



RESEARCH PAPER

OPEN ACCESS

Strengthening the agriculture domain in central plain valley of Khyber Pakhtunkhwa by public and private agriculture extension system

Shahzad Malik*, Ayesha Khan

Department of Agricultural Extension Education and Communication, Faculty of Rural Social Sciences, The University of Agriculture, Peshawar, Pakistan

Key words: Capacity Building; Public and Private Extension; Strengthening; Agriculture; IPM.

<http://dx.doi.org/10.12692/ijb/15.5.173-181>

Article published on November 15, 2019

Abstract

The instant study was conducted in central plain valley of Khyber Pakhtunkhwa to evaluate the strengthening of agriculture domain through capacity building of farmers by public and private agriculture extension sectors. Three districts namely Peshawar, Mardan and Charsada were selected purposively. Single tehsil was purposively selected from each district i.e. Town-4, Takhtbhai and tehsil Charsada respectively. Sample size for the present study was 270 respondents i.e. 90 from each tehsil. Data were collected from respondents through well-structured interview schedule. Simple percentages and frequencies were calculated whereas, paired t-test was applied to compare gap between capacity building of farmers by both aforementioned sectors. It was found that the respondents praised private sector in capacity building regarding farm management (59.2%), selection of varieties (54.4%), selection of fertilizers (56.3%) and harvesting techniques (57.4%) whereas the public sector performed best in capacity building of farmers regarding IWM (58.5%), IPM (64.8%) and orchard layout (62.2%). There was highly significant ($p \leq 0.01$) difference among public and private services regarding capacity building of farmers in terms of farm management, improve marketing skills, harvesting techniques, organic farming, IPM, seed rates and orchard layout. Overall there was a big gap in the strengthening of agriculture domain by public sector extension and private sector extension through capacity building of farmers. It is suggested that both extension sector must work on joint venture basis and should hold joint extension activities in order to strengthen the agriculture domain for the betterment of farming community.

*Corresponding Author: Shahzad Malik ✉ shahzadmalikz@gmail.com

Introduction

Agriculture is one of the most important divisions of a country's economy. History of monetary development of most of the developed nations of the world or those which have set out on the path of development, it is "agriculture" that has made the foundation of the prosperity of other sectors and economy as well (Pretty, 2008). Therefore agriculture is considered the backbone of economy of most of the nations including Pakistan. This is an establish fact that over the years, agriculture has contributed significantly, throughout a precious amount of foreign exchange to the national exchequer. Agriculture sector performs a very important role in Pakistan's economy. It is the second largest sector which contributes 18.9% of country's economy (GoP, 2017-18).

International studies demonstrated that smallholder and poorer farmers could make a noteworthy contribution to national economic growth if they received opportunities to become more gainful. Agricultural extension can play a crucial role in disseminating technological packages that are environment friendly, conserving natural resource base and also enhancing quality production. However, sustainable agriculture is not only the domain of agriculture extension and research, other considerations like appropriate policy, environment, farmers' awareness, knowledge and active role of other beneficiaries of agriculture can significantly influence sustainability (Kumbhar *et al.*, 2012).

Public and private agricultural extension play a major role in the capacity building of rural people. Their mandate is to facilitate farmer learning and decision making regarding changes to farming systems including trying out of new technology and overcoming problems such as food security, poverty reduction, environmental management and marketing of products. On the other side various private enterprises are also extending their services which include, but not limited i.e. seed distributing agents, pesticide dealers, fertilizer dealers and other crop management equipment dealers etc. The mixture of public and private extension activities

which survives in most countries and their affiliations with adjacent communities, organizations and institutions can also contribute positively (Heemskerk and Davis, 2012).

Extension professionals working frequently provide numerous services like capacity building, trainings in various sectors, income generation activities, marketing skills and education through extension teaching methods. In order to produce benefits in accordance with a positive objective such as increased production, better use of the inputs, access to an exact type and quality of output for domestic and export, extension agents must provide platform to clientele. It is evident that various research studies have been conducted on the said topic but comprehensive apprehensions of the farmers could not be identified. It is dreadful need to take steps to eradicate the weaknesses and threats should be changed into opportunities in system (Ali *et al.*, 2009). Hilderbrand said, capacity is the mean or the ability, to fulfill a task or meet an objective effectively. It is therefore dire need of the time, that agriculture extension services are designed in new prototype with the light of rural socioeconomic characteristics of growers, accessible qualified and skilled human resources (Khushk and Memon, 2004; Khan, 2006). Therefore, the present study was designed to highlight the performance of public sector and private sector in strengthening the agriculture domain through capacity building of farmers with the objectives: 1) to probe in to the capacity building of the farming community in various agriculture practices by public and private extension systems from farmer's perspective; 2) to find out the gap/difference among public and private agriculture extension systems regarding capacity building of farming community.

Material and methods

The present study was carried out in the central plain valley zone of Khyber Pakhtunkhwa province, Pakistan. Descriptive research design was used due to the fact that, this type of design is considered most appropriate for obtaining people's perception on

socio-economic facts. This design describes the characteristics or behavior of a particular population in a systematic and accurate fashion. For selection of respondents' multistage sampling technique was used. A sample is called multistage when sampling is passed out in diverse stages, using smaller and smaller units at each phase. Out of four agro ecological zones central plain valley (agro-ecological zone-C) was selected purposively because this region is highly fertile and rich agriculture zone. Public and private extension services agents mostly focus on this zone in Khyber Pakhtunkhwa province. In second stage from the selected agro-ecological zone i.e. central plain valley, three districts were purposively selected viz. Peshawar, Mardan and Charsada. In the third stage single tehsil was selected each from the selected districts i.e. town-4 was selected from Peshawar district whereas tehsil Takht Bhai and tehsil Charsada was selected from district Mardan and Charsada respectively. Total of 270 respondents were selected for the present study (Eq. 1). The sample size was determined on the basis of guesses variability i.e. 50% for maximum sample size as suggested by Kasely and Kumar (1989). Through equal allocation, 90 respondents were selected from each tehsil. Furthermore, for selection of farmers; convenience sampling technique was utilized. Data were collected only from those who fulfilled the inclusion criteria i.e. those farmers who got benefited from both public and private extension services along with 5 years of farming experience were considered as respondents of the present study so that better in depth investigations may be made.

$$n = Z^2 V^2 / D^2 \quad (1)$$

The aforesaid terms can be explained in such a way

n = Total size of the sample

D = Estimate acceptable margin (6%)

Z = Error of the confidence level limit or normal variation (95 %) and constant for this value is 1.96

V = 50% is because similar studies were difficult to find and taking the assumption that 50% of the farmers had taken the services both from private and public extension sector

$$n = (1.96)^2 \times (50)^2 / (6)^2 = 267 \text{ almost } 270$$

Data was collected through well-structured interview schedule which was comprised of open ended, close ended and partially open ended questions. Five point Likert Scale was also used (1= very low, 2= low, 3= uncertain, 4= high and 5= very high (Likert, 1932; Ajayi and Gunn, 2009). Data was analyzed using SPSS (ver. 20). Simple percentages and frequencies were calculated whereas to find the difference among the capacity building by public and private agriculture extension systems paired t-test (Eq. 2) was utilized (Park, 2009).

Whereas:

$\bar{d} = \Sigma d / n$ is the mean of d-values, where

n/d = difference between observations public and private extension services

$$S_d = \frac{\sqrt{\Sigma(d-d)^2}}{n-1} \quad (2)$$

n = number of pairs

Results and Discussion

Capacity building by extension services

Capacity building in extension is considered a series of learning steps which comprises training and other modules for the augmentation of potential capabilities and improvement of skills of individuals involved in farming activities. It includes trainings and all other forms of learning that improve information, knowledge and competencies (skills) of individuals (Gordon and Chadwick, 2007).

Information distribution, training, facilitation and monitoring are the main tools for development of capacities. Training is often used as the main capacity building method for agricultural extension in developing countries. Capacity building helps in building linkages between farmers and stakeholders involved in helping farmers. Results in Table 1 revealed that about 37.1% respondents reported capacity building in farm management by public extension staff, while 56% respondents denied capacity building for farm management by public sector. Similarly, 59.2% respondents agreed that

private extension services build their capacity regarding farm management. Agriculture Extension services also provides information to facilitate farmers in marketing knowledge and try to build their capacity accordingly. Out of the total sample, 58.5%

respondents stated their improvement of marketing skills by public extension staff, while for the public extension sector only 33.3% of the total respondents' capacity building in marketing skills.

Table 1. Farmers' perception regarding capacity building in various fields.

Capacity building	Public sector farmers' perception in capacity building					Total
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	
Farm management	52(19.3)	99(36.7)	19(7.0)	59(21.9)	41(15.2)	270
Improve marketing skills	40(14.8)	50(18.5)	22(8.1)	78(28.9)	80(29.6)	270
Selection of varieties	38(14.1)	83(30.7)	25(9.3)	78(28.9)	46(17.0)	270
Selection of fertilizer	50(18.5)	69(25.6)	22(8.1)	86(31.9)	43(15.9)	270
Harvesting techniques	61(22.6)	83(30.7)	18(6.7)	69(25.6)	39(14.4)	270
Organic farming	40(14.8)	49(18.1)	25(9.3)	102(37.8)	54(20.0)	270
food processing	50(18.5)	51(18.9)	26(9.6)	90(33.3)	53(19.6)	270
Integrated water management	57(21.1)	34(12.6)	21(7.8)	70(25.9)	88(32.6)	270
Integrated pest management (IPM)	36(13.3)	38(14.1)	21(7.8)	92(34.1)	83(30.7)	270
Seed rate ratio	55(20.4)	84(31.1)	19(7.0)	62(23.0)	50(18.5)	270
Time of sowing	52(19.3)	90 (33.3)	18(6.7)	64(23.7)	46(17.0)	270
Orchard layout	37(13.7)	41(15.2)	24(8.9)	93(34.4)	75(27.8)	270
Private sector farmers' perception regarding in capacity building						
Farm management	40(14.8)	47(17.4)	23(8.5)	87(32.2)	73(27.0)	270
Improve marketing skills	53(19.6)	108(40.0)	18(6.7)	57(21.1)	34(12.6)	270
Selection of varieties	35(13.0)	68(25.2)	20(7.4)	60(22.2)	87(32.2)	270
Selection of fertilizer	52(19.3)	41(15.2)	25(9.3)	97(35.9)	55(20.4)	270
Harvesting techniques	33(12.2)	66(24.4)	16(5.9)	74(27.4)	81(30.0)	270
Organic farming	61(22.6)	89(33.0)	31(11.5)	50(18.5)	39(14.4)	270
food processing	42(15.6)	107(39.6)	18(6.7)	53(19.6)	50(18.5)	270
Integrated water management	76(28.1)	71(26.3)	20(7.4)	64(23.7)	39(14.4)	270
Integrated pest management (IPM)	49(18.1)	110(40.7)	23(8.5)	55(20.4)	35(12.2)	270
Seed rate ratio	40(14.8)	53(19.6)	21(7.8)	85(31.5)	71(26.3)	270
Time of sowing	51(18.9)	55(20.4)	21(7.8)	89(33.0)	54(20.0)	270
Orchard layout	50(18.5)	109(40.4)	19(7.0)	57(21.1)	35(13.0)	270

Source: Field Data, 2017-18 (figures in parenthesis are percentages).

Our results are in contrast with that of (Lodhi *et al.*, 2006) who reported that only 28% respondents reported capacity building of marketing skill by public extension sector. Most of the farmers in our country use old varieties and are not aware of modern

practices in farming and high yielding varieties. Extension services are involved in capacity building of farmers providing information regarding innovative agricultural practices and selection of high yielding varieties. Results in Table 1 depicts that about 45.9%

respondents confirmed capacity building by public extension services in proper selection of varieties, while 44.8% respondents negated capacity building by public sector. Similarly, 54.4% respondents had capacity building by private extension services, while 38.2% respondents did not receive capacity building

regarding selection of varieties by private extension services. Our results are in close agreement with that of Singh and Narain (2008) who reported that private extension services provided information to farmers and build their capacities about new seed varieties.

Table 2. Paired t-test of capacity building shared by public and private extension systems.

Capacity building by Public vs Private sector	Public mean	Private mean	Mean difference	t-value
Farm management	2.77	3.39	-0.622	-4.11**
Improve marketing skills	3.40	2.67	0.730	5.01**
Selection of varieties	3.04	3.36	-0.315	-2.04*
Good selection of fertilizer	3.01	3.23	-0.219	-1.40 ^{ns}
Harvesting techniques	2.79	3.39	-0.600	-3.80**
Organic farming	3.30	2.69	0.607	4.34**
Food processing	3.17	2.86	0.307	2.60*
Integrated crop management	3.35	3.38	0.037	-0.20 ^{ns}
Integrated pest management	3.55	2.68	0.870	6.19**
Seed rate ratio	2.88	3.35	-0.467	-3.06**
Time of sowing	2.86	3.15	-0.289	-1.88 ^{ns}
Orchard layout	3.47	2.70	0.778	5.56**

Whereas * & ** Indicates significance at 5% and 1% level of probability, respectively.

Proper amount of fertilizer play an important role to enhance crop yield. During informal discussion with the respondents it was found that the farmers in the study area frequently apply high amount of nitrogen with small quantity of phosphorous which might have adverse effect on soil fertility resulting in low production. It should be according to soil condition and its pH value, to overcome this ignorance of the farming community. About 47.8% respondents confirmed capacity building regarding the proper selection of fertilizer by public extension staff, while 44.1% respondents negated the capacity building about proper selection of fertilizer by public extension staff. Likewise, 56.3% respondents reported that private sector build their capacity in proper selection of fertilizer as against 34.5% respondents in the study area. Harvesting is the last practice after completion of crop growth. It needs proper technique and know-how but most of the farmers lack awareness and they use old practices to harvest the crop and thus faces loss to their good portion of produce. The data

showed that 40% respondents confirmed the capacity building in harvesting techniques by public extension staff, while 53.3% respondents denied the capacity building of farmers in the said technique by public extension staff. Likewise, 57.4% respondents agreed the capacity building of farmers in harvesting by private extension services, while 36.6% respondents had no capacity building in harvesting techniques by private extension services.

Organic farming is used for crops and livestock production in which minimum use of pesticide application is encouraged to avoid health hazards due to toxicity of chemicals used in pesticides. Similarly, less application of fertilizers and more use of organic products like Farm Yard Manure etc. The data showed that 57.8% of the respondents had received capacity building in organic farming by public extension staff where for the private sector only 32.9% respondents reported that their capacity was built in organic farming by private extension sector.

Respondents of the study area also revealed during informal discussion that our crops profit sometime even not cover the cost of production due to fluctuation in the market, this is known as glut season in technical terminology. To avoid this type of scenario public and private extension sectors arrange capacity building sessions for the end-users to cope with situation like this and techniques are been taught to the end users like the food processing and value addition so that better profit can be obtained

from the crop. The overall data revealed that 52.9% respondents confirmed the capacity building in food processing by public extension staff whereas for the private sector only 38.1% of the total respondents reported the capacity building in food processing. Ours results are also been supported by the results of Umeh *et al.* (2018) who reported that public extension agents used field demonstrations to train farmers in food processing techniques.

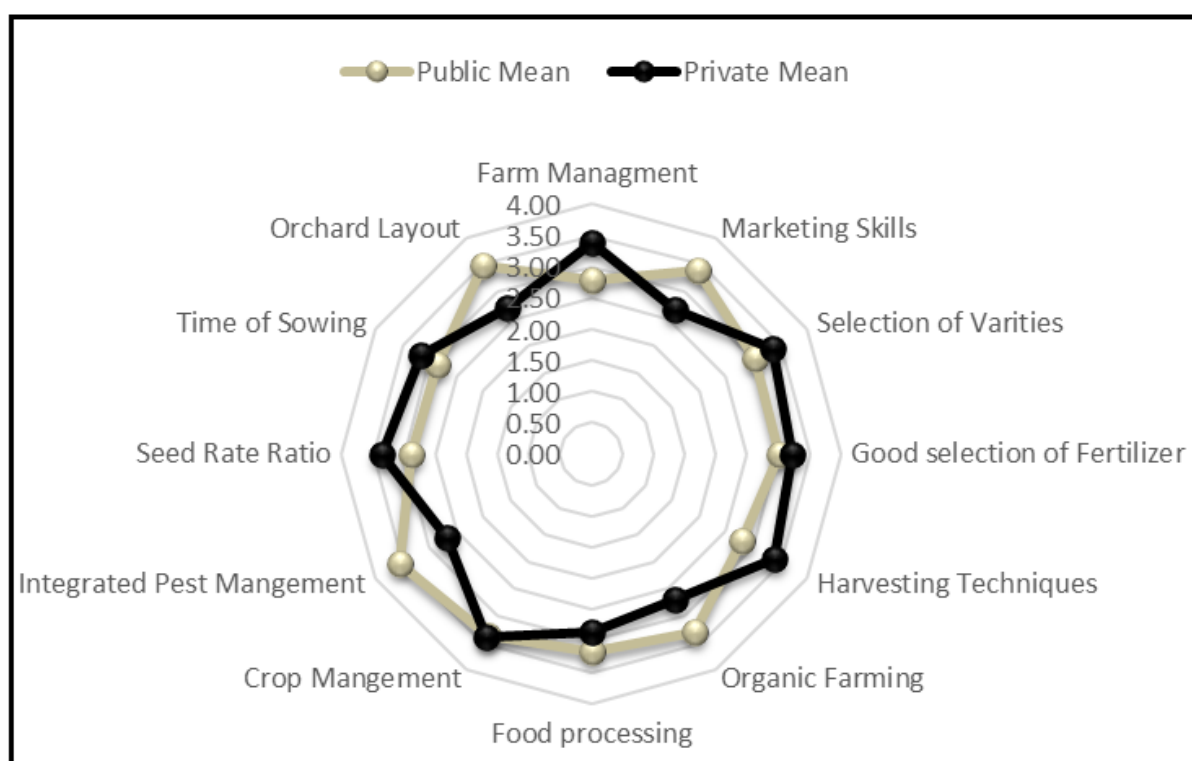


Fig. 1. Capacity building by public and private extension services.

Water management is very important for any crop. Most of the farmers have medium knowledge regarding proper use of water for higher crop yield, while some farmers have no knowledge in this regard. Extension services provide capacity building sessions to farmers about water management practices and perception of farmers is explained in Table 1. A total of 58.5% respondents mentioned the capacity building in water management by public extension staff, while 33.7% respondents negated the statement. Likewise, 38.1% respondents reported the capacity building in water management by private extension services, while 54.4% respondents were not pleased with capacity building sessions in water management

by private extension services. Ali *et al.* (2011) suggested that private sector should provide information to farmers about water management. Integrated pest management (IPM) is a method to control crop diseases mostly with biological control instead of chemical application. Its process needs proper knowledge about its implementation; however, most farmers do not know about how to deal with this environment friendly activity. Chemical application is not the sole solution to control diseases and pest attack to improve crop yield. The data in Table 1 showed that 64.8% respondents confirmed their capacity building in integrated pest management by public extension staff, while 27.4%

respondents denied the statement. Similarly, 32.6% respondents reported that we get benefitted from the capacity building session in IPM by private extension services, while 58.8% respondents disagreed. The data showed that public extension services mostly provided the capacity building in integrated pest management, while on the other hand private sector mostly focus on chemical control against pest, insect, and other viral or fungal diseases. These results are in contrast with that of Ali *et al.* (2011) who stated that 90% of the farmers got IPM knowledge from private extension workers. Similarly, utilization of proper seed rate is a common practice in agriculture which needs sufficient knowledge for increased crop production. Data revealed that 41.5% respondents reported in favor of capacity building in seed rate by public extension staff, while 51.5% respondents denied the statement. Similarly, 57.8% respondents confirmed the capacity building in seed rate by private extension services, while 34.4% respondents had no capacity building in seed rate by private extension services. Bahalkani (2013) also reported that farmers adopted the recommended practices of seed rate and insects control measures during capacity building sessions.

Accurate time of sowing may increase the productivity of any crop. Most of the farmers' use their parental timetable for sowing crop, while change in climate has done abrupt changes in time of sowing of different crops. Cabbage, wheat, cucumber and other vegetable and cereal crops timing has been changed in the last few years. Some farmer uses this technique to capture early market for maximum profit. The data of time of sowing in Table 1 showed that 40.7% respondent's capacity has been built by public extension staff, while 52.6% respondents told that no such type of sessions had been arranged by public sector. In addition, 53% respondents reported their capacity building by private extension services in proper sowing time, whereas 39.3% respondents had no capacity building in proper time of sowing by private extension services. Similarly, to establish a proper orchard, plant to plant distance, row to row distance and every other pre requisite requirement

should be in line to take optimum produce. Orchard layout is very technical job and only experts in the said field can do it accordingly. Therefore to train and build the capacity of farmers in this regard is also essential. The data revealed that 62.2% respondents confirmed the capacity building in orchard layout by public extension staff, while 28.9% respondents had no capacity building in orchard layout by public extension staff. Likewise, 34.1% respondents had the capacity building in orchard layout by private extension services, while 58.9% respondents reported no capacity building in orchard layout by private extension services.

Paired t-test for capacity building by public and private extension services.

In order to find out the difference among public and private sector paired t-test was applied and results are presented in Table 2. Results depicts that there was highly significant ($p \leq 0.01$) difference among public and private services regarding capacity building of farmers in terms of farm management, improve marketing skills, harvesting techniques, organic farming, integrated pest management, seed rate and orchard layout. Furthermore, significant ($p \leq 0.05$) difference was observed regarding selection of varieties and food processing whereas in the rest of variables non-significant difference was observed. The performance of private sector in capacity building was found better in most of the variables however in case of improve marketing skills, organic farming, orchard layout and integrated pest management the performance of the public sector extension system was better (Table 2, Fig. 1).

Conclusion

From the present study, it is concluded that the capacity building of farmers by public extension sector in respect of strengthening agriculture was quite better than the public sector. Private sector capacity building was found better in most of the variables however in case of those variables which were not profit based for the public sector the performance of the public sector extension was better

i.e. improving marketing skills, organic farming, orchard layout and integrated pest management. In the field of orchard layout and IPM, the better performance of the public extension sector might be due to the fact that they have their own nurseries and trained staff, while on the other hand private sector mostly focus on protection measures.

Overall there was a big gap in the performance of the public sector extension and private sector extension in capacity building which might also be due to the fact that the private companies etc. are quite in high numbers in comparison to the staff of the public sector thus they have high opportunity to reach maximum number of farmers and offered their services. Thus were in the better position to strengthen agriculture domain. It is suggested that both the public and private sector extension sector must work on joint venture basis and should holds joint extension activities for the betterment of farming community.

References

- Ajayi OJ, Gunn EE.** 2009. The role of communication in dissemination of improved agricultural technology in Bosso Local Government Area of Niger, Nigeria. *Journal of Agriculture Extension* **13(1)**, 66-72.
- Ali S, Ahmad M, Ahmad T.** 2011. Strengths and weaknesses of various information delivery methods used by private agricultural extension system in the Punjab, Pakistan. *Journal of Agriculture Research*, **49(2)**, 15-21.
- Ali S, Ahmad M, Ali T, Muhamad IZ.** 2009. Analysis of competencies possessed by field staff of private agricultural extension system in Punjab. *Pakistan Journal of Agriculture Research* **47(1)**, 101-106.
- Bahalkani NA.** 2013. Study on the diffusion and adoption of production practices of hybrid rice in Taluka Tangwani, District Kashmore, and Sindh. Master of Science. Thesis, Agriculture Extension, Sindh Agriculture University Tandojam Sindh, Pakistan.
- Gordon J, Chadwick K.** 2007. Impact assessment of capacity building and training: assessment framework and two case studies. *Australian Center for international Agriculture Research* **44**, 1-117.
- Government of Pakistan.** 2017-18. Pakistan economic survey, Ministry of Finance, Economic Advisor's Wing, Finance Division, Islamabad, Pakistan.
- Heemskerck W, Davis K.** 2012. Pluralistic extension systems. In World Bank (ed.), *agricultural innovation systems. An investment sourcebook*. World Bank, Washington DC, 194-203.
- Kasely DJ, Kumar K.** 1989. The collection, analysis and use of monitoring and evaluation data. The World Bank, International Fund for Agriculture Development, Food and Agriculture Organization, London, John Hophkins University Press.
- Khushk AM, Memon A.** 2004. Increasing wheat yield. *The Daily DAWN. Economic and Business Review*, 5 April.
- Kumbhar MI, Sheikh SA, Mughal S, Channa MJ.** 2012. Perception of the extension agents regarding information sources of sustainable agriculture in Sindh province of Pakistan *Journal of Basic and Applied Sciences* **8**, 334-338.
- Lodhi TE, Luqman M, Khan GA.** 2006. Perceived effectiveness of public sector extension under decentralized agricultural extension system in the Punjab, Pakistan. *Journal of Agriculture and Social Sciences* **23**, 195-200.
- Park HM.** 2009. Comparing group means: T-tests and one-way ANOVA using STATA, SAS, R and SPSS. Working Paper. The University Information Technology Services, Centre for Statistical and Mathematical Computing, Indiana University, United States of America.

Pretty J. 2008. Agricultural sustainability: concepts, principles and evidence. Philosophical transactions of the Royal Society of London. Biological Sciences **363**, **1491**, 447-465.

Singh AK, Narain S. 2008. Effectiveness of public and private extension system in delivering services. Indian Research Journal of Extension Education **8**, **2-3**, 29-31.

Umeh OJ, Aghale DN, Anyim A. 2018. Assessment of influence of extension teaching methods on the level of adoption of agricultural innovation in Akwa-Ibom State, Nigeria. International Journal of Advance Research and Botany **4**, **1**, 1-6.