Research Article

On the Estimation of Technical Efficiency of Tomato Growers in Malakand, Pakistan

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Abstract | This paper estimated and examined technical efficiency of tomato growers in Malakand district of Khyber Pakhtunkhwa, Pakistan. A sample of 120 tomato growers was selected employing multistage sampling technique. An interview schedule was used for data collection during November-January, 2016. Maximum likelihood technique was used for the estimation of the Cobb-Douglas stochastic frontier production model. After running various econometrics software the output of the Frontier 4.1 was found good fit. The findings of the study showed that technical efficiency ranges from 0.83 to 0.99 with the mean technical efficiency of 0.93. The findings further shows that among the inefficiency factors experience was significantly contributing to the technical efficiency of the farmers. On the basis of this study it is recommended that tomato growers in the study area need to increase the number of seedling for the purpose to increase the productivity. It is further recommended that government should provide training facilities to the farmers to improve their skills, as a results of which the productivity will be increased.

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Introduction

Tomato (Lycopersicon esculentum MILL) belongs to family Solanaceae (nightshade), having 2n=24 chromosomes. It was originated in the western coastal plain of South America (Harlan, 1992; Ali et al., 2012). It is cultivated in the warm season and is categorized as annual plant. The average optimum temperature for its cultivation range from 25°C to 29°C (Ejaz et al., 2011). It is utilized in a variety of ways such as sun dried tomatoes, tomato juice, tomato soup, tomato ketchup as well as fresh as a salad (Fruscinate et al., 2007). It is very important for human because it is a rich source of minerals and antioxidant such as carotenoids, lycopene, vitamin C and E and phenolic compounds which play important role in the human diet to prevent certain cancer and vascular diseases (Adalid et al., 2004).

Tomato has become one of the most common grown vegetables in the world which is considered as important cash as well as industrial crop (Babalola et al., 2010). According to Food and Agricultural Organization (FAO) out of fifteen vegetables tomato ranked 6th in terms of total annual world production (Raja and Khokhar, 1993). Productivity of tomato in Pakistan, compare to other countries of the world, is very low. During 2013-14 the total cultivated area under tomato crop was 63.2 thousand hectares and the total production was 599.7 thousand tons (GoP, 2015).

There are three possible ways to increase the production of vegetables in the country, i) by allocating more area to the vegetables production, ii) by adopting new technologies and iii) by using the available resources more efficiently. In short duration of time it is very difficult to enhance area under vegetables production because it requires reallocation of the cultivated area from major crops to vegetables crops which will lead to change in cropping pattern which is almost impossible. The second way through which the production can be increased is through developing and adopting new technologies. This method is also more costly and requires more funds to be allocated for research and development. The third option to increase the production of vegetables is using the available resources more efficiently, which is the feasible way in the present situation; therefore enough scope exists to increase the productivity (Bakhsh et al., 2007).

Pakistan produces two crops of tomato annually, one crop is cultivated in spring and the second crop is cultivated in autumn. During 2013-14 the total cultivated area under tomato crop was 63.2 thousand hectares and the total production was 599.7 thousand tones. It is grown in all the four provinces of Pakistan. During 2013-14 tomato was cultivated in KPK, Punjab, Baluchistan and Sind on area of 14.0, 7.8, 27.0 and 14.4 thousand hectares, respectively, and there production was 135.7, 100.1, 200.6 and 163.3 thousand tons, respectively (GoP, 2015).

Tomato is produced in various districts of Khyber Pakhtunkhwa having large variation in the level of productivity. This variation for the top eleven (11) tomato producing districts ranges from 5.391-12.63 tons/hectare (GoP, 2012). Malakand is one of the major tomato producing district of Khyber Pakhtunkhwa. It is very popular for the production of tomato. According to crop reporting service of Malakand Dargai tomato are grown in Kharif and Rabi seasons. During kharif season 2013-14 tomato was cultivated on an area of 281 hectares having total production of 2620 tons, while during Rabi it was cultivated on an area of 780 hectares having total production of 8353 tons. The average production in Malakand Dargai was 10.7 tons per hectare in Rabi season (Government of Khyber Pakhtunkhwa, 2015).

The results of the study are of great importance for researcher and tomato growers as well. The results obtained can be used by other researchers to compare their results with this study. For the tomato growers in the study area the elasticity's estimates of the explanatory variables and elasticity estimates of the inefficiency factors play important role because on the basis of these estimates they can increase their productivity and eventually efficiency. The findings of this study act as a yard stick for different government organizations and institutions to chart out sound policies for efficient utilization of resources and enhancing productivity.

This study was conducted to estimate technical efficiency of tomato growers in the study area and to identify and examine factors responsible for technical inefficiency, if present, across tomato growers.

Methodology

Study Area, Sampling and Data Collection Procedure

This study was conducted in District Malakand Khyber Pakhtunkhwa, Pakistan. This area is generally suitable for the production of tomato. According to crop reporting service of Malakand Dargai several crops including Wheat, Maize, Barly, Sugar cane, Sugar beet, Rice and Sun flower, and Vegetables including Potato, Tomato, Onion, Matter, Masoor, Garlic, Chilles, Arhar, Mash, Mung, Lady finger, Tanda, Pumpkin, Biter Guard and Bringal are grown in district Malakand. Among the vegetables tomato is the second largest vegetable in term of area allocation as well as in term of production after onion in the study area (Government of Khyber Pakhtunkhwa, 2015).

Multi-stage sampling technique was applied for the collection of data. Data were collected from one hundred and twenty (120) tomato growers. In first stage district Malakand was purposively selected because it is one of the major tomato producing district of Khyber Pakhtunkhwa. Malakand district consist of two Tehsil, Dargai and Batkhela. In stage second district Dargai was selected purposively because the number of tomato growers were high in tehsil Drgai then Batkhela. In stage thrid three villages namely Jabban, Kot and Heroshah were selected randomely. In fourth stage a random sample of one hundred and twenty (120) farmers were selected from the selected villages through proportional allocation sampling procedure.

Conceptual Framework

The concept of productive efficiency was introduced for the first time by Farrel (1957). Farrel (1957) argued that there are two component of the efficiency, technical efficiency and allocative efficiency. Technical efficiency is the ability of a firm to produce maximum level of possible output from the given inputs.

The ability of a firm to use the resources in the optimal proportion given their respective prices and production technology is called allocative efficiency, while economic efficiency is the product of technical efficiency and allocative efficiency and is defined as at the given level of technology the capacity of a firm to produce the established quantity of output at minimum cost (Farrel, 1957; Kopp and Diewert, 1982). To measure mean technical efficiency mainly two approaches, parametric (Stochastic frontiers approach) and non-parametric approach (Data Envelopment approach) have been used. Both approaches has their own merits and demerits. The main disadvantage of the DEA approach is that it assume that all the deviation from the frontier is due to the inefficiency of the farmers, while SFA approach described that all the deviation from the frontier is not only due to the inefficiency of the farmers but also due to the random errors (effects that are beyond the control of the farmers like, drought *etc.*). To control such lack Aigner et al. (1977) and Meeusen and Broeck (1977) proposed the stochastic frontier production model for the measurement of technical efficiency. In this study the parametric Stochastic Frontier approach of cobb-douglas form was used.

Model Specification

For the measurement of technical efficiency stochastic frontier production function of cobb-Douglas form is used as follows:

$$Y_i = f(\beta, X) + \varepsilon_i \ldots\ldots\ldots\ldots\ldots(1)$$

$$Ln\ Y_i = \beta_0 + Ln\beta_1 X_1 + Ln\beta_2 X_2 + Ln\beta_3 X_3 + Ln\beta_4 X_4 + Ln\beta_5 X_5 + Ln\beta_6 X_6 + Ln\beta_7 X_7 + \varepsilon \ldots\ldots\ldots\ldots(2)$$

Where, Y_i is output obtained by the ith farmer per acre, X_1 is number of seedling per acre, X_2 is number of tractor Hours per acre, X_3 is number of irrigation, X_4 is synthetic fertilizer in Kgs per acre, X_5 is FYM (Farm Yard Manure) in Kgs per acre, X_6 is pesticides in millilitres per acre, X_7 is number of labour days used for production per acre and ε_i is composite error term.

$$\varepsilon_i = V_i + U_i$$

Where, V_i is normally distributed component that represent variation in output due to those factors which are beyond the control of the farmers and U_i is half normally distributed component that represent variation in the output due to the inefficiency of the farmers (Obare et al, 2010).

The model used for technical inefficiency is as follow:

$$U_i = (\alpha, Z) + Q_i \ldots\ldots\ldots(3)$$

$$U_i = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + Q_i \ldots\ldots(4)$$

Where, α_0 is parameter to be estimated, Z_1 is age of the grower, Z_2 is experience of the grower, Z_3 is education of the grower, Z_4 is number of extension visit, Z_5 is area under tomato and Q_i is random error having normal distribution.

Technical efficiency of the individual farmer is defined as the ratio of observed output to the frontier output and can be expressed as:

$$TE = Y_i/Y_i^* \ (5)$$

$$TE_i = \frac{Exp(X_i'\beta + v_i - u_i)}{Exp(X_i'\beta + v_i : u_i = 0)} \ldots\ldots\ldots\ldots(6)$$

Technical efficiency takes values from 0 to 1, where 1 stand for efficient firms and 0 for non efficienct firm.

Table 1: *Descriptive statistics of the variables used in SFA Cobb-Douglas production function.*

Variable	Unit	Min.	Max.	Mean	Std. Dev.
Total produce	Kg	7000.0	11250.0	9097.60	836.30
Seedlings	No	4500.0	5800.00	5254.70	219.60
Total tractor	Hrs	4.00	6.70	5.20	0.70
Irrigation	No	15.00	20.00	16.70	1.30
Synthetic Fert	Kg	160.00	340.00	230.40	41.30
FYM	Kg	600.00	2057.10	1207.70	315.10
Pesticides	Ml	3000.0	6857.10	4968.40	1208.70
Labour	MD	64.00	105.00	84.60	10.100
Age	Year	17.00	65.00	34.50	9.10
Exp	Year	10.00	22.00	16.00	3.20
Education	Year	0.00	14.00	6.10	4.10
Tenure status	Dummy	0.00	1.00	0.57	0.48
Extension visit		0.00	1.00	0.57	0.48

Source: *Survey data (2016)*

Results and Discussion

Summary Statistics of the Variables used in the Stochastic Frontier Analysis

Table 1 presents the summary statistics of the variables used in the stochastic frontier analysis. The results show that mean yield of tomato was about 9097.6 kg per acre with maximum of 11250 and minimum of 7000 kgs per acre.

The number of seedling which is consider as a unit of production varies from farm to farm having average number of 5254.7 with maximum of 5800 and minimum of 4500 seedlings per acre. The average labor used for the production of tomato was 94 with the maximum labor of 105 and minimum of 84 labor per acre. The average use of synthetic Fertilizer (DAP, Urea, Nitrate and Nitropas) was about 230.4 kg with a maximum of 340kg and minimum of 160 kg per acre. Natural fertilizer (FYM) is also important for tomato crop. The application of FYM varies from farm to farm with the average of 1207.7kg with the maximum of 2057.1 and minimum of 600 kg per acre.

Irrigation is essential for each and every crop. The average number of irrigation for tomato crop was 16.7 with a maximum of 20 and minimum of 15 times per acre. Tomato is a vegetable crop and there is a big risk of plant diseases, weeds and insects. To avoid these risk tomato growers take great care of tomato crop and do checking on regular basis and if at any time there is a need of chemicals they apply it to the crop without any fear. The average amount of chemical used by the farmer was 4968.4 mille litter per acre with a maximum of 6857.1 and minimum of 3000 ML per acre. For ploughing purposes all the farmers in the study area have used tractor. The average time consume by tractor for one acre is about 5.2 hours with a maximum of 6.7 and minimum of 4 hours per acre.

For the analysis of technical efficiency five factors (age, experience, education, extension visit and tenure status) were taken into account. The study shows that maximum education was 14 years and minimum education was 0 years with an average level of education was 6.1 schooling years. Farmers in the study area were related to the farming activities for a long period of time having farming experience of 10 to 22 years with a mean experience of 16 years. Farmers in the study area have age between 17 and 65 with an average of 34.5 years. Fifty seven (57) percent of the farmers have own land and forty three (43) percent were tenant, while thirty (30) percent of the farmers have made extension visit while seventy (70) percent of the farmers have no extension visit.

Model Diagnostic Test

Normality of the residuals: Histogram of the residuals is the chi-square (X^2) distribution of p-value is 0.1214 which is greater than the 0.05 level of significance, so we can say that residuals are distributed normally.

Jarque Bera test (JB) for normality is a statistical test used for checking the normality of a data. Under JB test the null hypothesis is that the data is distributed normally, while alternative hypothesis is that the data is not normally distributed. As the estimated p-value was 0.0837 which was greater than the 0.05 level of significance so we cannot reject the null hypothesis of normal distribution.

Test for heteroscedasticity: The result by Whites' test showed that estimated p-value was 0.49> 0.05 level of significance, so we cannot reject the hypothesis of homoscedasticity.

The result by Koenker Bassett test showed that the estimated p value was 0.518> 5% level of significance, so we accept the the null hypothesis of homoscedasticity.

Multicollinearity tests: The results described that the value of variance inflationary factor was 1.33<10, which indicate that there was no multicollinearity in the data.

Model specification test: To chick that the model was correctly specified Ramsey test were performed. The results showed that p-value of F statistics was 0.92 which is greater than 5% significance level therefore we conclude that the model is correctly specified.

MLE Results of the Stochastic Frontier Cobb-Douglas Production Function for Tomato Growers

To estimate cobb-Douglas form of the stochastic frontier model Maximum Likelihood estimation procedure was applied. The findings showed that all results were according to our prior expectations having correct sign except for tractor hours where the sign of coefficient was negative and have insignificant effect on production.

The results in Table 2 showed that seedling have highly significant effect on production having t-value of 6.372. The coefficient of seedling is 1.02 which suggest that by increasing one percent increase in seedling there will be 1.02 percent rise in output. The findings is in accordance with the findings of Khan and Ghaffar (2013). The coefficient of the tractor is negative (-0.243) and insignificant which shows that tractor does not influence the output of the farmers. This result is in conformity with the findings of Munir (2012). The coefficient of the irrigation is significant, having coefficient of 0.123 which means that when the farmers increase irrigation by one percent there will be 0.123 percent increase in the output. This is according to the findings of Tsoho et al. (2012), Bakhsh et al. (2007), Huq et al. (2010), Shaheen et al. (2011) and Ali et al. (2013).

Table 2: *MLE results of tomato growers (dependent variable = ln Yield).*

Variable	Parameters	Coefficient	St. Error	T value
Intercept	β0	-0.94	1.30	-0.72
Ln Seedling	β1	1.02	0.16	6.37**
Ln Tractor	β2	-0.02	0.03	-0.66
Ln Irrigation	β3	0.12	0.06	2.00**
Ln Fertilizer	β4	0.02	0.02	1.00
Ln FYM	β5	0.05	0.02	2.50**
Ln Chemical	β6	0.04	0.02	2.00**
Ln labour	β7	0.04	0.05	0.80

Source: *Estimated from Survey data (2016);* ****:** *Significant at 1% level of significance*

The coefficient of synthetic fertilizer is insignificant which shows that synthetic fertilizer does not influence the output. This result is similar to the result of Dolisco and Jolly (2008), Huq et al. (2010) and Shaheen et al. (2011). The coefficient of FYM is significant, having coefficient value of 0.052 which means that when there is one percent increase in the application of FYM there will be 0.052 percent increase in the output. This findings is in coherence with the findings of Ali et al. (2013) and Latt et al. (2011). The coefficient of the chemical (pesticides + weedicides) is also significant, having coefficient value of 0.04 which suggest that the level of output will increase by 0.04 percent when there is a one percent increase in the application of chemicals. This outcomes is in line with the results of Hassan and Ahmad (2005). The coefficient of the labor is statistically insignificant which shows that labor does not influence the output. This findings is similar to the findings of Murthy et al. (2009), Dipeolu and Akinbode (2008) and Sibiko et al. (2013).

MLE of the Inefficiency Effect Model

Table 3 contains the MLE of the inefficiency model. The Inefficiency model contain age, experience, education, extension visit and tenure status of the farmers. Outcomes shows that the coefficient of age is statistically insignificant, which means that age cannot effect the technical efficiency of the farmers. This result is accordance to the finding of Dolisco and Jolly (2008), Khan and Ghaffar (2013), Abu et al. (2011). The relationship between experience and technical inefficiency is negative and significant, which describe that the expert farmers can be more technically efficient than the non-expert farmers.

Table 3: *MLE results of inefficiency effect model.*

Variable	Parameters	Coefficient	St. Error	T value
Intercept	α1	0.39	0.068	5.73
Age	α1	-0.001	0.0008	-1.25
Experience	α2	-0.031	0.007	-4.42**
Education	α3	-0.002	0.0018	-1.11
Tenure status	α4	-0.0016	0.0074	-0.21
Extension visit	α5	-0.006	0.0050	-1.20

Source: *Estimated from Survey data (2016);* ****:** *Significant at 1% level of significance*

This outcome is in line with the outcome of Orewa and Izekor (2012), Abasi et al. (2013) and Abu et al. (2011). Education and technical inefficiency shows negative relationship. As the coefficient of education is insignificant so the farmers with more education is technically more efficient than those of low education. This result is in conformity with the result of Latt et al. (2011) and Orewa and Izekor (2012). Outcomes shows that tenure status is inversely related to the technical inefficiency, but it is insignificant that is why we cannot say that owners were technically more efficient than tenant. This results is similar to the result of Shehu et al. (2010). Result shows that extension visit is inversely related to the technical inefficiency but is insignificant. That is why we cannot say that those farmers who made extension visit were technically more efficient than those who has no extension visit. This result is in coherence with the finding of Shehu et al (2010).

MLE of the Variance Parameters

Table 4 shows Maximum Likelihood Estimates of the variance parameters. The estimated gamma value (Y) as shown in table 4.4 is the ratio of (σ_u^2/ σ^2) which is 0.58, which describe that out of total variation from the isoquant fifty eight (58) percent of the variation is due to the inefficiency of the farmers, while the remaining forty two (42) percent of the variation is due to the error term (effects that are beyond the control of the farmers).

Table 4: *MLE results of the variance parameters.*

Variable	Parameters	Coefficient
$(Sigma)^2$	σ^2	0.002000
(Sigma) v^2	σ_v^2	0.000841
(Sigma) u^2	σ_u^2	0.001159
Gamma (σ_u^2/σ^2)	γ.	0.579366

Source: *Estimated from Survey data (2016)*

Table 5: *Frequency distribution of tomato farms on the basis of technical efficiency.*

TE	Frequency	Percentage
<0.9	31.0	26
0.9-0.95	46.0	38
0.96>	43.0	36
Max	0.99	-
Min	0.83	-
Mean	0.93	-
Efficiency gap	0.16	-

Source: *Estimated from Survey data (2016)*

Frequency Distribution of the Technical Efficiency of the Farmers in the Study Area

Table 5 shows the frequency distribution of the technical efficiency of the farmers. The technical efficiency ranges from 0.83 to 0.99 with the mean technical efficiency of 0.93. Those farmers whose technical efficiency were less than 0.9, 0.9-0.95 and above 0.95 were 31, 46 and 43, respectively, with a percentage of 26, 38 and 36, respectively.

Frequency Distribution of the Technical Efficiency of Tomato Growers According to Socio Economic Characteristics

Frequency distribution of TE on the basis of age: Table 6 shows the frequency distribution of TE of tomato growers on the behalf of their age. Results shows that 34, 53 and 26 percent of the farmer have age of less than 30 years, 30-40 and above 40 years, respectively, with the mean technical efficiency of 0.92, 0.92 and 0.94, respectively. The frequency of the farmers whose age were less than 30, 30-40 and above 40 years were 41, 53 and 26 in number out of 120.

Frequency distribution of TE on the basis experience: It is common that a person with high experience is more efficient than those of low experience. Persons with more experience are technically more efficient than those of low experience because of the repetition of the process again and again. So we can say that experience has an indirect relation with the technical inefficiency, as the experience increase technical efficiency will also increase and technical inefficiency will decrease.

Table 6: *Frequency distribution of TE on age basis.*

Age	Frequency	Percentage	TE
<30	41	34	0.92
30-40	53	44	0.92
40>	26	22	0.94

Source: *Estimated from Survey data (2016)*

Table 7: *Frequency distribution of TE on the basis of experience.*

Experience	Frequency	Percentage	TE
<10 years	24	20	0.88
12-18years	77	64	0.93
18> years	19	16	0.97

Source: *Estimated from Survey data (2016)*

Table 7 shows the frequency distribution of TE of tomato growers on the basis of experience. Results showed that farmers with the experience of less than 10, 12-18 and greater than 18 years were 20, 64, and 16 percent, respectively, with the mean technical efficiency of 0.88, 0.93 and 0.97, respectively. The frequency of the farmers whose experience was 10, 12-18 and greater than 18 year were 24, 77 and 19 out of 120.

Table 8: *Frequency distribution of TE of tomato growers on the basis of education.*

Education	Frequency	Percentage	TE
Illiterate	25	21	0.92
Primary	24	20	0.92
Middle	30	25	0.93
High	33	27	0.93
Above high	8.0	7.0	0.938

Source: *Estimated from Survey data (2016)*

Frequency distribution of TE on the basis education: Table 8 shows the frequency distribution of TE of tomato growers on the basis of education level. The result shows that farmers with no education, primary level, middle, high and above high level were 25 (21 %), 24 (20%), 30 (25%), 33(27%) and 8(7%) in number, respectively, with the mean technical efficiency of

0.92, 0.92, 0.93, 0.93 and 0.938, respectively.

Frequency distribution of TE on the basis tenure status: Table 9 shows the frequency distribution of TE of tomato growers on the basis of tenure status. Results show that 57 percent of the tomato growers were owner and 43 were tenant. The frequency of the farmers who have their own land were 68 and tenant have 52 out of 120 tomato growers.

Table 9: *Frequency distribution of TE on the basis of tenure status.*

Tenure status	Frequency	Percentage	TE
Owner	68	57	0.930
Tenant	52	43	0.931

Source: *Estimated from Survey data (2016)*

Frequency distribution of TE on the basis extension visit: Table 10 shows the Frequency distribution of TE of tomato growers on the basis of extension visit. The results shows that among one hundred and twenty (120) tomato growers thirty six (36) farmers has made extension visit who were thirty (30) percent and whose technical efficiency were 0.93, and eighty four (84) percent of the tomato growers has not made extension visit who were seventy (70) percent with a technical efficiency of 0.92.

Table 10: *Frequency distribution of TE of farmers on the basis of extension visits.*

Extension visit	Frequency	Percentage	TE
Yes	36	30	0.93
No	84	70	0.92

Source: *Estimated from Survey data (2016)*

Table 11: *Comparison of average technical efficiency from various studies using stochastic frontier production function.*

Author	Country	Crops	Mean TE
This study	Pakistan	Tomato	93(%)
Khan and Ghafar (2013)	Pakistan	Tomato	92(%)
Shehu *et al.* (2010)	Nigeria	Yam	95(%)
Hassan and Ahmad (2005)	Pakistan	Wheat	94(%)
Hussaini and Abayomi (2010)	Nigeria	Vegetable Crop	93(%)
Islam *et al.* (2011)	Bangladesh	Garlic	88(%)
Azizi and Moghaddasi (2012)	Iran	Potato	93(%)
Olayiwola (2013)	Nigeria	Soyabean	91(%)

Comparison of Average Technical Efficiency from various Studies using Stochastic Frontier Production Function

Table 11 shows the comparison of the mean technical efficiency of this study with various previous studies conducted in various countries of the world on different crops.

Conclusion

This study was focused to measure the technical efficiency of tomato growers in district Malakand. The findings of this study revealed that the technical efficiency ranges from 0.83 to 0.99 with a mean technical efficiency of 0.93, which shows that farmer in the study area are highly efficient and utilize the resources efficiently. Various inefficiency factors including age, experience, education, extension visit and tenure status were also analyzed to show their effect on the inefficiency. The results shows that age, education, tenure status and extension visit were insignificant while experience have significant effect on the technical inefficiency.

Recommendations

On the basis of this study it is recommended that, i) as the coefficient of seedling was 1.02 which is the elasticity of production that represent first stage of new classical production function. Therefor the farmers in the study area needs to increase the number of seedlings to increase production and efficiency, ii) the estimated coefficient of the irrigation was 0.123 which is statistically significant at 0.01 level of significance, so the farmers in the study area need to increase the application of irrigation in order to increase the productivity and efficiency, iii) in the technical inefficiency model experience was found statistically significant and show negative relationship with technical inefficiency, thus the government needs to provide training and farming practices to improve the productivity.

Authors' Contribution

UW collected and analysed the data and wrote the manuscript. SA provided technical input and helped in writing and editing the manuscript. NAH helped in data collection, data entry, data analysis and interpretation.

Conflict of Interests

Authors have declared no conflict of interest.

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