Modern technologies for agriculture: how far Pakistani farmers are from the developed world?

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Abstract

In order to accomplish the objective of the current study household data was collected from one district of Sindh province. Main aim of this study is to find out that which modern technologies are being used at various form level and suggest police measure for technical advancement. For this study a purposive sample selection method was adopted to select Hyderabad, because it was considered that farmers of this location might be more aware about modern technologies due to Sindh Agriculture University and Directorate General of Agriculture extension are situated in this district. Those institutes are organizing awareness seminars/training for farmers of the province. Diversified stakeholders are presenting this region, that is why, we selected the respondents from there. At the second stage, through stratified random sampling method 80 households were selected 50 small, 20 medium and 10 large based on proportion of population size in each category of small medium and large farmers. Stratification was made on the bases of small (farmers own land from 1 to 12 acres), medium (farmers own land from 13 to 25 acres) and large (farmers own land from 26 to 46 acres) farmers. Results revealed that the small farmers predominantly rely on farming for their livelihood. They have limited educational attainment, with the majority completing only primary education. While they exhibit a strong commitment to farming, their relatively small landholding of 3.9 acres and the prevalence of financial challenges, as indicated by total household expenditure exceeding income, suggest potential vulnerabilities. Medium farmers, strikes a balance between farming and education, with a more diverse educational background. With a larger landholding of 16 acres and stable income and expenditure patterns, this household appears to be in a relatively secure financial position. Large farmers exhibit the most favorable economic profile. With a more educated and experienced demographic, extensive land ownership, and strong financial stability, they are positioned for prosperity.

Keywords: Farmer's Psychology, Modern Technology,

Introduction

Agricultural mechanization has been selective in Pakistan and only those operations are mechanized for which there is constraint of labour or power or a combination of both. Syed et al. (2014). The adoption of technology in agriculture is a critical factor in enhancing productivity and ensuring food security. However, several challenges and barriers deter farmers from embracing modern agricultural technology the key factors that affect technology adoption in agricultural practices, will be explored drawing on research conducted in Pakistan and other developing countries (Iqbal & Ahmad, 2015).

A). Literature Review

Farmers' adoption of recommended technology is influenced by a multitude of factors. Poverty, lack of resources, limited access to farming implements, farm size, labour availability, education, access to credit, and irrigation are among the primary determinants of technology adoption (Mirani et al., 2023; Iqbal & Ahmad, 2015).These factors, as identified in the same study, can either facilitate or hinder the uptake of modern agricultural practices. The adoption of technology in agriculture is intrinsically linked to productivity. The rapid advancement of technology has the potential to significantly increase agricultural productivity, as demonstrated during the Green Revolution (Zaman et al.,2012; Iqbal & Ahmad, 2015). However, the subsequent slowdown in productivity growth in developing countries, as mentioned in the study by Zaman, Khan, Ahmad, and Rustam (2012), underscores the importance of continuous technological innovation and its impact on agricultural productivity.

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The socioeconomic context of farmers, such as their level of education, farm size, and access to resources, plays a crucial role in technology adoption. In the study by Jariko et al. (2011), low levels of education are identified as a common barrier to the adoption of new technologies. Additionally, tenancy status, landownership, and income influence farmers' decisions to embrace modern practices (Iqbal & Ahmad, 2015, Magsi et al., 2016).

B). Information Sources and Extension Services

The dissemination of technology-related information is a vital component of technology adoption. In the context of rural Pakistan, the research suggests that extension services, agricultural conferences, and radio broadcasts are valuable sources of information for farmers (Mirani et al., 2023; Iqbal & Ahmad, 2015). These channels provide the necessary guidance to motivate and educate farmers about modern practices. This finding is corroborated in both studies, emphasizing the role of extension agents and radio in technology dissemination (Mirani et al., 2023). However, due to inadequate extension services, farmers remain deprived of the information related to modern technologies that can help increase productivity.

C). Government Initiatives and Policy Implications

Government programs can play a significant role in promoting technology adoption in agriculture. In Pakistan, government initiatives are proposed to focus on organizing agricultural education programs and providing access to financial resources, such as loans (Zaman et al., 2012; Iqbal & Ahmad, 2015; Lakhan et al., 2020). These measures are crucial in supporting farmers and facilitating the adoption of modern technology. The study by Zaman et al. (2012) recognizes the importance of public technology policies in addressing agricultural productivity challenges. The lack of agricultural policies that promote mechanization at farm, the farmers remain deprived of the solution.

In conclusion, the literature review underscores the importance of technology adoption in agriculture and highlights the multifaceted factors that influence farmers' decisions. The role of socioeconomic factors, education, information sources, and government programs is crucial in shaping technology adoption patterns. Future research should continue to explore innovative ways to disseminate technology- related information and promote the adoption of modern agricultural practices, especially in developing countries like Pakistan, where agriculture is a cornerstone of the economy (Mirani et al., 2023; Iqbal & Ahmad, 2015). Understanding the barriers and facilitators to technology adoption is essential for devising effective policies and strategies that can unlock the potential of technology in agriculture and contribute to global food security (Zaman et al., 2012; Iqbal & Ahmad, 2015). Further research should delve into the evolving landscape of technology adoption and its implications for sustainable agricultural development. Hence there is need to conduct research of that how modern techniques are penetrating among the farming communities. Therefore, aim of the article is to find out that which modern technologies are being used at farm level and suggest policy measure for technical advancement

Research Methodology

In order to accomplish objective of the current study household data was collected from one district of Sindh province. Main aim of this study is to find out that which modern technologies are being used at various form level and suggest police measure for technical advancement.

Major crops grown in district Hyderabad are, cotton, wheat and sugarcane. Although the quality of available cultivable land is good but potential of land for agriculture purpose is not fully utilized due to lack of knowledge about agriculture modern technologies irrigation water and lack of investment in new irrigation technologies. Major crops of the district are sugarcane, wheat and rice. People depend on agriculture and livestock for their livelihoods. Livestock present in this region are domestic poultry, buffaloes and goats.

At first stage, purposive sample selection method was adopted to select Hyderabad district from Sindh Province, because it was considered that farmers of this location might be more aware about modern technologies due to Sindh Agriculture University and Directorate General of Agriculture extension are situated in this district. Those institutes are organizing awareness seminars/training for farmers of the province. Diversified stakeholders are present in this region that is why, I selected the respondents from there.

At second stage, through stratified random sampling method 15 households were selected 50 small, 20 medium and 10 large based on proportion of population size in each category of small medium and large farmers. Stratification was made on the bases of small (farmers own land from 1 to12 acres), medium (farmers own land from 13 to 25 acres) and large (farmers own land from 26 to 46 acres) farmers. Table 1& 2 show sampling strategies for current research study. From one village 80 households were selected based on the proportion to population of households in each category of small, medium large farmer's category. A total number of 80 respondents were interviewed. Google form was created with specialized set of questions to be asked from farmers. The data collected in google forms was then analyzed by creating graphs. All respondents were male because in pretesting process of questionnaire it was identified that in these areas all decisions are made by the male farmers therefore in order to get correct information about adoption of new agriculturetechnologies by the households etc, male farmers were interviewed.

Results and Discussion

Table#1 Small size Farmers

Description	Average
Primary Education	95%
Secondary Education	5%
Graduation	0%
Age of Respondent	36
Farming Experience (years)	23
Total operational holding (acres)	3.9
Own land (acres)	4
Children (below 18)	3
Adult (18-60)	6
Old (Above 60)	1
No. of earners in household	3
No. of months worked during last 12 months	10
Income of earners per month	46000
Total expenditure of HH	54000

Table no# 1 shows that, the household in question primarily consists of farmers, with 95% of the respondents having received primary education, and only 5% having completed secondary education, while none have attained graduation. The average age of the household members is 36, and they collectively have an extensive farming experience, averaging 23 years. They own a total of 3.9 acres of operational land, with 4 acres under their ownership. The household includes 3 children below 18, 6 adults aged 18-60, and 1 elderly member above 60. There are 3 earners in the household who worked an average of 10 months in the past year, earning a monthly income of 46,000. Their total household expenditure amounts to 54,000, reflecting their economic circumstances and expenditure patterns, the same was also exposed by Rauniyar & Goode (1992).

Table#2   Medium size Farmers

Description	Average
Primary Education	65%
Secondary Education	30%
Graduation	5%
Age of Respondent	38
Farming Experience (years)	20
Total operational holding (acres)	16
Own land (acres)	16
Children (below 18)	3
Adult (18-60)`	6
Old (Above 60)	2
No. of earners in household	3
No. of months worked during last 12 months	12
Income of earners per month	55000
Total expenditure of HH	50000

Table no#2 shows the medium farmers data and the households in question is primarily composed of individuals engaged in farming, with an average of65% having received primary education, 30% with secondary education, and 5% having graduated. The respondents have an average age of 38 years and possess an average of 20 years of farming experience. Notably, they own a substantial 16 acres of operational land, all of which is under their ownership. The family consists of 3 children under 18, 6 adults aged 18-60, and 2 elderly members above 60. There are 3 earners within the household, all of

whom worked for the entire 12 months of the previous year and earned an average monthly income of 55,000. Their total household expenditure amounts to 50,000, indicating a balanced financial situation with earnings covering their expenses.

Table#3   **Large size Farmers**

Description	Average
Primary Education	55%
Secondary Education	30%
Graduation	15%
Age of Respondent	45
Farming Experience (years)	50
Total operational holding (acres)	30
Own land (acres)	30
Children (below 18)	2
Adult (18-60)	5
Old (Above 60)	2
No. of earners in household	2
No. of months worked during last 12 months	12
Income of earners per month	70000
Total expenditure of HH	60000

Table no#3 shows the household is respondents are 45, and they boast an impressive 50 years of farming experience. They own a substantial 30 acres of predominantly involved in farming and can be categorized as a large farming family. About 55% of the household members have received primary education, 30% have completed secondary education, and 15% have graduated. The average age of operational land, with all of it under their ownership. The family comprises 2children below the age of 18, 5 adults aged18-60, and 2 elderly members above 60. In this household, there are 2 earners who have worked for the full 12 months of the past year, earning an average monthly income of 70,000. Their total household expenditure amounts to 60,000, indicating strong financial position where their earnings comfortably cover their expenses, allowing for potential savings or investments in their farming enterprise (Derpsch et al., 2016).

Conclusion and suggestions

Small farmers, predominantly rely on farming for their livelihood. They have limited educational attainment, with the majority completing only primary education. While they exhibit a strong commitment to farming, their relatively small landholding of 3.9 acres and the prevalence of financial challenges, as indicated by total household expenditure exceeding income, suggest potential vulnerabilities. To improve their situation, they could explore opportunities for increasing income through diversifying crops or seeking additional off-farm employment. Additionally, adopting cost-cutting measures and implementing effective financial planning may help to balance their expenses and income.

Medium farmers, strikes a balance between farming and education, with a more diverse educational background. With a larger landholding of 16 acres and stable income and expenditure patterns, this household appears to be in a relatively secure financial position. However, to ensure sustainable growth, they may consider further diversification of their farming activities and investments in the education and skill development of their children, providing them with better prospects for the future.

Large farmers exhibit the most favorable economic profile. With a more educated and experienced demographic, extensive land ownership, and strong financial stability, they are positioned for prosperity. Suggestions for this household include exploring opportunities to optimize their farming practices, improve productivity, and secure their financial future. They may also consider investing in the education and skill development of the younger generation, ensuring the continued success and expansion of their farming enterprise.

In summary, each household's unique circumstances require tailored suggestions. Common themes across households include the importance of education, income diversification, and prudent financial management. By addressing these key areas, each household can work towards enhancing their well-being and securing their future.

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