# Analysis of Adoption of GlobalGAP Certification in Pakistan

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## Abstract

In this paper, we analyzed various determinants of the adoption of GlobalGAP certification in Pakistan. The study found that higher schooling as well as financial know how increase the probability of adoption of certification. In the same way, training helped farmers to successfully adopt the GlobalGAP standard. As there are some additional costs associated with compliance to the certification, it is clear that farmers with relatively larger farm size and those who could access credit are more likely to adopt. On the other hand, factors such as age, experience and distance from the provincial capital are not significant predictors of the outcome. However, there is a requirement to assess the properties of GlobalGAP for Pakistani agriculture; to attain this a complete methodological idea is essential. It would make the agriculture sector of Pakistan more export oriented, yielding higher returns to the gross domestic production of the county. In this context, this study offers a valuable guideline in order to reformulate policies that would ultimately help to improve global competency of agriculture sector of Pakistan.

## Keywords
GlobalGAP, Certification Adoption, Private Standards, smallholders, Farm Management

## 1. Introduction
### 1.1. Background
During the last couple of decades, certifications' role across the globe had taken a remarkable place with respect to meeting the international market demands for food security and safety. The progressive growth of many developing countries including Pakistan is the consequence of the agricultural sector. With such significance of the agricultural sector, improvement in farm profitability and productivity is always in demand. The agriculture sector plays a vital role in Pakistan's economy, like other developing economies (Imran et al., 2021; Imran & Fadillah, 2021). In Pakistan, 19.5% of the uncultured domestic outcomes and 42.3% of the labor-pool employment accounts for the agriculture sector (Asfaw, Mithöfer, & Waibel, 2010a, 2010b). The agriculture sector also provides the basic material for some value-added sectors. An exponential increase in the country's population required a higher production level for crops

and high-value consumable products, such as dairy, fruits, meat, and vegetables. In order to make the agriculture sector profitable further, better policy decisions are mandatory (Muriithi, Mburu, & Ngigi, 2011).

Developing countries require wholesalers to fulfill the necessities, and along with the supply chain dynamics of these policies are transmitted to producers (Kersting & Wollni, 2012). By fulfilling the standards' requirements, small farmers in advanced countries could probably gain potential access to global value chains, and new opportunities are created for them. Incorporating smallholders to the international value chains standards play a crucial role that encourages the trained manufacturers' economic welfare and creates spillover effects in terms of additional income and developing countries for employment opportunities (Williams, 2007). A significant number of GlobalGAP auditors, i.e., 18 Certification Bodies, i.e., 04, are working in Pakistan to perform audit activities and farms' certifications. Since the '90s, the yield of the main crops of Pakistan has been found almost standstill. There was a direct need for a breakthrough in their productivity in the scenario, which was indeed not feasible without following the certifications of international perspective like GlobalGAP, opening the ways and means to access the international markets to pursue high returns products (Asfaw, Mithöfer, & Waibel, 2009; Kersting & Wollni, 2012).

## 2. Research Objective

The main objective of this study is to identify various determinants of the adoption of GlobalGAP certification in Pakistan.

## 3. Literature Review

In recent decades, the fast development of Pakistan's city area shows that the demands for high-cost consumable products, for example, vegetables, dairy, meat, and fruits, are increasing. The agricultural sector of Pakistan during 2016-17 gained growth of 3.46 percent. The imperative crops are containing rice, sugarcane, cotton, maize, and wheat account for 4.66% of GDP and 23.85% of the total agriculture value. In agriculture, the Livestock share 58.33%, and it observed growth of 3.43% (Asfaw et al., 2010a). Fruits and vegetables are also an important subsector that constitutes a significant portion of the country's agriculture exports. In Pakistan, as the country's National standards body, PSQCA was established and working under the Ministry of Science & Technology's organizational field through the PSQCA Act VI of 1996 (Muriithi et al., 2011; Owuor, 2014).

Functioning of Pakistan Standards & Quality Control Authority moved on since December 2000, initially as a self-finance body. Under the law, PSQCA was given the mandate to align with the Government of Pakistan's treaties with ISO& WTO and other international practices. In this regard, 22070 ISO Standards were adopted, and PSQCA developed 8857 Pakistan Standards on behalf of Pakistan's Government. However, Food requirements are compatible with Codex Alimentarius Commission, accountable to WHO (Owuor, 2014). The key function of the Authority was to propose to the Government of Pakistan policies, criteria, parameters, rules, and regulations on standardization of processes, product quality, safety, and services. Many standards spoke as "Voluntary" adhered to be mandatory when those are referred to in the standards' regulations. The term standardization encompasses Conformity Assessment, including System Certification, Testing, Inspection, Calibration, and Product Certification, in addition to standards development (Wasilwa, 2008). In this way, the PSQCA works out to develop standards of national and international recognition and services to conformity assessment for the benefit of Pakistan's openness to competition in the field of standardization at both international and national levels, resultantly pursuing the uplift of the national economy, enhance industrial growth, ensure public health and safety, promote the indigenous and foreign trade and foster the international relations in conformance to the international standards (Chege, Mburu, Nyikal, & Muriithi, 2013).

ISO forms a link as per its manifesto that deals only with National Standard Bodies. Every member is solely represented as the National Standard Body of its country, and a part of a country or a company is not eligible to be its member. PSQCA is the National Standard Body of Pakistan, representing ISO and other International Organizations like WTO, OIML, and IEC. Since 1998, the Government of Pakistan also assigned PSQCA to oversee the issues referred to as TBT of WTO. In 1963, in association with WHO, FAO developed Codex Alimentarius Commission, with the mandate to equilibrate codes, global food measures, guidelines, and practices to safeguard the health of the consumer and promote a reasonable system the global food trade (Wasilwa, 2008). The Commission also plays a substantial role in all works about food standards done by international non-governmental and governmental organizations. Pakistan Standards & Quality Control Authority has also followed and formulated food standards aligned with the Codex Alimentarius Commission (Orewa & Iyangbe, 2009).

ASF is an important member introducing GlobalGAP in Pakistan. Farmers in Pakistan have been facilitated with technical and managerial support and services to improve creditworthiness, competitiveness, and productivity and

access the loan facility for their companies being provided by the ASF (Asfaw et al., 2010b). In this regard, the Government of Pakistan initiated the way and convinced a China-based GlobalGAP Consultancy Firm, namely Star Farm Company (SFC), to open its second office in Pakistan after observing its successful results in China in the provision of pieces of training and capacity building services to suppliers through the processes of training, auditing, retraining, re-examination, on-hand training and especially the world's significantly required trace-ability system. The Pakistan government also provided various incentives to suppliers and subsidized the costs to comply with the GlobalGAP certification to motivate and facilitate the people. No GlobalGAP checker or body is working in Pakistan. Still, traders can hire the GlobalGAP checkers' facilities from other countries or Firms, to arrange Chinese checkers for Pakistani traders through their links (Asfaw et al., 2010b; Ogessa & Sife, 2018; Orewa & Iyangbe, 2009).

Star Farm Company (SFC) training and auditing systems are claimed to be the game-changer for Pakistan's farm bases in the shape of substantial output growth, ensuring food security and food safety in the region, resultantly earning high returns through the spread of the excellent produce (Henson & Humphrey, 2009). Moreover, Firm namely Star Farm Company, also claims that when farm bases are dealt with their supply chain initiatives, up to fifty percent of farm produce would be enhanced, and the same proportion of post-harvest losses would be saved. Therefore, such types of initiatives are considered vital to tackle the big challenge of the provision of food safety and quality being faced by the people of Pakistan. Pakistani farmers are reluctant in the agreement of the world's most popular retailers and required GlobalGAP certification (Asfaw et al., 2010b; Henson & Humphrey, 2009). The responsibility comes on the government's shoulders in private and general sector, public-private sector, NGOs and media in specific to perform their role in disseminating the information and awareness of agreement of quality standards and food safety of International level like GlobalGAP.

Agri-food supply chains have been stretched from the national level to the international stage being facilitated by more liberal international trade policies. Product quality and safety attributes have become the customers' priority concerns give rise to a move towards "customer-pushed" global value chains. An increase in the concerns and awareness of food security has direct to strict regulations (Reardon, Timmer, Barrett, & Berdegué, 2003). At the international level, there are private and public food safety measures. On the public side, there are two main standard-setting organizations, i.e., CAC and the ISO. The Codex Alimentarius Commission was established as a part of the combined FAO/WHO Food Standards details with the main objectives to constitute food standards, guidelines, and the related material. The CAC sets out the standards on safety and food quality, containing food product standards and technological or hygienic system codes. Furthermore, it also defines the parameters of guidelines for contaminants and pesticide residues. According to Henson and Humphrey (2009), the Codex Alimentarius Commission has a significant proper position in developing rules and regulations for Member nations' essential public measures. Thus, Codex Standards have become the actual international standards and a benchmark for national law-making about food safety. The prime function of ISO, an international Non-Government Organization, is to set international standards that spread across a broad range of management systems, serviceability, and products and mostly voluntary.

On the Food Safety side, ISO developed standard namely ISO 22000:2005 dealing with Food security Management System while a range of universal guides related to the procedure of standards-setting and allegiance determination systems like model 28 for third party approval and the models 65 and 62 to deal with the procedure of certification and inquisition bodies. The European food security regulatory structure at the regional level comes out as a product of the combination of various regulatory tools, i.e., Reg. 1881/2006 defines the maximum threshold limits of impurity (heavy metals, dioxin, aflatoxin) admissible in the food, Regulation (EC) 396/2005 develops the utmost residue levels acceptable for the commodities based on animal and plant origin certainly at a community level. Moreover, the bases of food hygienics describing the procedural mechanism of HACCP and the general standards of hygiene of foodstuff from its production to processing to distribution to the export for the business runners are set by Regulation (EC) No. 178/2002viii and Regulation (EC) No. 852/2004 and likely Regulation (EC) No. 853/2004x specifically deals with basis on the hygienics of food of animal origin. Furthermore, some regulations constitute official control systems to make sure the implementation of feed and food law, i.e., Regulation (EC) No. 882/2004xii and Regulation (EC) No. 854/2004xiii are to validate the compliance with the rules meant particularly to minimize the risks up to acceptable levels to the human beings and animals in the food and feed commerce (Reardon et al., 2003; Roberts & Krissoff, 2004).

Besides the public regulations, there are several private standards appearing in a form of internal control to an organization like 'QMS' or customer-supplier communication practically developed by large-scaled manufacturers, traders, and service providers. Private standards are initially enforced by dominant retailers and supermarket chains in industrial-origin countries against the stringent public regulations and reply to the developing consumer demands

for food quality and security. Private Voluntary Standards (PVS) have gained exponential access beyond the limits of regional and national levels to the international markets to cater to the demand raised by the leading food business operators. GlobalGAP, -BRC, SQF, -GFSI are of world-level prominent names of collective PVS. These private standards are considered "baseline standards" meant to meet the desired minimum level of performance to access the targeted market. PVS is usually considered more rigid and specific in nature and addresses the issues that remain untouched in public regulations.

PVS is generally introduced as "process standards" aiming at specifying the component the process may have to achieve any specific goal, e.g., "safe," "eco-friendly," etc. (Jang, Enkerlin, & Reyes-Flores, 2014). At the same time, public management is termed as "performance standards" determining the product's component when it is evaluated at any certain stage in the agri-food chain, e.g., the maximum threshold limit of pesticide residues, etc.

Out of the private standards, GlobalGAP is the most extensively established private sector food security certification in the world for primary producers. Global-Gap is a pre-farm gate standard for the good agricultural process where traceability, food safety, workers' health, environmental stability, security, and animal health are the major concerns. The standard was initially developed in 1997 by retailers belonging to the Euro-Retailer production Working Group called as Europe-Gap, aiming to standardize the retailers' prevailing minimum standards, and with the exponential increase of its significant impacts beyond Europe and over the globe, it was re-named as GlobalGAP in 2007. Crossing the number of 1,700 well-experienced auditors and inspectors working for about 140 authorized certification bodies approve 415 agricultural outputs for than 140,000 authorize manufactures in more than 125 countries across the globe is being done by this standard-setting body. Certifications and private food standards are becoming gradually important, with increasing international trade in high-value agronomic products. Literature discloses that in various cases GlobalGAP standards improve present skill flows for both developing and established countries. Further evidence i.e., Henson and Humphrey (2009); Orewa and Iyangbe (2009); Wasilwa (2008) provided from a policy viewpoint that trade are improves from food standards that are consistent to a common international level. Similarly, meeting private sector necessities improve trade, because confidence between trading partners is increased by them. Hence, to join advance countries into global value chains volunteer certification can be a suitable mechanism. From voluntary compliance this recognized possible trade benefit should motivate agri-food manufacturing countries to revolutionize their export-oriented sectors. To help manufacturers this needs public sector financial and technical support to overcome the initial costs of certification particularly those in developing countries (Sharpe, 2010). From a caveat the last policy suggestion arises that is essential in most of the research and our analysis that has operating this method, i.e., there is no difference between non-certified and certified product trade flows in most trade databases. Considering the importance and benefits of GlobalGAP certification, this study attempts to analyze various determinants of the adoption of GlobalGAP certification in Pakistan.

## 4. Methodology

Decision to adopt or not to adopt can be modeled using probit equation. A probit model can be stated as a latent variable model such that $Y^* = X^T \beta + \varepsilon$ where X is the vector of explanatory variables while $\beta$ as regression coefficient. The outcome denoted by Y can take two values 1 or zero depending upon the explanatory variables. A typical expression of probit model is given below.

$$Y = \begin{cases} 1 & Y^* < 0 \\ 0 & otherwise \end{cases} = \begin{cases} 1 & \varepsilon < X^T \beta, \\ 0 & otherwise \end{cases}$$

Benefits associated with certification is evident from literature. However, compliance to a standard also raise cost, both fixed cost and variable cost. In this way, a farmer's decision to adopt or not to adopt involve a cost benefit analysis. A representative farmer will opt for certification if the expected benefits equal or exceeds the incremental costs associated with certification.

### 4.1. Econometric Model

We model GlobalGAP adoption as a binary variable. In the equation given below, dependent variable $GAP$ is a dummy variable in order to capture whether a farmer adopted the certification or not. In case of adoption, the variable assumes value equal to 1, and zero otherwise. The equation is estimated using the probit model.

$$GAP_i = \beta_0 + \beta_1 \ln\_FAGE_i + \beta_2 \ln\_FEDU_i + \beta_3 \ln\_FEXP_i + \beta_4 FINLIT_i + \beta_5 TRAIN_i + \beta_6 \ln\_FSIZE_i + \beta_7 \ln\_MACHIN_i + \beta_8 CREDIT_i + \beta_9 \ln\_DISTANCE_i + \varepsilon_i$$

Robust standard error are estimated in order to achieve a reliable analysis. As the interpretation of probit model is not straightforward, we have estimated marginal effect for more direct and meaningful interpreting the estimation, and

subsequently devising policy recommendations. In the equation above, βs are the parameters to be estimated, ε demarks the regression error term. Other variables are labelled as follows.

Farmer's age (*FAGE*) is measured in years while farmer's education (*FEDU*) level is recorded as number of schooling years. Moreover, farming experience (*FEXP*) is taken in years. Financial literacy (*FINLIT*) is measured in respondents score from 1 to 9. The variables for training (*TRAIN*) captures whether a farmer has taken any training for GlobalGAP certification. The variable takes value 0 for no training, 1 for participation in one training, and 2 to denote participation in multiple trainings. Farm size (*FSIZE*) is measured as number of acres. The value of farm machinery (*MACHIN*) is taken in rupees. A dummy variable for credit (*CREDIT*) takes value 1 if the farmers had accessed any credit, and zero otherwise. Finally, the distance of farm from the provincial capital (*DISTANCE*) is taken in kilometers.

### 4.2. Data Collection

For data collection, the study surveyed 228 farmers across Punjab. Out of this sample, there are 95 farmers who have participated least once in a training for GlobalGAP certification while there are 75 farmers who adopted to the certification scheme.

## 5.  Results & Discussion

### 5.1. Descriptive Statistics

In the Table 1 given below presents descriptive statistics of variable included in the study. Different statistic including mean, standard deviation as well as minimum and maximum values are mentioned. In the Table 1 shows there is a great range of variation in the data. The mean value for age and experience is 47 years and 23 years, respectively. The mean value for farmers' education shows an overall low education in the sample farming community. In the sample, 33 percent of farmers are GlobalGAP certified. There are total 75 certified farmers. 54 farmers have once taken a training, 41 farmers participated in multiple trainings, while 133 farmers in the sample had no training. The maximum distance from the provincial capital ranges from 60 to 620 kilometers. Similarly, there is a degree of variation in landholding size. Similarly, the farm size ranges between 2 to 112 acres.

Table 1: Descriptive statistics (N=228)

| Variables | (1) Mean | (2) SD | (3) Min | (4) Max |
|---|---|---|---|---|
| *FAGE* | 47.50 | 9.907 | 22 | 78 |
| *FEDU* | 9.904 | 3.930 | 0 | 18 |
| *FEXP* | 22.91 | 10.35 | 4 | 52 |
| *FINLIT* | 5.434 | 2.362 | 1 | 9 |
| *TRAIN* | 0.596 | 0.777 | 0 | 2 |
| *FSIZE* | 11.44 | 16.38 | 2 | 112 |
| *MACHIN* | 353,987 | 343,144 | 50,000 | 3.140e+06 |
| *CREDIT* | 0.241 | 0.429 | 0 | 1 |
| *DISTANCE* | 369.2 | 132.9 | 60 | 620 |
| *GAP* | 0.329 | 0.471 | 0 | 1 |

*Source: Authors' calculations*

### 5.2. Comparison of group means using t-test

The two-sample t-test is one of the most used statistical procedures. Its purpose is to test the hypothesis that the means of two groups are the same. We divided the sample into two groups of farmers in Table 2 i.e. those who adopted GlobalGAP certification and those who did not. We run t-test to check the difference of means for all the variables taken the equation above. The estimates show that the two groups of farmers are significantly different for all variables except age, experience and distance. The Table 2 shows that farmers with higher level of schooling and better financial literacy are more likely to be able to adopt. Participation in training and farm size are also significantly different across the two groups.

Table 2: t-test estimates

| Variables | GlobalGAP certified | Not certified | Differences |
|---|---|---|---|
| *FAGE* | 47.04 | 47.73 | 0.69 |
| *FEDU* | 12.41 | 8.67 | -3.74*** |
| *FEXP* | 21.28 | 23.71 | 2.43 |
| *FINLIT* | 7.05 | 4.64 | -2.41*** |
| *TRAIN* | 1.16 | 0.32 | -0.84*** |
| *FSIZE* | 20.56 | 6.97 | -13.59*** |
| *MACHIN* | 542613.33 | 261522.88 | -281090.46*** |
| *CREDIT* | 0.45 | 0.14 | -0.32*** |
| *DISTANCE* | 369.31 | 369.19 | -0.12 |
| Observations | 228 | | |

*Source: Authors' calculations*

There are different factors of farmers' motivation to adopt GlobalGAP as shown in Figure 1. The highest motivation is to adopt the certification in order to attain high price premium for the certified produce. On the other hand, Figure 2 show various reasons for not adopting the certification scheme where high invest cost associated with compliance to certification is the most important reason. Another reason for not implementing the certification report by farmers is that they found it difficult to understand various requirement of GlobalGAP certification. Note that multiple options by one respondent are possible. The bar graphs given below shows percentage of each category.



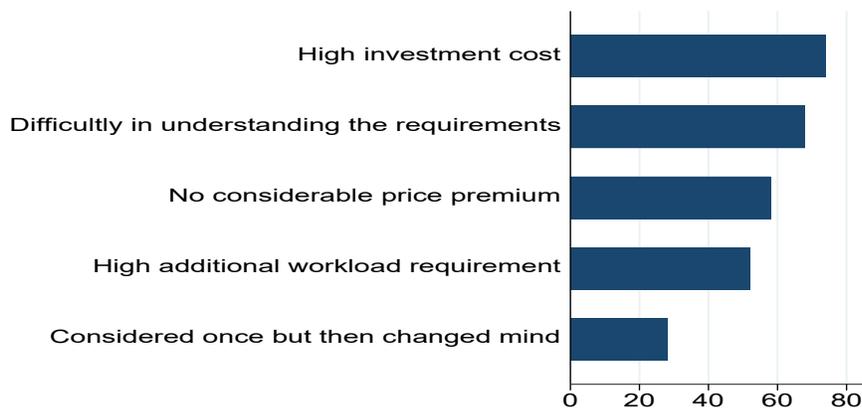Figure 1: Farmers' motivation to adopt GlobalGAP.



Figure 2: Reasons for not adopting GlobalGAP

### 5.3. Regression analysis

This section presents regression analysis. The primary question is to identify potential factor which may affect the adoption of GlobalGAP certification by farmers across Punjab province. The study takes dependent variable *GAP* as a dummy variable in order to capture whether a farmer adopted the certification or not. Table 3 shows regression analysis of probit model under column (1), and marginal effects of the probit model under column (2). Robust estimates of standard errors for each model is given in the right adjacent column. Total 228 observations are analyzed. The value of pseudo R squared is estimated to be 0.5125.

Table 3: Regression analysis

| Variables | (1)<br>Probit model | Robust SE | (2)<br>Marginal effect | Robust SE |
|---|---|---|---|---|
| *ln_FAGE* | -0.080 | (0.846) | -0.019 | (0.205) |
| *ln_FEDU* | 2.625*** | (0.771) | 0.636*** | (0.129) |
| *ln_FEXP* | 0.141 | (0.399) | 0.034 | (0.098) |
| *ln_FINLIT* | 0.804* | (0.434) | 0.195* | (0.102) |
| *TRAIN* | 0.448** | (0.191) | 0.108** | (0.051) |
| *ln_FSIZE* | 0.734*** | (0.272) | 0.178*** | (0.064) |
| *ln_MACHIN* | 0.323 | (0.213) | 0.078 | (0.053) |
| *CREDIT* | 0.482* | (0.282) | 0.131 | (0.082) |
| *ln_DISTANCE* | 0.429 | (0.402) | 0.104 | (0.097) |
| *Constant* | -17.034*** | (5.363) | | |
| *Pseudo R²* | 0.5125 | | | |
| *Observations* | 228 | | | |

Source: Authors' calculations

From the results, it is clear that both higher schooling and financial know how increase the probability of adoption of certification. In the same way, training helped farmers to successfully adopt the GlobalGAP standard. As there are some additional costs associated with compliance to the certification, it is clearer that farmers with relatively larger farm size and those who could access credit are more likely to adopt. On the other hand, factors such as age, experience and distance from the provincial capital are not significant predictors of the outcome. It is noteworthy that these finding are in line with the t-test estimate presented above. Note further that estimated standard errors are robust that increase the reliability of the models.

## 6. Conclusion

This study is aimed to identify various determinants of the adoption of GlobalGAP certification in Pakistan. We found that higher schooling and financial know how helps to increase the probability of adoption of certification. As the figure 1 shows that the highest motivation is to adopt the certification in order to attain high price premium for the certified produce. Additionally, as demonstrated by figure 2, various reasons for not adopting the certification scheme where high investment cost associated with compliance to certification is the most important reason. Another reason for not implementing the certification report by farmers is that they found it difficult to understand various requirement of GlobalGAP certification. Similarly, trainings are the useful sources for farmers to successfully adopt the GlobalGAP standard. As there are some additional costs associated with compliance to the certification, it is concluded that farmers with relatively larger farm size and those who could access credit are more likely to adopt. In the light of these finding, we draw policy recommendations for the improvement of the horticulture sector of Pakistan. In Pakistan, almost 20 million hectares are used for agricultural and horticultural which is almost one fourth of the total arable land, (PHDEC, 2015). Robust estimates of standard errors for each model is given in the right adjacent column. Total 228 observations are analyzed. The value of pseudo R squared is estimated to be 0.5125. Of that amount only 20 percent is considered to have the potential for intensive crop production (Irshad, 2021; Khan, 2011). In addition, the Ministry of Food, Agriculture and Livestock, organizations such as Pakistan Horticulture Development & Export Company (PHDEC) and Agribusiness Support Fund (APS) can play important role in this regard.

In order to facilitate certification process, the mechanism of public-private partnerships (PPPs) can be a valuable tool. In additional to this, establishment of efficient national technical working groups can facilitate the adoption of GlobalGAP adoption. As the cost of certification process is a major factor discouraging small holders to certify, establishment of auditing facility locally would reduce the cost, hence it would encourage adoption process. Establishment of farmer organization (FOs) would be another approach. FOs would not only be helpful for farmers to opt for group certification, this would prove to be an effective platform for farmer training. Implementation of these approaches would ultimately enhance the certification in the country and would resultantly add to the expansion of horticultural exports. This study offers a valuable guideline in order to reformulate policies that would ultimately help to improve global competency of agriculture sector of Pakistan.

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