Measurement of Technical Efficiency and Its Determinants in Wheat Production: The Case of Smallholder Farmers in Wogidi District, South Wollo Zone Ethiopia

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Abstract
Growth in agriculture was one of the major drivers of the remarkable economic growth recorded in Ethiopia in the last decade. The major grain crops grown in Ethiopia are wheat, teff, maize, barley, sorghum and millet. The aim of this study was to determine the level of technical efficiency of smallholder Wheat producers and identify factors affecting technical efficiency of smallholder farmers in Wheat production of Wogidi district, South Wollo Zone, Ethiopia. A three-stage sampling technique was employed to select 123 sample farmers who were interviewed using a structured schedule to obtain data pertaining to Wheat production during 2016/2017 production year. A Cobb-Douglas stochastic frontier production analysis approach with the inefficiency effect model was used to estimate technical efficiency and identify the determinants of efficiency of Wheat producing farmers. The maximum likelihood parameter estimates showed that Wheat output was positively and significantly influenced by area, fertilizer, labor and number of oxen. This would mean that there is a room to increase Wheat output from the existing level if farmers are able to use these input variables in an efficient manner. The estimated mean levels of technical efficiency of the sample farmers were about 82%. This shows that there exists a possibility to increase the level of Wheat output by 18% through efficiently utilizing the existing resources. The estimated stochastic production frontier model together with the inefficiency parameters showed that, age, education, improved seed, training and credit were found to have negative and significant effect on technical inefficiency while farm size was found to have positive and significant effect on technical inefficiency of Wheat production. Hence, local government should provide necessary supports such as formal as well as informal education, training, credit, improved seed and timely supply of fertilizer.
Keywords: Wegidi district; stochastic frontier analysis; Technical efficiency; Wheat

1. INTRODUCTION

Agriculture in Ethiopia is dominated by smallholder farming households, which cultivated 94% of the national cropped area in 2013/14 (CSA, 2014a). A large majority of Ethiopians and the poor living in rural areas are deriving their livelihood from agriculture. The proportion of the population of Ethiopia residing in rural areas in 2040 is predicted to be nearly 70%, when there will be 40 percent more rural residents (UN, 2014).

Growth in agriculture was one of the major drivers of the remarkable economic growth recorded in Ethiopia in the last decade (National Bank of Ethiopia, 2014). The major grain crops grown in Ethiopia are wheat, *teff* , maize, barley, sorghum and millet. Out of the total grain production, cereals account for roughly 60% of rural employment and 80% of total cultivated land (Abu and Quentin, 2013).

In the crop production sub-sector, cereals are the dominant food grains. The major crops occupy over 8 million hectares of land with an estimated annual production of about 12 million tons (CSA, 2015). The potential to increase productivity of these crops is very high as it has been demonstrated and realized by recent extension activities in different parts of the country. However, population expansion, low productivity due to lack of technology transfer and decreasing availability of arable land are the major contributors to the current food shortage in Ethiopia (Alemu *et al*., 2018). According to CSA (2015), Ethiopian population will exceed 126 million by the year 2030. This increase in population will impose additional stress on the already depleted resources of land, water, food and energy.

In Ethiopia agricultural production and productivity is very low and the growth in agricultural output has barely kept pace with the growth in population. The high potential areas of Ethiopia can produce enough grains to meet the needs of the people in the deficit areas. However, the inefficient agricultural systems and differences in efficiency of production discourage farmers to produce more (Alemu *et al*., 2018).

Gains in agricultural output through improvement of efficiency levels are becoming particularly important now a day. The opportunities to increase farm production by bringing additional forest land into cultivation or by increasing the utilization of the physical resources have been diminishing. In addition, eliminating existing inefficiency among farmers can prove to be more cost effective than introducing new technologies as a means of increasing agricultural output and farm household income (Wondimu *et al.*, 2014).

The smallholder farmers in the north eastern Ethiopia are poor, individual land holding ranges between 0.5 and 2.5 hectares, large family sizes, land productivity is low and household food requirements are not fully met.

The smallholder cereal-based farming systems have also remained traditional and non-commercial oriented. Thus, the system is unable to sustain the ever increasing population with food and energy demands. Therefore, an ever increasing population pressure and environmental degradation followed by declining productivity and expansion of marginal agricultural lands necessitates farmers either to use modern technologies or need to use resources efficiently in order to optimize outputs in the North Eastern Ethiopia (Mekonnen *et al.*, 2015).

According to previous researches in Ethiopia (for example Hassen, 2014; Wondimu and Hassen, 2014, Alemu *et al*., 2018), there also exists a wide cereal yield gap among the farmers that might be attributed to many factors such as lack of knowledge and information on how to use new crop technologies, poor management, biotic, climate factors and more others (Mesay *et al*., 2013; Sisaye *et al*., 2015). Because of the scanty resources that are on ground, recently it is getting importance to use these resources at the optimum level which can be determined by efficiency searches (Gebregziabher *et al*., 2012). Thus, increasing crop production and productivity among smallholder producers requires a good knowledge of the current efficiency/inefficiency level inherent in the sector as well as factors responsible for this level of efficiency/inefficiency (Essa *et al*., 2012).

Despite its potential, Wogidi District's agricultural productivity is declining (CSA, 2012). Therefore, the need for the efficient allocation of productive resources cannot be overemphasized. However, in areas where there is inefficiency trying to introduce new technology may not bring the expected impact, unless factors associated with inefficiency among farmers are indentified and acted upon. The existence of inefficiency in production comes from inefficient use of scarce resources. The measurement of efficiency in agricultural production is important issue for agricultural development and it gives useful information for making relevant decision in the use of these scare resources and for reformulating agricultural policies. Moreover, since social development is dynamic, it is imperative to update the information based on the current productivity of farmers. However, the productivity of agricultural system in the study area is very low. The poor production and productivity of crop and livestock resulted in food insecurity. The specific objectives of the study were to: (1) estimate the level of technical efficiency in Wheat production of smallholder farmers in the study area, (2) identify factors affecting the level of technical efficiency in Wheat production among farmers in the study area.

2. RESEARCH METHODOLGY

2.1 Description of the Study Area

The study was carried out in Wegidi District. It is located in the North Eastern part of Amhara National Regional State, South Wollo Zone, Ethiopia. Wogidi is one of the woredas in the Amhara Region of Ethiopia. Part of the South Wollo Zone, Wogidi is bordered on the south by the Walaqa River which separates it from the Oromia Region, on the west by the Abay River which separates it from the Misraq Gojjam Zone, on the north by Debre Sina, on the northeast by Legambo, and on the east by Kelala. The major town in Wegde is Mahdere Selam.Wegde lies on the lower portion of a spur running from Mount Amba Ferit southwest to the confluence of the Walaqa with the Abay; altitudes range from 500 meters above sea level to 2700 meters at the northeast point of the woreda (CSA, 2012).

2.2 Data Types, Sources and Methods of Data Collection

Both primary and secondary data as well as quantitative and qualitative data were employed for this study. In the study cross-sectional household data of 2016/2017 main harvest cropping season was used. Data for input (such as land, human labor, oxen labor, fertilizer, and seed amount) were used and output of wheat production was collected from the specified period of time. Data on input use and outputs were collected in local units and converting into standard units. In addition, primary data were collected by interviewing the selected wheat producing farmers and variables that cause variation in production efficiency like age, education, household size, extension contact, gender, and the like. In addition, socio-economic variables such as demographic data, credit access, livestock holding, wealth indicators and institutional data were collected. On the other hand, data related to Wheat production trend, input supply and extension services were collected to clarify and support analysis and interpretation of primary data.

2.3 Sampling Technique and Sample Size

In order to select sample households, three-stage sampling technique where combinations of purposive and simple random sampling techniques were used to select the district and sample household heads. Out of the 20 rural districts in South Wello Zone, Wogidi district was purposively selected due to long year experience in wheat production and extent of wheat production in South Wollo Zone. This information is obtained from South Wello Zone Agricultural Office. In the first stage, out of the three agro-ecologies of the district *weyina dega* was selected purposively due to the major wheat production part of the district. In the second stage, out of the total *weyina dega kebeles*, three *kebeles* were selected by simple random sampling. In the third stage, 123 sample wheat producing farmers were selected using simple random sampling technique from each selected *kebeles* based on probability proportion to size sampling technique.

2.4 Specification of the Empirical Model

Stochastic production frontier is the most appropriate technique for efficiency studies which have a probability of being affected by factors beyond control of decision making unit. This is because of the fact that this technique accounts for measuring inefficiency as a result of these factors and technical errors occurring during measurement and observation. *Wheat* production at the study area is likely to be affected by natural hazards, unexpected weather conditions, pest and disease occurrence which are beyond the control of the farmers. In addition, measurement and observational errors could also occur during data collection. So as to capture effects of these errors, this study used stochastic frontier model.

Stochastic frontier analysis was simultaneously introduced by Aigner *et al*. (1977) and Meeusen and Van der Broeck (1977). The stochastic frontier approach splits the deviation (error term) into two parts to accommodate factors which are purely random and are out of the control of the firm. One component is the technical inefficiency of a firm and the other component is random shocks (white noise) such as bad weather, measurement error, and omission of variables and so on.

The model is expressed as:

$$\ln Yi = \beta_0 + \sum \beta_i \ln X_{ij} + \exp^{ei} \quad (1)$$

Where:

ln = denotes the natural logarithm; i = represent the i^{th} farmer in the sample, Y_i = represents yield of *Wheat* output of the i^{th} farmer (Qt), X_{ij} = refers to the farm inputs of the i^{th} farmer, $e_i = v_i - u_i$ which is the residual random term composed of two elements v_i and u_i.

The v_i is a symmetric component and permits a random variation in output due to factors such as weather, omitted variables and other exogenous shocks.

2.5 Selection of the Functional Form

Another issue surrounding parametric frontiers relates to the choice of functional form. Among the possible algebraic forms, Cobb-Douglas and the translog functions have been the most widely used functional forms in most empirical production analysis studies. Each functional form has its own advantage and limitations. Some researchers argue that Cobb-Douglas functional form has advantages over the other functional forms in that it provides a comparison between adequate fit of the data and computational feasibility. It is also convenient in interpreting elasticity of production and it is very parsimonious with respect to degrees of freedom. So, it is widely used in the frontier production function studies as stated in Hazarika and Subramanian, (1999).

In addition, due to its simplicity features, the Cobb-Douglas functional form has been commonly used in most empirical estimation of frontier models. This simplicity however, is associated with some restrictive features in that it assumes constant elasticity, constant return to scale for all firms/farms and elasticity of substitution are equal to one (Coelli *et al*., 1998). In addition, the Cobb-Douglas functional form is also convenient in interpreting elasticity of production and it is very parsimonious with respect to degrees of freedom. Therefore, that is why Cobb-Douglas functional form was used in this study.

The technical efficiency of Wheat production in Wogidi district was measured by considering the output obtained per household head as the dependent variable. The output of Wheat from the 2016/17 production year was measured in quintals. The independent variables were the inputs (factors) of production used in the same production year. Accordingly the relevant inputs which were considered were as follow:

Y = the total amount of Wheat produced in quintal by the i^{th} farmer;
X_1= the total number of oxen-power used for Wheat production in oxen-days by the i^{th} farmer;
X_2=the total labor (family and hired) in man-days used for Wheat production by the i^{th} farmer;
X_3=the total quantity of Wheat seed in kilogram used for Wheat production by the i^{th} farmer;
X_4 = the total amount of fertilizer in kilogram applied for Wheat production by the i^{th} farmer;
X_5= the total area covered by Wheat in hectares of the i^{th} farmer;

The Cobb-Douglas form of stochastic frontier production is stated as follows;

$$lnY = \beta_0 + \sum_{j=1}^{5} \beta_j lnX_{ij} + V_i - U_i \quad (2)$$

Where:

For i^{th} farmer, Y is the total quantity of Wheat produced, x is the quantity of input j used in the production process including Oxen labor, Human labor, land, quantity of seed and quantity of fertilizer; V_j is the two-sided error term and U_j is the one-sided error term (technical inefficiency effects).

The inefficiency model was estimated as the equation given below.

$$\ln Y = \delta_0 + \sum_{n=1}^{13} \delta_n Z_{ni} \quad (3)$$

Zi is the variable in the inefficiency model

The technical inefficiency (u_i) could be estimated by subtracting TE from unity. The function determining the technical inefficiency effect is defined in its general form as a linear function of socio-economic and management factors.

It can be defined in the following equation:

$$U_i = \delta_0 + \sum_{k=1}^{13} \delta_K Z_{jk} \quad (4)$$

Where,

u_i is the technical inefficiency effect,

δ_k is the coefficient of explanatory variables,

The Z_i variables represent the socio-economic characteristics of the farm explaining inefficiency of the i[th] farmer. As a result the technical inefficiency was explained by the following determinants:

Z_{i1} = Age of the household head (years); Z_{i2}= Sex of the household (a dummy variable. It takes a value of 1if male, 0 otherwise; Z_{i3} = Household size (total numbers of family member who lives in one roof); Z_{i4} = Education (number of years of schooling of the farmer); Z_{i5} = Farm size measured by hectare; Z_{i6} = Land fragmentation (it include the number of locations of different plots); Z_{i7} = Distance to Wheat plot from residence measured in km; Z_{i8} = Number of livestock measured by TLU; Z_{i9} = Training (A dummy variable. It takes a value of 1 if yes, 0 otherwise); Z_{i10} = Extension contact (frequency of extension service during the farming season); Z_{i11} = off/nonfarm income (total amount of off/nonfarm income in birr); Z_{i12} = credit (total amount of credit received during the production season);

Z_{i13} = Improved seed (A dummy variable. It takes a value of 1 if yes, 0 otherwise).

3. RESULTS AND DISCUSSION

3.1 Maximum Likelihood Estimation of Parameters

The ML estimates of the parameters of the frontier production functions and inefficiency effects are presented in Table 2. The coefficients of the input variables were estimated under the full frontier production function (MLE). During the estimation, a single estimation procedure was applied using the Cobb-Douglas functional form. The computer program FRONTIER version 4.1 gave the value of the parameter estimations for the frontier model and the value of δ^2. Moreover it gave the value of Log-likelihood function for the stochastic production function. The Maximum Likelihood estimates of the parameter of SPF functions together with the inefficiency effects model are presented in Table 1 below.

Out of the total five variables considered in the production function, four (land, labor, oxen power and fertilizer) had a significant effect in explaining the variation in *Wheat* production among farmers. The coefficients of production function variables were positive. The coefficients of land, oxen power and fertilizer were significant at 1% level of significance, and the coefficient of labor was significant at 10% level of significance. This informs that they were significantly different from zero and hence these variables were important in explaining Wheat production in the study area. The positive production elasticity with respect to land, fertilizer, oxen and labor imply that as each of these variables increase, Wheat output will increase. On average, as the farmer increases area allocated to Wheat, amount of chemical fertilizer application, labor and oxen power for the production of Wheat by 1% each, he/she can increase the level of Wheat output by 0.859, 0.341, 0.087and 0.023percent, respectively.

Table 1. Maximum likelihood estimate for Cobb-Douglas production function

Variable	Maximum likelihood estimate		
	Coefficient	SE	Z- value
Intercept	1.254***	0.289	4.33
lnOxen	0.023***	0.009	2.56
lnLabor	0.087*	0.049	1.78
lnSeed	0 .023	0 .031	0'74
lnFertilizer	0.341***	0.041	6.62
lnArea	0.859***	0.188	8.32
Sigma-squared	0.27***	0.082	3.28
Log likelihood	-53.28		
Gamma	0.756		
Return to scale	1.31		
Mean technical efficiency	0.82		
Total sample size	123		

***, * represents significance at 1% and 10%probability levels, respectively
Source: Own Survey, 2018

Summing the individual elasticity yields a scale elasticity of 1.31. This indicates that farmers are facing increasing returns to scale (Table 1) and depicts that there is potential for Wheat producers to increase their production. In other words, they are not efficient in allocation of resource this implies production is inefficient moreover there is a room to increase production with an increasing rate.

3.2 Determinant of Technical Efficiency

The focus of this analysis was to provide an empirical evidence of the determinant productivity variability/inefficiency gaps among smallholder Wheat farmers in the study area. Merely having knowledge that farmers were technically inefficient might not be useful unless the sources of the inefficiency are identified. Thus, in the second stage of this analysis, the study investigated farm and farmer-specific attributes that had impact on smallholders` technical efficiency.

Accordingly, the negative and significant coefficients of age of the household head, education, improved seed, training and credit indicate that improving these factors contribute to reducing technical inefficiency. Whereas, the positive and significant variable such as farm size, affect the technical inefficiency positively that is increases in the magnitude of these factors aggravate the technical inefficiency level. The implications of significant variables on the technical inefficiency of the farmers in the study area were discussed here under.

Table 2. Maximum-likelihood estimates of technical inefficiency determinants

Variables	Coefficients	SE	Z- value
Constant	0.983***	0.202	4.87
Sex	-0.006**	0.003	-2.01
Age	-0.014**	0.007	-2.00
Household size	-0 .047	0.083	-0.57
Education	-0 .238***	0.075	-3.17
Farm size	0.076***	0.026	2.92
Improved seed	-0.109***	0.019	-5.74
Off/non farm income	0.001	0.006	0.167
Training	-0.327*	0.193	-1.69
Credit	-0 .165**	0.075	-2.20
Extension contact	-0.001	0.015	-0.067
Land fragmentation	0.079	0.050	1.58
Distance to Wheat field	0.031	0.023	1.34
TLU	0 .0089	0.010	0.89
Log likelihood	-53.28		
Total sample size	123		

*, **, *** represents significant at 10%, 5% and 1% probability level respectively
Source: Own Survey, 2018

Age of farm household heads: The age of the household is the proxy for the experience of the household head in farming. The result indicated that age of the household heads influenced inefficiency negatively at 5% level of significance. This suggested that older farmers were more efficient than their young counterparts. The reason for this may probably be that the farmers become more skill full as they grow older due to cumulative farming experiences (Liu and Zhung, 2000). Moreover increase in farming experiences leads to a better assessment of the important and complexities of good farming decision-making including efficient use of input. This result was consistent with the arguments by Mesay *et al*. (2013) they indicated that, since farming as any other professions needs accumulated knowledge, skill and physical capability, it is decisive in determining efficiency. The knowledge, the skills as well as the physical capability of farmers is likely to increase as their age increases.

Education: Education enhances the acquisition and utilization of information on improved technology by the farmers. In this study, education measured in years of formal schooling, as expected, the sign of education was negative effect on technical inefficiency at 1% level of significance. This implying that less educated farmers are not technically efficient than those that have relatively more education. This could be because; educated farmers have the ability to use information from various sources and can apply the new information and technologies on their farm that would increase outputs of Wheat. In general, more educated farmers were able to perceive, interpret and respond to new information and adopt improved technologies such as fertilizers, pesticides and planting materials much faster than their counterparts. This result was in line with the findings of Tefera *et al*. (2014), Ali and Khan (2014), Hailemariam (2015), Fantu *et al*. (2015b), Ouedraogo (2015) and Alemu *et al*., 2018) who stated that an increase in human capital will augment the productivity of farmers.

Farm size: It is measured as total land cultivated by the farmer including those rented and shared in. In this study, it was hypothesized that farm size affects inefficiency positively. As the farm size of a farmer increases the managing ability of him/her will decrease given the level of technology, this lead to reduce the efficiency of the farmer. Accordingly, the estimated result coincides with the expectation and that coefficients of this inefficiency variable found positive and statistically significant. That means total area cultivated by a household affected technical inefficiency level positively and significantly at 1% level of significance. This shows that a household operating on large area is less efficient than a household with small land holding size. This might be because an existence of increased in area cultivated might entail that the farmer might not be able to carry out important crop husbandry practices that need to be done on time, given his limited access to resources. As a result, with increase farm holding size the technical inefficiency of the farmer might increase. This finding was in line with results obtained by Sultan and Ahmed (2014) and Alemu *et al*. (2018)

Improved seed: Use of improved seeds negatively and significantly affected farmers` technical inefficiency in Wheat production at 1% level of significance. Thus, production of Wheat through the use of more of improved Wheat seeds was more efficient compared to using local seeds. This was in agreement with the findings of Sultan and Ahmed (2014). Moreover, the negative sign of the estimated coefficients had important implications on the technical inefficiency of the Wheat farmers in the study area. It means that the tendency for any Wheat farmers to increase his production depend on the type and quality of improved seed available at the right time of sowing.

Training: Training is an important tool in building the managerial capacity of the household head. Household's head that get training related with crop production and marketing or any related agricultural training are hypothesized to be more efficient than those who did not receive training. Training of farmers on Wheat crop was important because it could improve farmers` skill regarding production practices and related aspects. A number of farmers in the study areas received training on Wheat for few days mainly on production practices and importance of using improved package. The dummy coefficient of training was negative and significant in the technical inefficiency model of *Wheat* production at 10% level of significance. This implied that technical inefficiency effect decreases with farmers having training on Wheat. It may also be concluded that farmers with training on Wheat tended to have lower inefficiency effects than farmers without training. That is, farmers with training were technically more efficient than farmers without training. This result is in line with the arguments by Beyan *et al*. (2013) and Michael and James (2017) who indicated that training given outside locality relatively for longer period of time determined inefficiency negatively and significantly.

Credit: It is an important element in agricultural production systems. It allows producer to satisfy their cash needs induced by the production cycle. Amount of credit increases farmers' efficiency because it temporarily solves shortage of liquidity/working capital. In this study, amount of credit was hypothesized in such a way that farmers who get more amount of credit at the given production season from either formal or informal sources were expected to be more efficient than those who get less amount of credit. In this study, amount of credit affected inefficiency of farmers negatively and significantly at 5% level of significance. This implies that credit availability shifts the cash constraint outwards and thus enables farmers to make timely purchases of inputs that they cannot afford otherwise from their own resources and enhances the use of agricultural inputs that leads to more efficiency. The empirical studies conducted by Musa *et al.* (2014) and Biam *et al.* (2016) found positive and significant relationship between credit and farmers` technical efficiency which was in line with this study.

4. Conclusions and Recommendations

The implication of this study is that, technical efficiency of the farmers can be increased through better allocation of the available resources especially: land, oxen power, labor, and fertilizer. Thus, local government or other concerned bodies in the developmental activities working with the view to boost production efficiency of the farmers in the study area should work on improving productivity of farmers by giving especial emphasis for significant factors of production.

Moreover, age should be considered in increasing resource use efficiency and agricultural productivity. This is because results showed that younger farmers are technically more inefficient than older ones. It implies that there should be policies to improve resource use efficiency of younger farmers and encourage them to be in farming activities by providing them incentives. Continues trainings on the agricultural business environment and follow up during agricultural operation for younger farmers should be provided. However, this should not be at the expense of older ones.

Training determined technical efficiency positively and significantly in *Wheat* producing farmers. Provision of training for farmers to improve their skills in use of improved seed, resource management, post-harvest handling, and general farm management capabilities will increase their farm productivity. In addition to strengthening the practical training provided to farmers, efforts should be made to train farmers for relatively longer period of time using the already constructed farmers` training centers and agriculture research demonstration centers.

The amount of credit received was found to positively and significantly influence household technical efficiency level. But Smallholder framers in the study area have financial constraints. This could imply that households needed external financial sources to solve their own financial constraints. Therefore, *Amhara* Credit and Saving Institution (ACSI) have mandated to provide relatively high amount of credit for farmers should be encouraged and strengthen to deliver more than this and also harmonization loan delivery with the time input required and loan payment plans with harvesting seasons. In addition to this the regional government should intervene to strength the operation of rural saving and credit institutions at village level and creates awareness for those farmers to improve their saving habits so as to improve their asset formation.

Total farm size was negatively and statistical significantly related with technical efficiency in Wheat production. This may be due to the nature of more time requirement of Wheat farming and demanding close supervision of the farm operator which share significant part of his/her time. Hence, smallholder farmers have a limitation of resources which are used for agriculture production on his/her available farm land in the given operation calendar, his/her production performance affected negatively. So, this gives a direction to use technologies like tractor, combiner for facilitating the farm operations work within the specified operational calendar. This in turn improves the production of the farmers due to using better technology which shifts the production frontier outward. Therefore, it would be better if the regional government or concerned body facilitate such machinery services either on credit bases or cooperative rendering rental service.

Those farmers that are more educated are relatively more technically efficient than less educated ones, in the study area. This may be due to the fact that more educated farmers have access to information and better communication media that helps them to use modern Wheat production technologies. Education is fundamental in improving the technical efficiency of farmers. Therefore, the regional governments need to strengthen farmers' access to education that could be implemented through expansion of farmers training center or expansion of formal and non- formal education in the area.

Improved Wheat seed had a significant and negative effect on technical inefficiency of Wheat production. Hence, researchers and extension agent should improved the awareness of farmers to use improved Wheat seed and efforts should be made to access different types of high yielding Wheat seed before the starting of sowing date.

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