Global Science Research Journals

Available Online at

www.globalscienceresearchjournals.org

ISSN- 2408-5480 Vol 9(4)

Research Article OpenAccess

Economic Efficiency of Wheat Production: The Case of Angecha District, Southern Ethiopia

Alemayehu Bashe*

Agricultural Research,
Southern Agricultural Research Institute (SARI)
Awasa, Ethiopia
*Corresponding author. E-mail: bashalemayehu2008@gmail.com
Received 05 August 2021; **Accepted** 12 August, 2021; **Published** 26 August 2021

ABSTRACT

Production improvement through the use of improved technologies and increasing efficiency of inputs in cereal production in general and wheat production in particular might be an important alternative to settle food security problem in Ethiopia. However, the potential to increase the production by new introduced technologies could be less and less through time due to scarcity of resources. The efficiency of producers that they could not use available resources on hand was taken as a great attention. In this study, it was aimed to analyze the levels of technical, allocate and economic efficiencies of wheat producers; and determine factors for inefficiency in farmers' wheat production by using cross sectional data from randomly selected 123 households during 2018/19 production year. Both primary and secondary data sources were used to undertake the study. Stochastic production frontier approach was used to estimate the level of efficiencies and ordinary least square estimation was used to identify factors that affect inefficiencies of sample households in study area. The regression model result indicated that input variables like land and seed were the significant inputs to increase the yield of wheat output. 55.63, 55.47and 30.85% were the estimated mean values of technical, allocate and economic efficiencies respectively, which indicate the presence of inefficiency in wheat production in the study area. Model result indicated that technical inefficiency positively and significantly affected by gender of the household head, and negatively affected by age, farm experience, land fragmentation, credit access and total livestock unit. Similarly, allocate inefficiency positively and significantly affected by gender and negatively by credit access and total livestock holdings. In addition, economic inefficiency negatively and significantly affected by credit access and total livestock holdings. The policy measures implied from the results include: working further for quality seed and sustainable land management, expansion of gender sensitive and youth based

strengthening of the extension services and trainings, strengthening the existing credit institutions services, and expansion of new livestock technologies in the study area.

Keywords: Angecha, Economic efficiency, Frontier, Households', Wheat production

INTRODUCTION

In sub-Saharan Africa, Ethiopia is the second largest producer of wheat, following South Africa. It is a staple food in the diets of several Ethiopian, providing about 15% of the caloric intake, hence increasing productivity in smallholder agriculture is government top priority, recognizing the importance of the smallholder sub-sector, the high prevalence of rural poverty and the large productivity gap.

The agricultural sector in Ethiopia is explained by low productivity, caused by combination: of natural hazards, demographic factors, socio-economic factors; lack of knowledge on the efficient utilization of available and limited resources, poor and backward technologies and limited use of modern agricultural technologies [1]. During the past years, the government and NGOs have undertaken various attempts to enhance agricultural productivity particularly that of cereal crops so as to achieve food security and to reduce poverty in the country.

Researchers from the International Food Policy Research Institute (IFPRI) collected wheat growing farmer survey to how wheat growers in Ethiopia respond to the new promotional package rolled out by the Ministry of Agriculture (MoA) and Ethiopian Agricultural Transformation Agency (ATA). The purpose of the package is to help wheat farmers increase their crop yields (IFPRI, 2015). There are about 4.7 million wheat farmers in Ethiopia. Of these, more than three-quarters (78 percent) live in Oromia and Amhara. In contrast, the smallest areas cultivated with wheat are found in SNNPR, where the average is just 0.19 ha/farm, which is dominated by small-scale farmers.

Economic efficiency is composed of two components; technical component and allocative component. The technical component refers to the ability to avoid waste, either by producing as much output as technology and input usage allow or by using as little input as required by technology and output production. And the allocate component refers to the ability to combine inputs and/or outputs in optimal proportions in light of prevailing prices. Technical efficiency (that part of efficiency which explains the physical performance of a firm) measures the relative ability of a farmer to get the maximum possible output at a given input or set of inputs.

In SNNPR, the total area covered by wheat was127,246.59 ha produced by 525,386.0 smallholders with the total production of 3,391,959.51quintal and average productivity was 26.66qt/ha (CSA, 2017/18). According to Angecha District, Wheat is the first and major cereal crop with a total area of 4567.5ha. It primarily produced as a cash crop in the district.

Objective of the study

Due to above mentioned reasons and others, it was aimed that there was no literature and past research conducted in the study area, but the area was well known in maximum production of wheat both at zonal and regional level [2]. So that it was aimed to conduct economic efficiency in terms of productive and cost efficiency and to document the data as reference to scholars, stakeholders, governments and non-governmental institutions by extracting full of information regarding the economic efficiency through estimating the level of technical, allocative and economic efficiencies in wheat production and identifying the major determinants that lead variations in efficiencies in wheat producer households in the study area.

METHODOLOGY

Description of the study area

The study was conducted in Angecha District, Kambata Tambaro Zone of South nation nationalities and people's region of Ethiopia. Part of Kembata Tembaro Zone, Angecha is bordered on north by Hadya Zone, on west by Doyogena, on south by Kacha Bira, on the east by Damboya, and on the southeast by Kedida Gamela. The area of the District is mainly of 35% dega, 65% woina-dega and its altitude ranging from 1900-3018 meter above sea level. The area wa characterized with Minimum and maximum temperature of 12 and 16°C. The District receives an average annual rain fall of 1250ml. Angecha has 77 km of all-weather roads and 45 of dry weather roads. The area practice mixed crop-livestock farming system. Wheat is the first major cereal crop followed by teff, faba bean, field pea, barley and sorghum.

Sampling technique and sample size determination

Two stages random sampling procedures were employed to draw a representative sample. In the first stage, two kebeles out of the 10 maximum wheat producing kebeles in the district were randomly selected. In the second stage, 123 sample farmers were selected using simple random sampling technique based on probability proportional to the size of wheat producers in each of two selected kebeles.

Data collection, type and sources

Qualitative and quantitative data were used in order to meet the objectives. Data was collected from both primary and secondary data sources. The primary data were obtained through structured questionnaire designed that was administered by the trained enumerators. The questionnaire was pre-tested and important corrections were made before direct use. Secondary data were also collected from bureau of agriculture of the district and other relevant sources.

Methods of data analysis

Both descriptive and econometric analysis was used to narrate the data. Descriptive statistics, mean, minimum, maximum, standard deviations, frequency and percentage were used. Most empirical studies on efficiency in Ethiopia were analyzed using stochastic production frontier method. This estimation procedure guarantees that the assumption of independent distribution of the inefficiency

error term is not violated. The maximum likelihood estimation of the stochastic frontier model yields the estimate for beta (β), sigma squared (σ2) and gamma (γ), and are variance parameters; γ value measures the total deviation of observed output from frontier output. The study used the parameterization following and is given as, $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and, γ = $\sigma_u^2/\sigma_v^2 + \sigma_u^2$ where the gamma lies between zero and one (0 ≤ γ ≤ 1). If the value is very close to zero, then the deviations are due to the result of random factors and/or if the value is close to 1, then the deviations are due to inefficiency factors from the frontier function.

RESULTS AND DISCUSSION

Table 1: Descriptive summary of variables used in production and cost functions of wheat (N=123).

Variables	Unit	Min	Max	Mean	Std. Dev
Land	Ha	0.125	2	0.52	0.372203
Yield	Qt.	0.25	52	10.05	8.84937
Seed	Kg	12.5	200	53.75	33.5558
NPS	Kg	0.0001	300	61.03	41.24759
Urea	Kg	0	300	74.39	64.78026
Labour	Man-days	4	101	30.02	15.226
Oxen	Oxen-days	6	44	16.94	6.6891
Total cost of production	Birr	909.5	12230	3950.7	1828.485
cost of seed	Birr	250	3000	798.28	504.1127
cost of NPS	Birr	0	3600	742.857	509.0636
Cost	Birr	112	3600	775.5907	706.7171
Cost of labor	Birr	80	3800	955.305	697.1267
Cost of oxen	Birr	90	2050	591.11	265.694
Cost of land	Birr	7.8	480	87.65752	77.01

Table 2: Socioeconomic characteristics of sampled households.

Variables	Min	Max	Mean	Std. Dev
Age of household head in (years)	21	70	44.76	12.41
Family size in (ME)	1.2	12.6	4.92	2.05
Education level of household head in (years of schooling)	0	13	5.72	3.92
Farming experience of household head in (years)	1	50	22.62	11.55
Total land owned in household head in (ha)	0.25	3	0.93	0.56
Land fragmentation of household in (number)	0	7	2.22	1.16
Livestock owned in (TLU)	0	19	7.03	3.53

Table 3: Summary of dummy variables in used in the model.

Variables	Description	Frequency	Percentage
Gender of household head	Male(0)	109	88.6
	Female	14	11.4
Access to extension service	Yes (1)	104	84.6
	No	19	15.4
Participation in off/non-farm activities	Yes (1)	31	25.2
	No	92	74.8
Credit utilization	Yes (1)	56	54.5
	No	67	45.5
Perception to fertility status of soil	Yes (fertile) (1)	109	88.6
	No (infertile)	14	11.4

Table 4: Summary of level of efficiencies in sample households.

Efficiencies	Min	Max	Mean	Std. Dev
TE	0.06	0.88	0.5563	0.19008
AE	0.06	0.97	0.5547	0.21017
EE	0.01	0.61	0.3085	0.14561

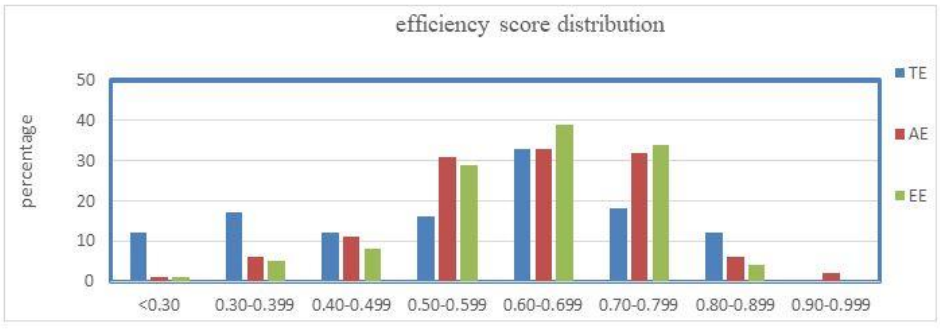

Figure 1: Frequency of efficiency score distribution of technical, allocative and economic efficiencies.

The coefficient of farming experience of farm household on wheat production negatively affects the TE inefficiencies of farmers at 5% significant level. Its negative sign might indicate that those farmers having high experiences of farming were less inefficient and responsive for modern inputs

combination from their long term farm proximity and maximize output. There is ease access to them experience input combination and there by maximizing output from them.

Scattered and fragmented land held by farmers was believed to affect inefficiency negatively, Farmers with more fragmented land (measured by the number of plots) are likely to be less inefficient than a farmer who has a few number of plots owned. The logical reasoning is that as the number of plots operated by a farmer increases, it becomes farm household only participate on agriculture sector there to focus on production potential and put himself as model and try to manage each plot more efficiently. In addition, a farmer who owned more of farm land may tries to use improved technologies and invest more of his/her resources for production improvement [3]. Credit access has significant and negative effect on all types of inefficiencies of smallholder wheat farmers in the study area. This refers that inefficiencies decrease in credit user households than non-users. The reason could be credit user farmers might spend and use it for wheat production timely and planned way in order for asset accumulation spending to increase the output of wheat production in cost minimizing way.

This is the total livestock holding in terms of Tropical Livestock Unit (TLU). Livestock would support crop production in different ways; they can be source of cash, draft power and manure that will be used to maintain soil fertility. It also serves as shock absorber to an unexpected hazard in crop failure and the main sources of animal labor in crop production [4, 5]. In addition, it indicates the wealth status of household. The number and value of livestock holding was found to be negatively related to technical inefficiency and also other inefficiencies. Due to this, in this study the effect of livestock on efficiency was hypothesized to be positive.

Conclusion and Recommendation

The Cobb-Douglas approach of stochastic production frontier and its dual cost functions were applied from which TE, AE and EE extracted. The result of production function (TE) showed that, two of the factors of production (area and seed) were positively and significantly affect wheat output. In addition results showed that the input variables specified in the model had elastic effect on the output of wheat production. The coefficient calculated was 8.064, indicating increasing returns to scale. The average estimated level of TE, AE and EE of sampled farm households were 55.63%, 55.47% and 30.85% respectively.

This in turn implies that farmers can increase their wheat production on average by 36.78% when they were technically efficient. Similarly, they can reduce their cost by 42.78% given the optimum level of output. Furthermore it implies that the good resource utilizing base, improved efficiency can still be achieved and there exist a potential to increase the gross output and profit with the existing level of factor inputs.

It shows that there is a base for wheat producers to increase wheat output at existing levels of inputs and minimize cost without negotiating yield with present technologies available in the hands of producers. Again; Among 12 explanatory variables hypothesized to determine inefficiencies; age, gender, farm experience, land fragmentation and credit access were found to be statistically

significant to affect the level of technical inefficiency, gender of household head, access to credit service, Total Livestock Unit (TLU) affect allocative inefficiencies and access to credit services and Total livestock unit significantly affect the economic inefficiencies of sample wheat producer households in the study area. Therefore, the policy measures derived from the results include expansion of gender sensitive and youth based strengthening of the extension services and trainings, establish and/or strengthening the existing credit institutions, developing and enhancing land management system and expansion of new livestock technologies in the study area.

REFERENCES

1. Aigner D, Lovell CAK, Schmidt P, et al (1977) Formulation and estimation of stochastic production function models. J Econom. 6:21-37.
2. Ahmed B, Haji J, Geta E, et al. (2013) Analysis of Farm Households' Technical Efficiency in Production of Smallholder Farmers: The Case of Girawa District, Ethiopia. American-Eurasian. J Agric Environ Sci. 13:1615-1621.
3. Battese GE, Coelli TS. (1995) Model for technical efficiency effects in a stochastic frontier production function for panel data. Emp Econom. 20:325-332.
4. Beshir H, Emana B, Kassa B, et al. (2012) Economic efficiency of mixed crop-livestock production system in the North eastern highlands of Ethiopia: the stochastic frontier approach. J Agric Econ Dev. 1:10-20.
5. Debebe S, Haji J, Goshu D, et al. (2015) Technical allocative and economic efficiency among smallholder maize farmers in Southwestern Ethiopia: Parametric approach. J Dev Agric Econ. 7:282-291.