Pak. J. Agri. Sci., Vol. 58 (2), 731-738; 2021
ISSN (Print) 0552-9034, ISSN (Online) 2076-0906
DOI:10.21162/PAKJAS/21.1101
http://www.pakjas.com.pk

ROLE OF RADIO COMMUNICATION AND ADOPTION OF MODERN AGRICULTURAL TECHNOLOGY: A STUDY OF FARMERS IN DISTRICT JHANG, PUNJAB-PAKISTAN

Muzaffar Hussain Salik[1], Farooq Tanwir[1,*], Abdul Saboor[2], Muhammad Babar Akram[3], Farkhanda Anjum[1], Mubashir Mehdi[1], Ijaz Ashraf [1], Manzoor Ahmad Naazer[3], Muhammad Suleman[1], Muhammad Latif [4], Muhammad Sarfaraz Ahmad[5], Sumaira Yasmin[6] and Kanwal Asghar[1]

[1]University of Agriculture, Faisalabad, [2]PMAS-Arid Agriculture University, Rawalpindi. [3]International Islamic University, Islamabad, [4]llama Iqbal Open University, Islamabad, [5]Bank Alflah Faisalabad,[6]Government Degree College(W), Sahianwala Faisalabad Punjab-Pakistan
***Corresponding author's e-mail: farooqtanwir@gmail.com**

This research study was aimed to examine the role of radio communication in the adoption of modern agricultural technology among the farmers of district Jhang. Presently 33 governments owned public radio channels along with 57 FM Radio Transmitters while 240 private FM Radio channels (180 commercials and 60 non-commercials) are working in Pakistan. The study statement has been proved through empirical evidence as, "more the farmers will listen radio agri. programs, more they will adopt latest information and modern agricultural technology". This research was conducted among the farming community of district Jhang, which is a historical territory and agricultural hub of Punjab province and moreover mostly public and private radio channels are being listened there. The study provides a deep insight about land holding of farmers and it is proved that most of the farmers hold up to 12.5 acres' land (small scale farmers). It was noted that mostly farmers were illiterate while around one-fourth were matriculate. Less than a half of the farmers were listening agricultural radio programs regularly. Majority of the farmers reported that radio communication is helpful "to some extent" about the information for the preparation of soil, crop varieties, suitable fertilizers, sowing time and improved inputs (regarding drip irrigation, tunnel farming and hydroponic agriculture etc.). However mostly farmers adopted these technologies. Majority (67.3%) farmers told that information related to agriculture provided by the radio programs is helpful to increase the agricultural production and they were satisfied with the information disseminated by radio communication. It was found that there is a positive relationship between listening of broadcasted agricultural radio programs and awareness of agri. machinery and equipment. More duration of using radio resulted in the higher use of water management techniques. A positive relationship was observed between satisfaction with the dissemination of information through radio communication and increase in the agricultural production. It is also recommended that agricultural extension programs broadcasted by radio channels should be related to the actual needs of the farmers with the special focus to aware the farmers for the adoption of latest techniques and agricultural technologies having greater potential of production like as hydroponic agriculture, tunnel farming and drip irrigation etc.
Keywords: Agricultural technology, radio communication, latest information, adoption, farming community.

INTRODUCTION

Pakistan is an agro-based country as agriculture is the largest sector of our economy. Contribution of agriculture in GDP is up to 18.5 % and its share in employment is 38.5% of the total labor force. The growth of agriculture remained slow due to non-adoption of modern technology, least control on crop diseases and weather conditions (Wilson and Tisdell, 2001; Cooper and Dobson, 2007; Damalas, 2009; Damalas and Eleftherohorinos, 2011; Govt. of Pakistan, 2013; Mahmood *et.al*., 2016; Govt. of Pakistan, 2018; Tarar *et.al*., 2019; Government of Pakistan, 2019). In spite of the importance of agriculture sector, the growth of this sector remains slow. Therefore, it is the basic need of the farmers to adopt new methods and technologies at their farms to increase actual output. In this context, mass media can play a vital role by educating the farmers (Ponniah *et.al*., 2008; Anaeto *et.al.*, 2012; Adekunle, 2013; Hashmi *et al.*, 2016, Tarar *et.al.*, 2017). Mohy-ud-Din (2011) and Tarar *et.al.*, (2017) states that agricultural extension workers play an important role for extension at the small farms through providing useful information to the farmers, but the mass media has its own importance. Mass media especially radio holds a high position as compared to extension workers due to its wide coverage. Mass media stimulates farmers about new information and then farmers consult to their peer, extension workers and

friends to get more detailed information (Behrens, 1984; Ponniah *et.al*., 2008). It can be concluded from the above-mentioned facts that agriculture is an important and the largest sector of our economy. In fact, farming has a key role in the overall economy of the country and agriculture sector is very important indicator for the development of the economy. Routine growth rate in agricultural production has not been increased with the current growth rate of the population of Pakistan. Therefore, we have to spend a large share of our foreign exchange to import agricultural products to meet the requirements of our rapidly increasing population. Development of agriculture is not satisfactory due to a number of factors i.e. less knowledge about the main agricultural implements, small land holdings, traditional farming practices, continuous adoption of varieties having low yield potential and improper plant production measures. Productivity in agriculture needs special attention as rapidly growing population has to be fed and this can only be done by increasing food supplies. Equilibrium between means of subsistence and population can be made by increasing per ace agricultural production. In addition to the factors of natural growth depends upon the efficient use of key inputs like as improved water management techniques and internationally proved technologies having greater potential of production (e.g. hydroponic agriculture, tunnel farming and drip irrigation etc.).A variety of sources for dissemination of the output of agricultural research and information among the farmers are in practice internationally e.g. agriculture extension department, personal contacts, neighbors, and friends, mass media (Radio and T.V.) (Ponniah *et.al*., 2008; Anaeto *et.al.*, 2012; Adekunle, 2013; Hashmi *et.al.*, 2016, Tarar *et.al.*, 2017). The cost of educating farmers through mass media is low as compared to extension workers (Oakley, 1985; Adekunle, 2013) but one time feedback cannot be generalized through mass media (Muhammad, 2006). In mass media mechanisms TV, newspapers, research publications and Radio communication have important role in the diffusion of farming related information (Muhammad, 2006; Ponniah *et al*., 2008; Anaeto *et.al.*, 2012; Adekunle, 2013; Hashmi *et.al.*, 2016, Tarar *et.al.*, 2017; Tarar *et.al.*, 2019). Radio is a basic tool for communication among rural area population (FAO, 2001).To achieve the success in the programs of agricultural development in developing countries depends upon the nature and level of using media channels to mobilize the people for development and it is proved that radio communication technologies are the most important source for the dissemination of technical, scientific and agricultural information to the farming community (Murty & Albino, 2012). According to Hussain, (1997) radio and TV are the most efficient means of communication. In consonance to this Mohammad *et.al.,* (2012) stated that the strong areas of agriculture information are livestock sector and major crops in electronic media (both in Radio and TV) broadcasts and regarding all aspects like interest, effectiveness, usefulness, and practicability "Khait Khait Haryali" program of Lahore Radio is at the top and is followed by agri. Program "Sandhal Dharti" of Faisalabad Radio. The present study was limited to evaluate only the role of the radio in the adoption of modern agricultural technologies as radio is more powerful instrument for dissemination of fast information due to its vast coverage in local areas. In Pakistan, there was monopoly of radio till 2002. Government of Pakistan (during General Musharraf regime) opened opportunities for private investors for innovation and entrepreneurial activities and in 2002 a new body namely PEMRA was set up to control satellite TV, cable networks, and radio channels (Government of Pakistan, Annual Plan 2019-20, P-73,). PEMRA was established to reduce the monopoly of privately owned radios and through PEMRA government issued license to private radio channels known as FM or Local radios. This action initially emerged into 40 FM radio channels but now the figure is in hundreds. Presently 240 FM Radio licenses have been issued (180 channels are commercial while others are noncommercial), government owned radio channel are 33 along with 57 (FM-93, FM-94 and FM-101) transmitters (Government of Pakistan, Annual Plan 2019-20, P-120). Government has provided special funds for the expansion/strengthening of the services of Pakistan Broadcasting Corporation (the official body responsible to run the affairs of public radio channels). Abbas *et.al*., (2003), stated that in central Punjab most of the farmers are exposed through Radio and Television. Radio is proved as a strapping tool for dissemination of agricultural information (Chapman *et.al.,* 2003: Nakabugu, 2001). The role of Radio communication technology is important in the dissemination of information for agriculture development especially for the use of pesticides and weathers conditions among the farming community (Weiss *et.al.*, 2000).

In Pakistan local radio channels are dominating in rural areas and seen as a tool of information exchange. This research study was aimed to examine the local radio communication/programs in term of agricultural farm extension. In developing countries radio is a major medium of mass communication for transmitting certain kind of information as discussed above. This medium is very much useful in the process of development. Among the broadcast media radio has special importance because it is able to help in the developmental process by establishing mobility and change, widening horizons, by raising the general levels of aspirations to focus attention on agricultural development issues. This media is also useful for involving the farmers in the national goals and policies of agriculture. In the countries like Pakistan where there is a need to speed up the low level of the flow of agricultural information, the use of radio communication is considered very effective, if it is used with careful planning.

The present research study was designed to find the relationship between the adoption patterns of latest

information regarding modern agriculture technology and the role of radio communication on the farmer's agro-economic and social conditions of the farming community of district Jhang. Furthermore, the adoption of radio communication in agriculture as a source of information will be helpful to discover the socio-economic characteristics of the farmers. The objectives for the research were, to ascertain the socio-economic status of the farmers of the selected research area and to identify the role of radio communication for creating awareness to adopt the modern agricultural technologies by the farmers along with knowing the relationship between the adoption patterns of the radio communication and its impact on the farmers socio-economic status

MATERIALS AND METHOD

This research study was conducted among the farming community of district Jhang, which is a historical territory and agricultural hub of Punjab province. The rural areas of the district Jhang are highly well known for agriculture especially for vegetables, fruits & major crops (i.e. wheat, cotton, sugarcane etc.). This study was an attempt to know the role of radio communication in the adoption of modern agricultural technology among the farming community. The major objective of the study was to explore the attitude of the farmers towards the radio programs in the adoption of modern agricultural technologies. The study of the whole universe in research territory was expensive and time consuming, so for the convenience only four villages (Chak No. 489, 490, 491 & 492) were selected as universe of the study. A multistage design was employed. Through a preliminary survey of each village, a separate list of farmers was prepared, then from every prepared list, the farmers who were Radio users were separated and at the end, 38 respondents were chosen randomly. In this way, 150 respondents were selected for interviewing from the selected villages. An interview schedule was developed to collect data according to the research objectives. The questionnaire used included a combination of both closed and open ended questions. The tool was appropriately pretested in order to maximize its validity and reliability.

RESULTS AND DISCUSSION

Presented data in the Table 1 show that major portion of the selected farmers were illiterate (36%), married (85.3), lived in joint family system (56.7%), and were in the age group of 51 years and above (46.6%). Majority respondents were small farmers (67.3%) and 75.3% of the respondents were owner-cum-cultivators. This table further indicates that 44.6% of the respondents (selected farmers) had annual income up to Rs.50000 while 19.4% of the farmers had annual income above Rs.75000. It is evident from the above data that majority respondents are illiterate (i.e., 36%), while 14% were primary, 15.3% were middle, 26.7% were matriculate, 5.3% were intermediate and only 2.7% were graduate and master's degree holders. Table 1 also indicated that majority farmers were owner cum-cultivator (i.e., 75.3%), while 16% were owner cum tenants and only 8.7% were tenants. When we see landholding size, the small farmers were at the top (i.e., 67.3%), medium farmers were at no.2 with 28% ratio and only 4.7% of the respondents were large farmers and having land holding more than 25 acres' land.

Table 1. Socio-economic/demographic characteristics of the respondents (n=150)

Socio-economic & demographic, characteristics	Categories	Frequency	%
Age	Up to 40	21	14.1
	41-50	59	39.3
	51 and above	70	46.6
	Total	150	100.0
Marital status	Married	128	85.3
	Unmarried	009	6.0
	Widowed	13	8.7
	Total	150	100.0
Family type	Joint	85	56.7
	Nuclear	65	43.3
	Total	150	100.0
Educational level	Illiterate	54	36.0
	Primary	21	14.0
	Middle	23	15.3
	SSC (Matric)	40	26.7
	HSSC(F.A./F.Sc)	8	5.3
	Graduate/Master	4	2.7
	Total	150	100.0
Tenancy status	Owner-cum-cultivator	113	75.3
	Tenant	13	8.7
	Owner-cum-tenant	24	16.0
	Total	150	100.0
land holding size	Large (above 25 acres)	07	04.7
	Medium (12.5-25)	42	28.0
	Small (up to 12.5)	101	67.3
	Total	150	100.0
Annual income (PKR)	Up to 25000	11	07.3
	25001-50000	67	44.6
	50001-75000	43	28.7
	75001 and above	29	19.4
	Total	150	100.0

Table 2 throws light on classification of the respondents (selected farmers) according to the duration for which they had been using the radio. Majority farmers (64%) were using radio for five to ten years, 24.7% of the respondents were listening radio for more than 10 years and only 11.3% were listener less than or up to 5 years.Table 2 also illustrates that 98.7 respondents (farmers) have opinion that radio presents agricultural programs, majority respondents (76.7%) have viewpoint that mostly radio agricultural programs were of explanatory type. This table also depicts that 47.3% selected

farmers were listening radio regularly while others (52.7%) were listening it occasionally.

Table 2. Respondents distribution with regard to the radio communication (agricultural program, types of programs and regularity in listening).

Activities	Frequency (f)	Percentage %
Duration of radio using (in Years)		
Up to 5 years	17	11.3
5.1 to 10 years	96	64.0
10.1 and above	37	24.7
Total	150	100.0
Agri. Programs		
No	002	01.3
Yes	148	98.7
Total	150	100.0
Regularity of Programs		
Regularly	071	47.3
Occasionally	079	52.7
Total	150	100.0
Type of Program		
Explanatory	115	76.7
Documentary	003	02.0
Both	030	20.0
No of Agri. Programs	002	01.3
Total	150	100.0

Table 3 is clear-cut indication that majority (61.3%) of the selected farmers got awareness "to much extent" in the preparation of soil while 28.7% got awareness "to some extent" for the same purpose. 80.7% selected farmers adopted new ways in soil preparation "to much extent" on the basis of the impacts of radio communication. Only 8.7% farmers did not use radio information for the soil preparation.

It is evident from Table 3 that majority farmers got awareness in the selection of crop verities through Radio Communication but 7.3% of the farmers did not use radio communication in the adoption of this agricultural technology Table 3 throws light on the classification of the selected farmers with regard to their awareness for the administration of suitable fertilizer through radio, according to data 29.4% of the farmers were aware of "to some extent" and majority. (65.3%) respondents were aware of "to much extent". Table 6 reveals that the administration of suitable fertilizer as an agricultural technology was adopted by 32 percent of the respondents out of total through radio. A majority of the respondent 63.3% adopted "to much extent" for the administration of suitable fertilizer as an agricultural technology. The same technology was not adopted by 4.7% respondents only.

Table 3 shows that majority of the farmers (64.7%) got awareness "to some extent" for the use of water management techniques through radio, 26.6% were aware of "to much extent". Only 8.7% of the respondents out of total replied in "not at all".

Table 3. Respondents distribution with regard to their awareness and adoption for the selection of various farm activities (soil preparation, suitable crop varieties, fertilizer etc.) through radio communication.

Extent of Awareness & Adoption for the:	Awareness		Adoption	
	F	%	F	%
Soil preparation through Radio communication				
To much extent	092	61.3	121	80.6
To some extent	043	28.7	016	10.7
Not at all	015	10.0	013	08.7
Total	150	100.0	150	100.0
Selection of suitable crop varieties				
To much extent	103	68.7	116	77.3
To some extent	038	26.3	023	15.4
Not at all	009	05.0	011	07.3
Total	150	100.0	150	100.0
Selection of suitable crop varieties				
To much extent	98	65.3	98	65.3
To some extent	44	29.4	44	29.4
Not at all	8	5.3	8	5.3
Total	150	100.0	150	100.0
Use of water management techniques through radio communication				
To much extent	40	26.6	21	14.0
To some extent	97	64.7	123	82.0
Not at all	13	8.7	6	04.0
Total	150	100.0	150	100.0
Cultivation time through radio communication				
To much extent	128	85.3	139	92.7
To some extent	016	10.7	004	02.7
`Not at all	006	04.0	007	04.6
Total	150	100.0	150	100.0
Plant protection measures through radio communication				
To much extent	52	34.7	29	19.3
To some extent	89	59.3	112	74.7
Not at all	9	6.0	9	6.0
Total	150	100.0	150	100.0
Agricultural equipment and machinery through radio communication.				
To some extent	103	68.7	135	90.0
To much extent	038	25.3	004	02.7
Not at all	009	06.0	011	07.3
Total	150	100	150	100.0
Improved implements (drip irrigation, tunnel farming and hydroponic agriculture) through radio communication				
To some extent	074	49.3	124	82.7
To much extent	060	40.0	015	10.0
Not at all	016	10.7	011	07.3
Total	150	100	150	100
About animal nutrition through radio communication				
To some extent	079	52.6	096	64.0
To much extent	056	37.3	036	24.0
Not at all	015	10.1	018	12.0
Total	150	100.0	150	100.0
About pesticides through radio communication				
To some extent	039	26.0	038	25.4
To much extent	097	64.7	101	67.3
Not at all	014	09.3	011	07.3
Total	150	100.0	150	100.0
Farmer's opinion, "has the radio communication been helpful to increase agricultural production?"			Farmers' satisfaction about the information of agricultural technology diffused by radio communication	
To some extent	16	10.7	85	56.7
To much extent	101	67.3	29	19.3
Not at all	33	22.0	36	24.0
Total	150	100.0	150	100.0

Table 7 depicts that water management techniques have been used "to some extent" by the majority of the respondents i.e. 82% and the same techniques were used "to much extent" by the 14% of the selected farmers. Only 4% of the respondents did not adopt this technique.

Data in Table 3 is the classification about the level of awareness which the respondents perceived through radio communication. According to data, 10.7 % of the farmers were aware of "to some extent" and majority of the respondents 85.3% were aware of "to much extent" for the cultivation time. Only 4 percent of the respondents did not perceive awareness through radio for the same technology. Above table identified that majority (92.7%) of the respondents had adopted cultivation time "to much extent" as an agricultural technology through radio, while this technology was adopted "to some extent" by the 2.7% of the farmers only. This technology was not adopted by the 4.6 % of the total respondents.

Table 3 reflects that 59.3% of the selected farmers got awareness "to some extent" for the plant protection measures through radio communication, 34.7% of the respondents obtained awareness "to much extent" and only 6 % out of total selected farmers did not obtain awareness for this technology. It is clear from the above table a major portion (74.7%) of the farmers used plant protection measures "to some extent", 19.3% adopted "to much extent" and only 6% of the selected farmers did not make use of the plant protection measures as an agricultural technology through radio communication.

Data presented in Table 3 is evident that most of the farmers (68.7%) got awareness "to some extent" and 25.3% of the selected farmers were aware of "to much extent" for the agricultural equipment and machinery through radio. Only 6% of the respondents did not get awareness through radio communication. According to the data of the above table: Major portion (90 %) of the farmers used agricultural equipment and machinery "to some extent" through radio communication and 2.7% farmers used the above mentioned technology "to much extent", 7.3% replies that they did not use radio communication to adopt the agricultural equipment and machinery.

It is evident from the Table 3 that nearly one half (49.3%) of the respondents got awareness "to some extent" for the improved implements (regarding drip irrigation, tunnel farming and hydroponic agriculture) through radio, 40% of the selected farmers were aware of "to much extent" and 10.7% of the farmers did not get awareness for improved implements as an agricultural technology. It is also identified by this table that a majority (82.7%) of the farmers used the improved implements "to some extent", while 10 percent out of the total selected farmers used this technology "to much extent" and 7.3% of the respondents did not use the improved implements.

Results of above-mentioned Table 3 illustrates that 52.6% of the selected farmers out of total obtained awareness "to some extent", for the animal nutrition through radio, 37.3 percent were aware of "to much extent" for the same technology. Only 10.1 percent of the farmers did not get awareness through radio. As mentioned in the table 12 that 64% of the farmers have been used animal nutrition "to some extent" as an agricultural technology, 24% of the respondents (farmers) adopted "to much extent" and 12% did not adopt the same technology.

Table3 depicts the percentages of the selected farmers with regard to their awareness and adoption of pesticides through radio communication. It is evident from the table 26% farmers were aware of "to some extent" for the proper use of pesticides, 64.7% were well aware of "to much extent" and 9.3% of the farmers did not get awareness for the use of pesticides through radio communication. As is evident from the data in table pesticides as an agricultural technology was adopted "to some extent" by the one fourth (25.4%) of the respondents. It was also adopted "to much extent" by the 67.3% of the farmers, while 7.3% did not adopt the above technology through radio communication.

Data in the Table 3 describe the classification of the selected farmers with regard to their opinion that "to what extent" radio helped them to increase their agricultural production. It is clear from the data that 10.7% of the farmers were in favor of the opinion that radio programs had contributed "to much extent" for increasing agricultural production, 67.3% of the farmers were in the favor that radio had helped "to some extent" to increase agricultural production, while 22% of the selected farmers replied that radio did not help them to increase their agricultural production.

Data presented in above Table 3 indicate that 56.67% of the selected farmers were found satisfactory "to some extent" about the information of agricultural technology diffused by the radio, while 19.33% were satisfied "to much extent" and 24% out of the total selected farmers were not satisfied about the information of agricultural technology diffused by the radio.

BI-VARIATE ANALYSIS

HYPOTHESIS TESTED IN THE CURRENT RESEARCH:

Hypothesis No 1 Farmer who will be regular radio listener will get more awareness about modern agricultural technology

Hypothesis No 2 More duration of listening radio by farmers, more will be adoption of modern agricultural technology

Sub Hypothesis No 2 (a) More duration of listening radio by farmers, more will be the adoption of suitable fertilizer.

Sub Hypothesis No 2(b) More duration of listening radio by farmers, more will be adoption of water management techniques.

Hypothesis No 3 More will be the age of the farmers, more will be adoption of improved implements

Hypothesis No 4 More satisfied farmers with the information diffused by radio more will be increase in the agri. Production.

Table 4. Association between listening, Using of Radio Programs; and Awareness & Adoption of various Agri. Technology and inputs

Hypothesis 1. Farmer who will be regular radio listener will get more awareness about modern agricultural technology

Association between the listening of radio programs by the respondents and awareness of agricultural equipment and machinery

Listening of programs	**Awareness of Agri. Machinery and Equipment** Chi-square = 5.837 (Significant), df = 2, γ = 0.367			
	To some extent - f/(%)	To much extent - f/(%)	Not at all - f/(%)	Total - f/(%)
Regularly	42 (40.78)	24 (63.16)	5 (55.56)	71 (43.3)
Occasionally	61 (59.22)	14 36.84)	4 (44.4)	79 (52.7)
Total	103 (68.67)	38 (25.33)	9 (6.0)	150 (100.0)

Hypothesis 2. More duration of listening radio by farmers, more will be adoption of modern agricultural technology

(a) Association between the duration of listening radio by the respondents and adoption of the suitable fertilizer

Duration of using radio	**Adoption of suitable fertilizer** Chi-square = 5.078 (Non-significant), df = 2, γ = 0.395			
	To some extent - f/(%)	To much extent - f/(%)	Not at all - f/(%)	Total - f/(%)
Up to 10 years	38 (34.23)	67 (60.36)	6 (5.42)	111 (74.0)
Above 10 years	7 (17.95)	27 (69.23)	5 (12.82)	39 (26.0)
Total	45 (30.0)	94 (62.67)	11 (7.33)	150 (100.0)

Hypothesis 2. More duration of listening radio by farmers, more will be adoption of modern agricultural technology

(b) Association between the listening radio communication duration by the farmers and the adoption of water management techniques

Duration of using radio	**Adoption of water management techniques** Chi-square = 8.237 (Significant), df = 2, γ = 0.498			
	To some extent - f/(%)	To much extent - f/(%)	Not at all - f/(%)	Total - f/(%)
Up to 10 years	94 (84.68)	12 (10.81)	5 (4.57)	111 (74.0)
Above10 years	25 (64.10)	8 (20.51)	6 (12.29)	39 (26.0)
Total	119 (79.33)	20 (13.33)	11 (7.34)	150 (100.0)

Hypothesis 3: More will be the age of the farmers, more will be adoption of improved implements

Association between the age of the farmers and the adoption of improved implements

Age (years)	**Adoption of improved implements** Chi-square = 4.189 (Non-significant) df = 4, γ = 2.34			
	To some extent - f/(%)	To much extent - f/(%)	Not at all - f/(%)	Total - f/(%)
Less than 45	14 (33.3)	24 (57.2)	4 (9.5)	42 (28.0)
45-55	16 (25.0)	43 (67.20)	5 (7.8)	64 (42.67)
Above 55	7 (5.91)	31 (70.45)	6 (13.64)	44 (29.33)
Total	37 (24.67)	98 (65.33)	15 (10.00)	150 (100.0)

Hypothesis 4: More satisfied farmers with the information diffused by radio more will be increase in the agri. Production.

Association between the respondent satisfactions with the information diffused by radio and increase in the agricultural production

Satisfaction with information by radio	**Increase in agricultural production** Chi-square = 77.219 (Highly significant), df = 2, γ = 0.641			
	To some extent - f/(%)	To much extent - f/(%)	Not at all - f/(%)	Total - f/(%)
Yes	16 14.00	93 (81.60)	5 (4.40)	114 (76.00)
No	06 (16.67)	5 (13.89)	25 (69.44)	36 (24.00)
Total	22 (14.67)	98 (65.33)	30 (20.00)	150 (100.0)

Association between the listening of radio programs and awareness of agricultural equipment and machinery:

Hypothesis 1."Farmer who will be regular radio listener will get more awareness about modern agri. Technology".

The data regarding listening of Radio & Awareness about modern agricultural technologies in the Table 4 is evident that 40.78% of the farmers who listened the radio programs regularly got awareness about the agricultural machinery and equipment "to some extent", 63.16% of the farmers got awareness "to much extent" and 55.56% did not adopt the same technology. Similarly, 59.22%, 36.84% and 44.44% of the respondents (selected farmers) who listened the programs occasionally had got awareness about the agricultural machinery and equipment. The computed chi-square value 6.83 when compared with the table value was found to be significant. The positive value of gamma shows that most of the regular listener gets awareness "to some extent".

Therefore, the Hypothesis, "Farmer who will be regular radio listener will get more awareness about modern agricultural technology" is accepted.

***Association between the duration of listening radio and adoption of the suitable fertilizer*:** Data in Table4 indicates that the calculated value of chi-square is found to be non-significant at 0.05 level of table value, so there is no association between the duration of using radio and the adoption of the suitable fertilizer. It is evident from the above

table that 34.23% and 17.95% of the farmers (using the radio up to 10 years and above) who had adopted suitable fertilizer "to some extent" as an agricultural technology, while 60.63% of the respondents (selected farmers) were using radio up to 10 years and 69.23% were using above 10 years, who adopted the suitable fertilizer "to much extent". Similarly, 5.42% of the farmers up to 10 years, 12.82% of the farmers above 10 years used the radio but did not adopt the above technology. Therefore, the relationship is found non-significant.

Hence the sub-Hypothesis (2-a), "More duration of listening radio by farmers, more will be the adoption of suitable fertilizer" is rejected.

***Association between the listening radio communication duration and the adoption of water management techniques*:** Hypothesis2 (b). "More duration of listening radio by farmers, more will be adoption of water management techniques". Table 4 explains the significance of the relationship between the duration of using or listening of radio and the adoption of water management techniques. The calculated chi-square value is greater than the table value when it is seen at 0.05 percent significance level. However, percentages were also calculated to observe the trend of association between the two variables. The gamma value is 0.498 shows positive relationship between the said two variables. Hence sub-hypothesis, "More duration of listening radio by farmers, more will be adoption of water management techniques" is accepted. Thus Hypothesis2 "More duration of listening radio by farmers, more will be adoption of modern agricultural technology "is partially accepted on the basis of the results presented in the Table 4

***Association between the age of the farmers and the adoption of improved implements*:**

Hypothesis 3. "More will be the age of the farmers more will be adoption of improved implements"

As mentioned in the Table 4, selected farmers less than 45 years were found 28% out of total, among these respondents 33.3% adopted the improved implements "to some extent", 57.2% adopted "to much extent" and 9.5% did not adopt. The farmers between ages 45-55 were found 42.67%; between these categories 25% of the respondents adopted "to some extent", 67.20% adopted "to much extent" and 7.8% did not adopt the same technology. Above 55 years old, 29.33% of the respondents were found, in this age group 15.91% adopted the improved implements "to some extent", 70.45% adopted "to much extent" and 13.64% did not adopt. The calculated value of chi-square when compared to the table value, the association between the variable is non-significant.

Hence Hypothesis 3, "More will be the age of the farmers more will be adoption of improved implements" is rejected.

***Association between satisfactions with the information diffused by radio and increase in the agricultural production*:** Hypothesis 4. "More satisfied farmers with the information diffused by radio more will be increase in the agricultural Production," Table 23 reveals the highly association between the satisfaction with the information diffused by the radio and increase in the agricultural production. Data in the above table shows that 76 % of the farmers out of the total selected farmers were found to be satisfied in which 14% had reported that information diffused by radio has helped them "to much extent" to increase the agricultural production., 81.6% were found in favor of "to some extent" and 4.40% of the respondent were in favor of not at all. Only 24% out of the total respondents had the opinion in negative. The value of gamma is also positive. The calculated vale of chi-square was greater than tabulated value, which shows that there is a strong association between the satisfaction with information diffused by the radio communication and increase in the agricultural production. Hence Hypothesis 4, "More satisfied farmers with the information diffused by radio more will be increase in the agricultural Production" is accepted. The result proves "if more farmers listen radio agricultural programs more, they adopt new innovations in their farms and extension occurs in their farms"

***Conclusion and recommendation*:** It can be concluded that most of the farmers reported that radio broadcasted programs on the preparation of soil, crop varieties, suitable fertilizers, sowing time, and improved inputs (regarding drip irrigation, tunnel farming and hydroponic agriculture etc.) "to some extent". However mostly farmers adopted these technologies. Majority farmers told that information related to agriculture provided by the radio communication was helpful to increase in agricultural production and they were satisfied with the information. It was found that there is a positive relationship between the listening of agriculture radio programs and awareness of agri. Machinery & equipment like as duration of using radio with the use of water management techniques. It was also observed a positive connection between the satisfaction with information by radio communication and increase in agricultural production.

Following suggestions are being presented to improve the impact of radio communication / broadcasted agricultural programs to adopt the modern agricultural technologies and latest information. (1). Time duration for agricultural programs should be increased so that every aspect of agriculture can be elaborated comprehensively. (2). Use of local languages will be fruitful in the agricultural programs. (3). A special agricultural radio channel should be launched on national level. (4) The agricultural queries and problems consulted by the farmers through their letters should be entertained by the experts every week. (5). The topic of the speech and names of the speakers should be mentioned one day prior to the broadcasting. (6). Extension programs of the radio should always be related to the actual needs of the farmers and with the special focus to aware the farmers for the adoption of latest techniques and agricultural technologies

having greater potential of production like as hydroponic agriculture, tunnel farming and drip irrigation etc.

REFRENCES

Abbas, M., A.D. Sheikh, S. Muhammad and M. Ashfaq. 2003. Role of electronic media in the adoption of agricultural technologies by farmers in the central Punjab, Pakistan. Int. J. Agri. Biol.5:22-5.

Adekunle, O.O.2013. Analysis of Effectiveness of Agricultural Extension Service in among Rural Women: Case study of Odeda Local Government, Ogun State, Nigeria. J. Agri. Sci.5:65-71.

Anaeto, F.C., C. C. Asiabaka, F. N. Nnadi, J. O. Ajaero, O. O. Aja, F.O. Ugwoke, M. U. Ukpongson, and A. E. Onweagba. 2012. The role of extension officers and extension services in the development of agriculture in Nigeria. J. Agri. Res.1:180-185.

Behrens, J.H. and J.F. Evans. 1984. Using mass media for extension teaching. In: Swanson, B.E. (ed.), Agricultural Extension: A Reference Manual, pp. 144-155.

Chapman, R., R. Blench, G. Kranjac-Berisavljevic,and A.B.T Zakariah. 2003. Rural radio in agriculture extension: The example of vernacular radio programs on soil and water conservation in N.Ghana. Agricultural Research and Extension Network(AgREN). Network Paper No. 127.

Cooper, J. and H. Dobson. 2007. The benefits of pesticides to mankind and the environment. Crop Prot. 26:1337-1348

Damalas, C.A. 2009. Understanding benefits and risk of pesticide use. Sci. Res. Essays. 4:945-949.

Damalas, C.A and I.G. Eleftherohorinos. 2011. Pesticide exposure, safety issues and risk assessment indicators. Int. J. Environ. Rese. Public Health. 8:1402-1419.

FAO. 2001. Knowledge and information for food security in Africa from traditional media to the Internet. Communication for Development Group, Sustainable Development Department. Rome: FAO.

Govt. of Pakistan. 2013. Pakistan economic survey 2012-2013. Ministry of Finance, Islamabad.

Govt. of Pakistan. 2018. Pakistan Economic Survey 2017-18; Population, labor force and employment. Ministry of Finance, Government of Pakistan. Available online at http://www.finance.gov.pk/survey_1718.html

Govt. of Pakistan. 2019. Economic Survey of Pakistan 2018-19. Ministry of Finance, Government of Pakistan, Islamabad.

Govt. of Pakistan. 2019. Annual Plan 2019-20, Planning Commission, Ministry of Planning Development & Reforms, Government of Pakistan, Islamabad. pp.73 - 120.

Hashmi, M.S. 2016. Agrochemical and Agricultural Sustainability: A case study of Pakistan. JEAS. 9:1-9.

Hussain, M. 1997. Mass media. In: Memon, R.A. and E. Basir (eds.), Extension Methods. Pp: 208–61. National Book Foundation, Islamabad–Pakistan.

Mahmood, I., S.R. Imadi, K. Shazadi, A. Gul and K.R. Hakeem. 2016. Effects of pesticides on environment. Plant.3:253-367

Muhammad, S., T. E. Lodhi and G.A. Khan. 2012. In-depth analysis of electronic media to enhance their role in agricultural technology transferred in Punjab. Pakistan. Pak. J. Agri. Sci. 49:221-22

Mohy-ud-Din and H. Badar.2011. Marketing of agricultural products in Pakistan: Theory and practice. Pp. 83-85.

Muhammad, S. 2006. Agricultural Extension: Strategies and Skills. Unitech Communications, Faisalabad–Pakistan

Murty and Albino. 2012. Electronic media in rural agricultural business- A promotional injection. National monthly refereed Journal of Research in Science &Technology. 1: 63-68.

Nakabugu, S, B. 2001. The Role of Rural Radio in Agricultural and Rural Development Translating Agricultural Research Information into Messages for Farm Audiences. Programme of the Workshop in Uganda, 19 February 2001.

Oakley, P & C. Garforth. 1985. Guide to Extension Training. FAO, Rome Italy.

Ponniah, A., R. Puskur, S. Workhen and D. Hoekstra. 2008. Concepts and practices in agricultural extension in developing countries: A report published by Improving Productivity and Market Success (IPMS) of Ethiopian farmer Project International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia.

Tarar, M.A., M.I Arshad, N.Akhtar, M.B.Akram, A. Munir, S. Akhtar, Z. Batool, S. Siddique, Y.N. Khan, N.K. Mahsud, M. H. Salik, M. Ali and M. A. Iqbal. 2017. A sociological study about the need of agricultural extension services for rural women in Tehsil Dera Ghazi Khan-Pakistan. Transylvanian Review. 25:4728-4736.

Tarar, M.A., Y.N. Khan, M.Z. Ullah, M.H. Salik, S. Akhtar and T. Sultan. 2019. Knowledge and attitude; Pregnancy and antenatal care among young agrarian & non-agrarian females in Faisalabad District, Pakistan. Pak. J. Agri. Sci. 56:261-273.

Tarar, M.A, M.H.Salik, M.Riaz, A.S.Alvi, A.H.Tarar, K.Mushtaq, S.Akhtar and T.Sultan .2019a. Effects of Pesticides On Male Farmer's Health: A Study of Muzaffar Garh. Pak. J. Agri. Sci.56:1021-1030.

Weiss, A., Van Crowder, L. and Bernardi, M. 2000. Communicating agro meteorological information to farming communities. Agricultural and forest Meteorologyl.103:185-196.

Wilson, C and C. Tisdell. 2001. Why farmers continue to use pesticides despite environmental, health and sustainability costs. Ecological Econ. 39:449-462.

[Received 10 Sep 2020; Accepted 12 Feb 2021; Published (online) 18 April 2021]