EFFECT OF AGRICULTURAL INNOVATION ON MAIZE FARMING IN PAKISTAN

[1*]Fartosh Kashmiri & [2]Ozge Basra

[1,2]Department of Agriculture, Bacha Khan University

*Corresponding author's e-mail: fartoshkashmir33@gmail.com

ABSTRACT

Background: Maize is the third biggest produce in Pakistan. However, the majority of maize smallholder farmers, who account for over 75 % of national production, have limited participation in the access and use of maize technologies; which are important pre-requisites in increasing maize yields. Furthermore, many smallholders also have limited access to supportive services such as credit, technical and market information. It is also noteworthy that many smallholders are alienated from crucial stakeholders along the maize value chain.

Research Methodology: The study was conducted on two sites, namely Punjab and Khyber Pakhton Khan (KPK) which together make up close to 97% of all the maize produced in Pakistan. Through a combination of random and purposive sampling, 147 households were sampled in total. The research design used followed a descriptive research design. Quantitative data was collected using questionnaires consisting of closed questions. Data analysis was done using Statistical Package for Social Sciences (SPSS) version 23 software. Linear regression and correlation analysis was performed in order to answer the research questions and meet the research objectives.

Findings: The findings indicate that agricultural innovation is responsible for 21.3% (R^2=.213) of total change in Maize farming. An F statistic of 40.321 and reported p value of 0.000<0.05 implies that agricultural innovation is a significant predictor of maize farming production. The results further indicate that agricultural innovation had a positive and significant effect on maize farming (β=.328, P <.000). This implied that an increase in agricultural innovation by one unit would lead to increase in growth of maize farming by 0.328 units.

Recommendations: The study recommends that maize farmers should strengthen aspects relating to agricultural innovation including introduction of new products, implementation of improved farming processes and use of technology in their farming, harvesting, storage and marketing.

Keywords: *Agricultural Innovation, Maize Farming, Technology*

INTRODUCTION

Maize is ranked first in terms of high-yielding crops in the world and is third for the most grown cereal. Close to two-thirds of all maize yields are produced during the Kahrif season. Maize production is preferred in Pakistan because it is the only cereal that can grow during the Kharif season as well as the rabbi season. Khyber Pakhton Khan (KPK) was the source of half of the national corn output till the mid-eighties. At that time corn was grown in the northern parts of the country mainly for human consumption (Parveen, Gul, Khan, Rahim & Rafi, 2021).

This has resulted in the water shortfall for Pakistan's major cash crop 'cotton'. Cotton is a major source of foreign earning, because cotton supplies the Pakistani textile manufacturing industries who are a major exporter of Pakistan's economy (Mikosch, Becker, Schelter, Berger, Usman & Finkbeiner, 2020).The unpredictable and high rainfall has also led to a decline in the yield of Kharif crop. Water stress affects maize yield during fertilization and pollination (Sanaullah, Ali, Fayaz & Khan, 2020).

The Pakistani federal committee set a target for maize crop at 5012 thousand tonnes in 2020 and achieved about 7800 thousand tonnes. Availability of maize seed was established to be at 52.196%, with increased institutional credit raised to Rs 1.350 million. In Baluchistan, six new maize varieties were developed by the agriculture research institute. These new varieties were useful to increase the yield and to enhance the country's food security (Khan, Shehzad, Sameen & Butt, 2018).

On average, the yield of rabbi maize crop in Punjab was 8 tons per hectare, while in KPK, the Kharif crop yield was less than 2 tons per hectare. In the coming years, the corn crop in Pakistan will face a spiral in prices. In addition, contract farming is popular in Pakistan and this system lacks the efficiency of the marketing system. Khan (2019) shows that there is no significant difference between the productivity and income of contract and non-contract farming. The main difference is that in the case of contract farming, transport and input costs are covered by the contracting companies.

STATEMENT OF THE PROBLEM

Despite maize being an important food crop for the majority of households in Pakistan, production has not been at optimal level in recent years especially in the Khyber Pakhton Khan (KPK)

province. It is a key ingredient in the country's feeding system as well as a key part of Pakistan's export commodities (Harris, Rashid, Miraj, Arif & Shah, 2007). This trend is a major source of concern for policy makers and the country's food and economic security as a whole. Furthermore, given that a majority of the population in the two provinces relies on agriculture as a source of livelihood, this trend is an impediment towards realizing the developmental goals of poverty reduction and food security (Grote, Fasse, Nguyen & Erenstein, 2021). The declining performance in the agricultural sector, including the maize sub-sector, is attributed to a number of challenges that are biophysical, institutional, market, infrastructural and policy oriented in nature. These challenges include low adoption of technology, uncoordinated research, erratic weather patterns, inadequate funding among many others (Aryal, Rahut, Sapkota, Khurana & Khatri-Chhetri, 2020).

More than 75% of national production which is mainly from smallholder farmers, have limited participation in the access and use of maize technologies such as fertilizer and improved maize seed varieties, which is an important prerequisite in increasing maize yields. Furthermore, many smallholders also have limited access to interlinked /supportive services such as credit access, technical and market information (Elahi, Abid, Zhang, Ul Haq & Sahito, 2018). As such, maize farmers along with the government of Pakistan seeks to provide value to all stakeholders along the maize value chain in order to improve production as well as the entire maize value chain.

OBJECTIVE OF THE STUDY

The objectives of the study was to establish the effect of agricultural innovation in use of maize technologies among maize farmers in Pakistan.

LITERATURE REVIEW

Brooks and Loevinsohn (2011) noticed that climate change and variability present new challenges for agriculture, in particular for small scale famers in developing countries. As a result, there have been food crises around the world. The study established that by adopting innovation in farming, food security can be enhanced in countries across the world. Gaffney, Challender, Califf and Harden (2019) discussed how science-based solutions can be used to enhance revenue for the industry as well as to advance the agriculture in developing economies. By improving agricultural innovation and increasing access to the benefits that require an alternative ay of operation,

technology can be used to improve the lives of smallholder farmers and to enhance equity for women in agriculture.

Ogunniyi, Oluseyi, Adeyemi, Kabir and Philips (2017) assessed use of these agricultural innovation research interventions impact the livelihood and productivity of small-scale farmers in sub-Saharan African countries with Nigeria used as a case study. The findings of the study established that households that adopted agricultural innovation had enhanced livelihoods, better productivity as well as more diverse portfolios. As such, the study recommends that systems of agricultural innovation should be mainstreamed in programmes of agricultural extension and research.

RESEARCH METHODOLOGY

The target of the study included 147 maize farmers in Pakistan. Descriptive survey strategy was used. Quantitative data was collected using questionnaires consisting of closed questions. Research assistants delivered the questionnaires to the respondents.

RESULTS

This section provides results on the relationship between the independent and dependent variables. The results (Table 1) indicate that Agricultural Innovation [X] had a positive and significant relationship with maize farming Y ($r = .325$, $p = 0.000 < 0.05$). This implies that agricultural innovation and growth of maize farming move in the same direction. As such, an increase in agricultural innovation is accompanied by increase in maize farming. According to Alomia-Hinojosa, Speelman, Thapa, Wei, McDonald, Tittonell and Groot (2018) innovation in agriculture enhances productivity in farming.

Table 1: Correlation Results

	Y	X
Y	1	
X	.352**	1
	.000	

** Correlation is significant at the 0.01 level (2-tailed).

Influence of agricultural innovation on Maize farming in Pakistan

The study sought to determine the influence of agricultural innovation on maize farming in Pakistan. The regression results in Table 2 show that agricultural innovation is responsible for 21.3% ($R2=.213$) of total change in Maize farming. An F statistic of 40.321 and reported p value of $0.000<0.05$ implies that agricultural innovation is a significant predictor of maize farming production. The results further indicate that agricultural innovation had a positive and significant effect on maize farming ($\beta=.328$, $P <.000$). This implied that an increase in agricultural innovation by one unit would lead to increase in growth of maize farming by 0.328 units.

The study findings concurred with those of Ogunniyi, Oluseyi, Adeyemi, Kabir and Philips (2017) who established that agricultural innovation influenced growth of maize farming by enhancing efficiency. Similarly, Gaffney, Challender, Califf and Harden (2019) observed that there exists a direct positive relationship between innovation and production of maize.

Estimated model;

$Y = 3.231 + 0.328X$

Where; Y- growth of maize farming; X- agricultural innovation

Table 2: Regression Model; Agricultural Innovation and Growth of Maize Farming

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.231	.186		17.272	.000
	Agricultural innovation	.328	.023	.352	14.542	.000
	R Squared	.213				
	Adjusted R Squared	.121				
	F statistic	40.321				
	P value	.000				

a) Dependent Variable: Growth of Maize Farming

CONCLUSION

The study established that agricultural innovation has a positive and significant influence on growth of maize farming in Pakistan. The study identified key aspects of agricultural innovation

that could be attributed to growth improvement. They included new products, processes and services.

RECOMMENDATIONS

The study found out that agricultural innovation has a positive and significant influence on growth of maize farming. As such, maize farmers especially small hold farmers should further develop their creativity and innovation in order to enhance their efficiency levels, reduce costs of production and increase their yields. The study recommends that maize farmers should strengthen aspects relating to agricultural innovation including introduction of new products, implementation of improved farming processes and use of technology in their farming, harvesting, storage and marketing.

REFERENCES

Ali, A., Beshir Issa, A., & Rahut, D. B. (2020). Adoption and impact of the maize hybrid on the livelihood of the maize growers: Some policy insights from Pakistan. *Scientifica*, *2020*.

Alomia-Hinojosa, V., Speelman, E. N., Thapa, A., Wei, H. E., McDonald, A. J., Tittonell, P., & Groot, J. C. (2018). Exploring farmer perceptions of agricultural innovations for maize-legume intensification in the mid-hills region of Nepal. *International journal of agricultural sustainability*, *16*(1), 74-93.

Aryal, J. P., Rahut, D. B., Sapkota, T. B., Khurana, R., & Khatri-Chhetri, A. (2020). Climate change mitigation options among farmers in South Asia. *Environment, Development and Sustainability*, *22*(4), 3267-3289.

Brooks, S., & Loevinsohn, M. (2011, August). Shaping agricultural innovation systems responsive to food insecurity and climate change. In *Natural Resources Forum* (Vol. 35, No. 3, pp. 185-200). Oxford, UK: Blackwell Publishing Ltd.

Elahi, E., Abid, M., Zhang, L., Ul Haq, S., & Sahito, J. G. M. (2018). Agricultural advisory and financial services; farm level access, outreach and impact in a mixed cropping district of Punjab, Pakistan. *Land use policy*, *71*, 249-260.

Gaffney, J., Challender, M., Califf, K., & Harden, K. (2019). Building bridges between agribusiness innovation and smallholder farmers: A review. *Global food security*, *20*, 60-65.

Grote, U., Fasse, A., Nguyen, T. T., & Erenstein, O. (2021). Food security and the dynamics of wheat and maize value chains in Africa and Asia. *Frontiers in Sustainable Food Systems*, *4*, 617009.

Harris, D., Rashid, A., Miraj, G., Arif, M., & Shah, H. (2007). 'On-farm'seed priming with zinc sulphate solution—A cost-effective way to increase the maize yields of resource-poor farmers. *Field Crops Research*, *102*(2), 119-127.

Hussain, A., Jadoon, K. Z., Rahman, K. U., Shang, S., Shahid, M., Ejaz, N., & Khan, H. (2022). Analyzing the impact of drought on agriculture: evidence from Pakistan using standardized precipitation evapotranspiration index. *Natural Hazards*, 1-20.

Khan, M. A. (2019). Drought assessment of Pakistan and its impact on its agricultural production.

Khan, M. R., Shehzad, A., Sameen, A., & Butt, M. S. (2018) 38 Value Addition. *Developing Sustainable Agriculture in Pakistan*, 857.

Mikosch, N., Becker, R., Schelter, L., Berger, M., Usman, M., & Finkbeiner, M. (2020). High resolution water scarcity analysis for cotton cultivation areas in Punjab, Pakistan. *Ecological Indicators*, *109*, 105852.

Ogunniyi, A., Oluseyi, O. K., Adeyemi, O., Kabir, S. K., & Philips, F. (2017). Scaling up agricultural innovation for inclusive livelihood and productivity outcomes in sub-Saharan Africa: The case of Nigeria. *African Development Review*, *29*(S2), 121-134.

Parveen, G., Gul, S., Khan, K., Rahim, Z., & Rafi, M. A. (2021). A Survey Report of Disease Fields of District; Swabi, Buner, Haripur and Mardan Province of Khyber Pakhtunkhwa: A Survey Report of Crop Losses. *Biological Sciences-PJSIR*, *64*(3), 288-300.

Sanaullah, U. P., Ali, S., Fayaz, M., & Khan, A. (2020). The impact of improved farming practices on maize yield in Federally Administered Tribal Areas, Pakistan. *Sarhad Journal of Agriculture*, *36*(1), 348-358.