation. These findings are subdivided into four sections (i) demographic profile of respondents (ii) awareness of farmers regarding weeds management (iii) effectiveness of interaction methods used by the extension field staff for information dissemination regarding weeds management and (iv) training need assessment of farmers regarding weeds management.

Demographic profile of respondents

Demographic attributes of the farmers are regarded as important in the process of technology awareness and adoption. The strong demographic profile of farmers may help in making wise decisions with special reference to technology. In this study, demographic attributes such as Age, Education, landholdings size, tenancy, rice farming experience and income sources are explored. The frequency distribution of the demographic attributes is given in Table 1.

Table 1 indicates that more than half of respondents (53%) were aged between 36 and 50 years followed by 23.8% of respondents who were considerably old and fell into the age bracket of more than 50 years. As for as the educational level of the farmers was concerned, 47.9% of respondents were illiterate, who have never attended formal schools. Only 14.5%of respondents had more than ten years of formal schooling. This implies that the educational level in the study was not so impressive and it might have adverse impacts on the awareness among farmers regarding the identification of different weeds and their respective control. More than half (53.6%) of respondents were small farmers bearing land size of fewer than 12.5 acres. Of the total respondents, 38.3% has 12.5-25 and 8.1% of farmers had more than 25 acres of land. Findings accentuate that the small landholders were widely dominant in the study area.

More than half of respondents (55.7%) were owner-cum-tenants in the study area followed by 34.3 and 9.9% owners and tenants, respectively. As for as experience was concerned, 38.3% of farmers were cultivating rice from 6-10 years followed by 32.8 and 28.9% of farmers cultivating rice from 11-15 and 1-5 years, respectively. For less than half (46.7%) of respondents, only rice farming was the major source of income. Whereas, 53.3% of farmers were generating income from multiple sources.

Table 1. Demographic profile of respondents.

Demographic attributes	f	%
Age (in year)		
Up to 35	77	23.2
36-50	176	53.0
above 50	79	23.8
Education (in year)		
Illiterate (0)	159	47.9
Up to primary (1-5)	46	13.9
Primary-middle (6-8)	41	12.3
Middle-matriculation (9-10)	38	11.4
Above matriculation (10+)	48	14.5
Land size (acres)		
Up to 12.5 acres	178	53.6
12.5-25	127	38.3
More than 25	27	8.1
Tenancy		
Owner	114	34.3
Owner-cum-tenant	185	55.7
Tenant	33	9.9
Rice farming experience (in years)		
1 to 5 years	96	28.9
6 to 10 years	127	38.3
11 to 15 years or more	109	32.8
Income sources		
Rice Farming only	155	46.7
Multiple sources	177	53.3

Awareness of farmers regarding weed management

In this section, farmers were asked to report their awareness about the different weeds of the rice crop. Farmers were informed with the scientific and local names of the weeds for their ease and they responded yes in case of awareness and no in case of unawareness. Farmers were also asked to explore the awareness regarding pre-emergence and post-emergence control of weeds by applying different weedicides effective for broad lead and narrow leaf weeds. The distribution of obtained responses is given in Table 2.

Table 2 shows the level of awareness among farmers regarding rice weeds and their management. All of the respondents (100%) were aware of the weeds such as Della, Swanki, Narro and Didan. However, 43.8 and 40.4% of respondents were familiar with the weeds such as Gowain and Bhoain, respectively. Regarding pre-emergence weeds management, 87.7% of farmers were aware of the use of weedicides like Machati, Topstar, Topclore, Rifat @800ml/acre to control broadleaf weeds. Of the total respondents, 73.2% of respondents were well aware of the use of weedicides like Sweadal, Petral, Raizer, Sunstar @400ml/acre to control narrow leaf weeds. In the context of post-emergence weed management, 69.6% of farmers reported their awareness of the use of weedicides like Clover@80g+80ml/acre to control broadleaf weeds. For narrow leaf weeds, 63.9% of respondents' reporter their awareness regarding the use of Winsta, Bingo@100g/acre. The results affirm that farmers had adequate awareness about the identification of weeds and this extended awareness could be attributed to their rice farming experience and fieldwork conducted by public and private sector extension field staff (EFS). In a recent study, Usman *et al.* (2021b) have reported that the farming experience of the farmers was statistically significantly associated with the awareness regarding weeds and adoption of recommended weed management techniques. Timely dissemination of the much-needed information for the farmers regarding weeds and their management by the extension field staff was one of the key driving forces. This timely dissemination of information had a significant role not in weed management but also in fostering the adoption of recommended techniques (Cartmell *et al.*, 2004). Considering the important role of extension field staff,

Usman *et al.* (2021a) stressed that extension field staff should diversify their working strategy for upscaling the technical knowledge of farmers regarding weeds and their prompt control.

Table 2. Awareness among farmers about recommended weed management techniques.

Recommended weed management technologies			Awareness	
			Yes	
	Scientific Name	Local Name	f	%
Weeds	Cyperus rotundas	Della	332	100
	Echinochloacolona	Sawanki	332	100
	Paspalumdistichum	Narro	332	100
	Echinochloa crus-galli	Didan	332	100
	Cyperusdifformis	Gowain	145	43.8
	Cyperusiria	Bhoian	134	40.4
Pre-emergence weed Management	For Broad-leaved weeds Machati, Topstar, Topclore, Rifat @800ml/acre		291	87.7
	For Narrow-leaved weeds Sweadal, Petral, Raizer, Sunstar @400ml/acre		243	73.2
Post-emergence weed Management	For Broad leaved weeds Clover@80g+80ml/acre		231	69.6
	For Narrow-leaved weeds Winsta, Bingo@100g/acre		212	63.9

Information dissemination methods used by extension field staff (EFS)

Extension field staff is regarded as one of the important information sources for the farmers to enrich them with the required information. EFS use different methods to create awareness among farmers such as demonstration, farm visits, farmer days, helplines, signboards, literature distribution and use of social media, electronic media. Thus, farmers were asked to explore that to what extent the use of different techniques appeared effective for them. The response was generated on a 5-point Likert scale i.e., 1: very low extent, 2: low extent, 3: medium, 4: high extent, 5: great extent. The mean and standard deviation of the collected data were calculated and rank order was given from higher to lower mean values. The mean, standard deviation and rank order of the data is given in Table 3.

Table 3. Effectiveness of information dissemination Methods as used by the extension field staff.

Training methods	Mean	Rank Order
Demonstrations	3.01±1.21	1
Farm visits	2.89±1.28	2
Farmers' days	2.65±1.48	3
Helplines	2.31±1.19	4
Sign boards/burgies	2.16±0.83	5
Literature distribution	2.01±0.99	6
Social media gadgets	1.95±0.96	7
Electronic media (Radio, TV)	1.70±0.72	8

Table 3 indicates that demonstration was the prominent technique perceived as more effective by the farmers ($\bar{x}$=3.01) although the level of effectiveness was exactly medium on a five-point Likert scale. Farmers appreciated the demonstration plots managed by the extension field staff. These plots and the activities performed to control the weeds fostered the level of awareness among farmers regarding the identification of weeds and their management. Findings are almost similar to those of Azumah *et al.* (2018) as they found that demonstration was the most effective technique of technology sharing as perceived by the rice farmers in Ghana. In another study, Ashraf *et al.* (2018) found that demonstration was often used by the EFS and farmers in Pakistan perceived it more effective. Findings are further endorsed with those of Khan *et al.* (2009) as they concluded that the demonstration technique was not only effective in creating awareness among farmers but also pushed them to adopt the recommended production practices.

Farm visits and Farmer's days were ranked 2nd and 3rd in terms of effectiveness with the mean values of 2.89 and 2.65, respectively. The effectiveness was rated less than medium level. These techniques such as farm visits and farmers days were more important for the interaction and information sharing and allowing farmers to physically observe the weeds in the field. Though, the perceived effectiveness is considerably lower. Use of

helplines, signboards/burgies, literature distribution also showed almost low-level effectiveness pointing to great concern over the use of these techniques by the extension field staff. Social media is revolutionizing agriculture and even the technology transfer process, however, in this study use of social media gadgets appeared least effective followed by the use of electronic media such as TV and radio. Azumah *et al.* (2018) found the same findings that the use of social media and electronic media gadgets was significantly lower while communicating information to rice farmers.

Training need assessment of farmers regarding weed management

In this section, farmers training needs with special reference to weeds and their management is calculated. For the collection of data 5-point Likert scale viz 1: very low extent, 2: low extent, 3: medium, 4: high extent, 5: great extent was used. The mean values of the collected data were collected, which was regarded as the possessed level of knowledge of the farmers. To calculate the training need, possessed mean values of each aspect were subtracted from 5 and the outcome mean value was termed as a training need. The data in this regard are mentioned in Table 4.

Table 4. Training Needs Assessment (TNA) of farmers related to Weed Management.

Aspects	Mean	Rank Order
Chemical control	3.20±1.61	1
Identification of rice weeds	3.17±1.40	2
Mechanical control	2.88±0.64	3
Cultural and ecological control	2.86±1.59	4
Biological control	2.85±0.74	5

Table 4 indicates that in terms of training need, chemical control, identification of weeds, mechanical control, cultural control and biological control were the key areas ranked 1st to 5th. Farmers had maximum training need regarding chemical control of weeds ($\bar{x}$=3.20). Rice farmers perceived chemical control of weeds as more effective, hence knowing the right chemical and application technique is much needed for the farmers. It has been reported that due to inappropriate use of chemicals and unawareness of the chemicals the weeds control was not up to the mark. Mubushar *et al.* (2019) arbitrated that inappropriate application of pesticides was common among the farmers in Punjab, Pakistan and the reason behind was unawareness and non-adoption of recommendations. In another study, Bakhtawer and Afsheen (2021) found that the overwhelming majority (93%) of farmers were unaware of the mode of action of pesticides and had poor understating levels regarding the use of pesticides. Consequently, they were applying pesticides abundantly. This unsafe and undue use of chemicals was developing resistance in the insects, pests and weeds. Jallow *et al.* (2017) also found that farmers level of awareness regarding pesticides use was insufficient. Most of the farmers were not able to understand the composition of pesticides and were also failed to follow the instructions give on the pesticides label.

Identification of rice weeds was the 2nd ranked area, that farmers need to be trained. The training need regarding the identification of rice weeds was of medium level ($\bar{x}$=3.17). Farmers had limited awareness to identify the rice weeds, as the findings of the current study are accentuated in Table 2. The areas such as mechanical control, cultural and ecological control and biological control reflected a training need of less than medium level. Somehow, farmers must be trained on all relevant aspects to enable them to identify the weeds and apply proper control to get rid of weeds infestation in a rice field.

CONCLUSION AND RECOMMENDATIONS

This study aimed to assess the training needs of rice farmers regarding weeds management. Rice farmers awareness regarding weeds and their management and effectiveness of different information dissemination methods as employed by the Extension field staff were also assessed.

In order of importance, we conclude that farmers had adequate awareness about the identification of weeds and this extended awareness was attributed to the working of extension field staff (EFS). The demonstration was the most effective technique for information sharing whereas the use of helplines, signboards/burgies, literature distribution showed low-level effectiveness pointing to great concern over the use of these techniques by the extension field staff. The use of social media and electronic media gadgets appeared least effective. In terms of training need, chemical control and identification of rice weeds were prominent areas that are required to be bridged through training. The areas such as mechanical control, cultural and

ecological control and biological control reflected a training need of less than medium level. Somehow, farmers must be trained on all relevant aspects to enable them to identify the weeds and apply proper control to get rid of weeds infestation in a rice field. It is therefore obligatory that the agricultural policies of the Agriculture Department, Punjab should be aimed at empowering the rice farmers technically, to train them through both conventional approaches (i.e., demonstration plots) and technology-led approaches (i.e., Information Communication Technologies (ICTs), social media and electronic media).

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