Available online at http://www.journalijdr.com

IJDR

ISSN: 2230-9926

International Journal of Development Research
Vol. 09, Issue, 08, pp. 28905-28908, August, 2019

RESEARCH ARTICLE OPEN ACCESS

IMPACT OF RECEIVING TRAINING ON WHEAT PRODUCTIVITY IN OROMIA REGIONAL STATE, ETHIOPIA

***Tesfaye Haregewoin**

Ethiopian Agricultural Research Council Secretariat

ARTICLE INFO

Article History:

Received 13th May, 2019
Received in revised form
26th June, 2019
Accepted 09th July, 2019
Published online 28th August, 2019

Key Words:

Impact, Training, Productivity, Wheat, Oromia, Ethiopia

ABSTRACT

This study examines the impact of receiving training on wheat productivity using 837 sample farm households in Oromia Regional State, Ethiopia. It employed Propensity score matching (PSM) technique since it is an increasingly utilized standard approach for evaluating impacts using observational data. And the study revealed that receiving training on wheat during the farming season appears to significantly increase productivity on the average by 28 to 36% for farm households in the study area. Thus, the study recommends that giving training on wheat during the farming season could be an effective strategy to enhance productivity and, thereby, production that contributes a lot to the improvement of the livelihood of wheat farmers.

Citation: Tesfaye Haregewoin. 2019. "Impact of receiving training on wheat productivity in oromia regional state, ethiopia", *International Journal of Development Research*, 09, (08), 28905-28908.

INTRODUCTION

Ethiopia is predominantly an agrarian country with 85% of the total population engaged in agriculture and the sector contributes 90% of exports (DMoFA, 2013). The agricultural sector also accounts for 36.3 of the Gross Domestic Product (NBE, 2017). In addition, agriculture is the major source of raw materials to food processing, beverage and textile industries (Endale, 2011). It also contributes almost 90% of the foreign exchange earnings (GebreEyesus, 2015). The lion's share of agricultural sector was crop production, comprising 65.3 percent followed by animal farming & hunting (25.3 percent) and forestry (8.9 percent) (NBE, 2017). Out of the total temporary and permanent crops produced in the country, more than 85% comes from three major food crops; cereals, pulses and oilseeds (Gebru, 2006). Abegaz 2011 claims cereal crops constitute the largest share of farming household's production and consumption activities. Accordingly citing Alemayehuet. al, 2009, only five major cereals; namely, barley, maize, sorghum, teff and wheat, account for about 70% of the area cultivated and 65% of the output produced. According to Wikipedia 2015 the principal grains are teff, wheat, barley, maize, sorghum, and millet among which the first three constitute the staple foods of a good part of the Ethiopian population and are major items in the diet of the pastoralists. Wheat (*Triticumaestivum L.*) is one of the important grain crops produced worldwide (Nigussie *et al.*, 2015) that played a significant role in feeding a hungry world and improving global food security (Ketema and Kassa, 2016). Accordingly citing Shiferaw *et al*. 2013, about 20% of the total dietary calories and proteins worldwide is acquired from wheat. According to Kelemu 2017 citing Shiferaw *et al*. 2011, it has been noted that there has been changes in dietary patterns and a rapid growth in wheat consumption over the past few decades in several countries in sub-Saharan Africa. Only South Africa surpasses Ethiopia in wheat production in sub-Saharan Africa (Nigussie *et al*., 2015). According to Kelemu 2017 citing CSA 2016, wheat is the third largest produced cereal in terms of production with 3,925,174.135 tons in 2013/14 cropping season in Ethiopia and fourth in terms of area coverage with 1,605,653.9 hectares following teff, maize and sorghum. Wheat is also one of the major staple crops in the country in terms of both production and consumption (Kelemu, 2017). According to Kelemu 2017 citing FAO 2014, maize ranks first in the country in terms of calorie intake followed by wheat. Wheat is one of the most important cereal crops consumed in different forms in Ethiopia and the rest of the world (Kelemu, 2017). Wheat yield is only 39% of the level in Egypt and about half of that of China. Therefore improving wheat production and productivity is a

***Corresponding author: Tesfaye Haregewoin,**
Ethiopian Agricultural Research Council Secretariat

key part of the agenda in the Ethiopian government's food security policy programs (Samuel *et al*, 2017). Anderson (2008) showed that agricultural extension implies an organization which supports and facilitates people engaged in agricultural production to obtain skills, information and technologies. No nation throughout the world doubted the role of agricultural extension in the development of agriculture because it has remained one of the prime movers of agricultural productivity and development in rural communities (Anaeto *et al*, 2012). Narman (1991) claims transmitting new techniques to farmers is one of the main tasks of Agricultural Extension Services; and farmers are provided with non-formal training on the use of new production techniques, the economic benefits and financial returns that can be yielded when new techniques are used. According to FAO (2010) improving farming methods and techniques owing to training procedures of agricultural extension brings about a better agricultural productivity for the lives of farmers socially and economically. Rose grant & Cline (2011) also claim that training and development to farmers results in increased local food availability and improved productivity.

It is necessary to appropriately evaluate the efforts and corresponding results of the past few decades in general and of the past recent years in particular in order to create a more fertile ground for better achievement of productivity growth in wheat. In this regard, it is indispensable to undertake different socio-economic studies to provide vital policy and related recommendations. Studies that assess the contribution of agricultural extension services like provision of trainings on agricultural practices for the productivity growth of such important and widely cultivated cereals like wheat in Ethiopia in the past recent years are among studies that can be cited in relation to this. However, studies carried out in the country on this issue are very much limited. Thus, the objective of this study is to identify the impact of receiving training on wheat productivity in Oromia Regional State, Ethiopia.

Analytical framework for evaluation of training impact on wheat productivity

The main challenge in undertaking a trustworthy impact evaluation is the construction of the counterfactual outcome, that is, what would have happened to participants in absence of treatment. Since this counterfactual outcome is never observed, it has to be estimated using statistical and econometric methods. And constructing the counterfactual outcome using propensity score matching technique (PSM) is becoming an increasingly employed approach. PSM uses information from a pool of units that do not participate in the intervention to identify what would have happened to participating units in the absence of the intervention. Pairing treatment units and units in the control group that are similar in terms of their observable characteristics is the general idea of PSM. When the relevant differences between any two units are captured in the observable pretreatment covariates, which occurs when outcomes are independent of assignment to treatment conditional on pretreatment covariates, matching methods can yield an unbiased estimate of the treatment impact (Cochran and Rubin, 1973 and Rosenbaum and Rubin, 1985). In PSM, it is assumed that data can be obtained for a set of potential control units, which are not necessarily drawn from the same population as the treated units but for whom the same set of pretreatment covariates, X_i, is observed. If for each unit we observe a vector of covariates X_i and $y_{i0} \perp T_i|X_i, \forall_i$, then the population treatment effect for the treated, $\tau|_{T=1}$, is equal to the treatment effect conditional on covariates and on assignment to treatment $\tau|_{T=1,X,}$ averaged over the distribution $X|T_i = 1$ (Rubin, 1977). Matching units on their vector of covariates, X_i, estimates this equation. Rosenbaum and Rubin (1983) suggest the use of the probability of receiving treatment conditional on covariates. Accordingly, the probability of receiving treatment conditional on covariates is expressed as: let $p(X_i)$ be the probability of a unit i having been assigned to a treatment defined as:

$$p(X_i) \equiv \Pr(T_i = 1|X_i) = E(T_i|X_i)\text{ , then}$$

$$(Y_{i1}, Y_{i0}) \perp T_i|X_i\, f\, (Y_{i1}, Y_{i0}) \perp T_i|p(X_i)$$

Heckman, Ichimura, and Todd (1998) suggested the following to determine or compute the treatment effect:

$$\hat{\tau}|_{T=1} = \frac{1}{|N|}\sum_{i\epsilon N}\left(Y_i - \frac{1}{|J_i|}\sum_{j\epsilon J_i} Y_i\right)$$

where N is the treatment group, $|N|$ the number of units in the treatment group, J_i is the set of comparison units matched to treatment unit i and $|J_i|$ is the number of comparison units in J_i.

Data

A farm household survey undertaken during 2015/16 by Ethiopian Institute of Agricultural Research (EIAR) in collaboration with the International Maize and Wheat Improvement Center (CIMMYT) is used to acquire the data utilized for this study. A total of 837 farm households living in major wheat producing areas of 11 administrative zones (provinces), 27 districts and 65 "kebeles"/villages/local councils in Oromia Regional State were interviewed. For selecting villages from each agro-ecology, and households from each "kebele"/village, a multi-stage stratified sampling procedure was used. First, agro-ecological zones that account for at least 3% of the national wheat area were selected from the major wheat growing areas of Oromia Regional State, Ethiopia. Second, up to 21 villages in each agro-ecology, and 15–18 farm households in each village were randomly selected based on proportionate random sampling. Trained and experienced enumerators, who speak the local language and have good knowledge of the farming systems, collected the data using a pre-tested interview schedule.

RESULTS AND DISCUSSIONS

Descriptive statistics: Table 1 below shows various variables that were included in the propensity score matching model that describe the major observed characteristics of the sample respondents. The productivities of those farm households who received training on wheat during the farming season and who did not receive training are respectively 1.87 ton and 1.39 ton. Thus, it tentatively shows that there is significant difference in productivity level between those households that receive training and those that do not receive. Gender, level of education and age are some of the most important demographic determinants that influence the decision to take training or not. The average ages of a household head for training receivers and non-receivers are respectively 45 and 48 years old, and tentatively indicating that taking training decreases with age. Besides, the descriptive statistics show that literate household heads are more probable in taking training.

Table 1. Descriptive statistics of important variables used in the probitmodel-Propensity Score Matching

Variables	Unit	Receivers Mean(se)	Non-receivers Mean(se)	Aggregate Mean(se)	t-stat.
Outcome variable					
Productivity	#	1865.397(40.19)	1392.52(80.97)	1794.78(36.71)	-4.65***
Variables that affect probability of receiving training					
HHAGE	#	45.07 (0.46)	47.77(1.38)	45.47 (0.45)	2.16**
HHSEX (Male=1)	1=Yes	0.93(0.01)	0.8 (0.04)	0.91(0.01)	-4.74***
FAMILY_SIZE	#	7.17(0.09)	6.93 (0.20)	7.14(0.08)	-1.07
HHEDU (Read & write=1)	1=yes	0.71(0.02)	0.56(0.04)	0.68(0.02)	-3.23***
MODELFARMER	1=Yes	0.46(0.02)	0.30(0.04)	0.44(0.02)	-3.28***
CREDIT	1=yes	0.04 (0.01)	0.02(0.01)	0.03 (0.01)	-1.12
LANDHOLDING_SIZE	ha	1.94(0.05)	1.92(0.12)	1.93(0.05)	-0.10
PLOTDISTANCE	#	15.35(0.97)	11.22(1.96)	14.73(0.88)	-1.68*
TLU	TLU	6.88 (0.17)	5.57(0.42)	6.68(0.17)	-2.76***

***, **, * indicate significance at 1 percent, 5 percent and 10 percent level respectively.
Source: Own computation, 2019

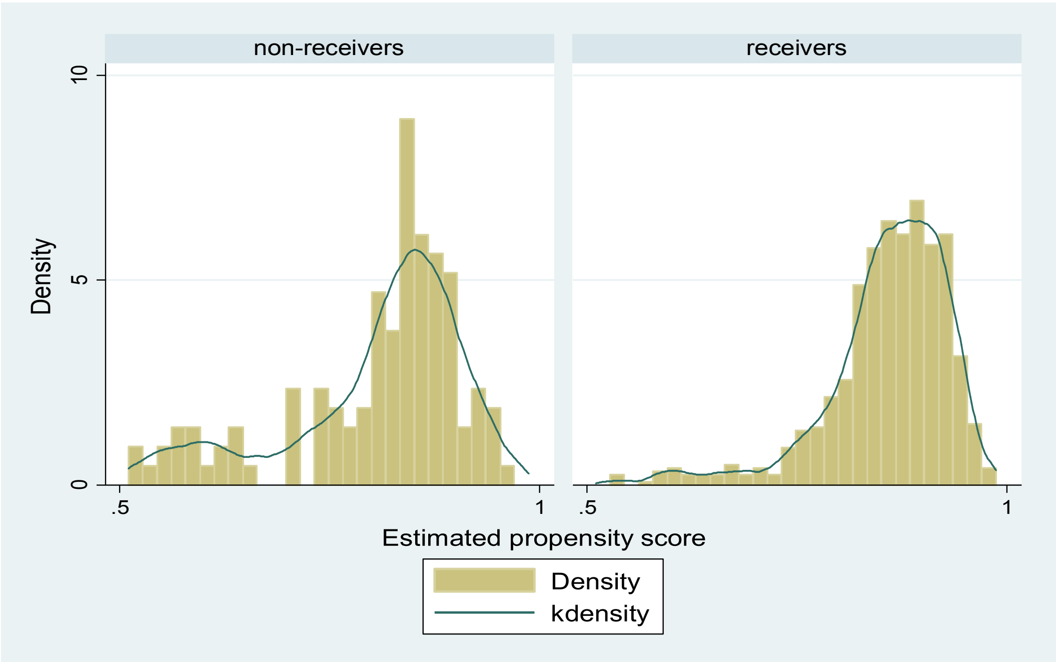

Figure 1. Distribution of propensity scores of receivers and non-receivers

Table 2. Average Treatment Effects estimation using propensity score matching estimators

Outcome Variable	Matching Algorithm	Mean of Outcome Variable Based on MatchedObservations		ATT	t-stat.
		Those who received training	Those who did not receive training		
lnproductivity	Nearest Neighbor Matching	7.361	7.008	0.353	4.01***
	Stratification Matching			0.357	4.59***
	Caliper Matching	7.390	7.112	0.278	3.28***
	Kernel Matching	7.361	7.050	0.311	4.00***

Significance levels (*, **, *** denoting significance level at 10%, 5% and 1% respectively) Source: Own computation, 2019

Model farmers are also more likely to take training than those that are not since they had better linkage with extension workers and higher exposure to new information.Those farm households that own larger number of livestock were also more likely to take training.

Propensity Scores Estimation using Probit Model

It is inappropriate to attribute the change in productivity to taking training without using rigorous impact evaluation technique since the difference in productivity might be owing to other determinants. To this end, a rigorous impact evaluation method; namely, Propensity Score Matching is employed to control for observed characteristics and determine the actual attributable impact of taking training, on wheat during the farming season, on productivity in wheat producing areas of Oromia Regional State, Ethiopia. Propensity scores for both who receive training and non-receivers are estimated using a probit model to compare the treatment group with the control group. The test for 'balancing condition' across the treatment and control groups was done and the result as indicated on figure 1 proved that the balancing condition is satisfied. Each observation's propensity scores are calculated using a probit model. The propensity score for receivers ranges between 0.5301334 and 0.9869178 while it ranges between 0.5106667 and .9671765 for non- receivers. And the region of common support for the distribution of estimated propensity scores of receivers and non-receivers ranges between

0.53013336 and 0.98691775. Observations whose propensity score lies outside this range were discardedwhen matching techniques are employed. Figure 1 shows the visual presentation of the distributions of the propensity scores. The common support condition is satisfied as indicated by the density distributions of the estimated propensity scores for the treatment and control groups as there is substantial overlap in the distribution of the propensity scores of both receivers and non-receivers. Test of balancing property of the propensity score also indicated that the balancing property is satisfied. Table 2 reports the estimates of the average effectsof training on wheat productivity estimated by nearest neighbor matching (NNM), Stratification matching, Kernel basedmatching (KBM) and Caliper matching methods. The table reportsresults based on actual nearest neighbor matches withreplacement and the Epanechnikov kernel estimator with0.06bandwidth and bootstrapped standard errors with 50 replications. The results tell that taking training significantly increases wheat productivity in the range of 28 to 36 percent for farm households in the study area.

Conclusion and Recommendation

The study is conducted to ascertain the impact of receiving training, on wheat during the farming season,on wheat productivity in Oromia Regional State, Ethiopia. It used an increasingly employed impact evaluation technique; namely, propensity score matching technique which is a robust impact evaluation technique that identifies the attributable impact to receiving training on wheat during the farming season.Then various matching algorithms were employed and compared in this study to ensure robustness of the impact estimates. Finally, the study concludes that receiving training on wheat during the farming season enabled farm households to enjoy a higher and significantly positive productivity than their counterparts, the non-receivers. Therefore, this study recommends to widely train wheat producing farm households to enhance their livelihood.

REFERENCES

Abegaz G. 2011. Cereal Productivity in Ethiopia: An Analysis Based on ERHS Data. *Ethiopian Journal of Economics,* Volume XX No. 2, October 2011.

Anaeto F.C, Asiabaka C.C., Nnadi F.N., Ajaero O.O. Ugwoke F.O., Ukpongson M.U & Onweagba A.E. 2012. The role of extension officers and extension services in the development of agriculture in Nigeria.*Wudpecker Journal of Agricultural Research,* Vol. 1(6) 180-185.

Anderson, J R. 2008. Agricultural Advisory Services: Background Paper for the World Development Report 2008. World Development Report.

Challenges for Future Value Chain Development. Center for Development Research, University of Bonn, Working Paper 160.

Cochran, W. G. and D. B. Rubin. 1973. 'Controlling Bias in Observational Studies: A Review,' Sankhya, ser. A, 35:4, 417–446.

Denmark Ministry of Foreign Affairs (DMoFA) 2013. Greening Agricultural Transformation in Ethiopia (GATE) 2014-2017. Concept Paper.

Endale K. 2011. Fertilizer Consumption and Agricultural Productivity in Ethiopia. Ethiopian Development Research Institute (EDRI), Working Paper 003.

FAO 2010. Guidance on how to address decent and rural employment in FAO country activities. Rome: Food and Agriculture Organization.

GebreEyesus A. 2015. A Study on Human Resource Management, Staff Turnover and Incentives in the National Agricultural Research System (NARS). Ethiopian Development Research Institute (EDRI), Research Report 27.

Gebru A. 2006. The Determinants of Modern Agricultural Inputs Adoption and Their Productivity in Ethiopia (The Case of Amhara and Tigray Regions). A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Economics (Economic Policy Analysis), July, 2006.

Heckman, J., H. Ichimura, and P. Todd. 1998. Matching as an Econometric Evaluation Estimator. The Review of Economic Studies 65(2): 261-294.

Kelemu K. 2017. Determinants of Farmers Access to Information about Improved Wheat Varieties: Case of Farmers in Major Wheat Growing Regions of Ethiopia. *International Journal of Research in Agricultural Sciences,* Volume 4(1): 2348 – 3997.

KetemaM., and Kassa B. 2016. Impact of Technology on Smallholder Wheat Production in Bale Highlands of Ethiopia: Application of Output Decomposition Model. *Turkish Journal of Agriculture - Food Science and Technology,* 4(6): 446-454.

Narman, Anders 1991. Education, training and agricultural development in Zimbabwe. Paris: UNESCO.

National Bank of Ethiopia (NBE) 2017.Annual Report.

Nigussie A., Kedir A., Adisu A., Belay G., Gebrie D. and Desalegn K. 2015. Bread Wheat Production in Small Scale Irrigation Users Agro-Pastoral Households in Ethiopia: Case of Afar and Oromia Regional State. *Journal of Development and Agricultural Economics*, Vol. 7(4), pp. 123-130.

Rosegrant M.W & Cline S.A. 2011. Global Food Security: Challenges and Policies. *American Association for the Advancement of Science*, Vol.302(5652) 1917-1919.

Rosenbaum, P. and D. Rubin. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. Biometrika 70:1, 41–55.

Rosenbaum, P. and D. Rubin. 1985. Constructing a ControlGroup Using Multivariate MatchedSampling Methods that Incorporatethe Propensity Score. The AmericanStatistician Association, February1985, Vol. 39, No. 1.

Rubin, D. B. 1977. Assignment to Treatment Group on the Basis of a Covariate. *Journal of Educational Statistics,* 2, 1-26.

Samuel G., Mekbib G. H., and Matthias K. 2017. The Wheat Sector in Ethiopia: Current Status and Key

Wikipedia. 2015. Agriculture in Ethiopia. (April 2015).

****