

# Adoption of Improved Potato Variety: the case of Dabat Woreda, Ethiopia

Getahun Abreham\*<sup>1</sup>, Yordanos Sete<sup>2</sup>

*Development Economics, Agricultural Economics*  
*College of Agriculture and Environmental Sciences, University of Gondar, Ethiopia*  
 gabreham@gmail.com, yordanos475@gmail.com

## Abstract

**Objectives:** The study is to identify the key factors that affect farmers' improved potato variety adaptation and its extent in Dabat Woreda, North Gondar Zone.

**Methods:** The study used both primary and secondary data. The primary data was gathered from 150 potato producing households selected by using simple random sampling technique in the three purposively selected potential kebeles. To analyze the data, both descriptive statistics and econometrics models were employed. Binary logistic and Tobit regression models were applied to analyze factors that affect potato new variety adoption and its extent respectively.

**Main findings:** The results of binary logistic regression model show that adoption status of potato new variety was affected by access to rural credit, education level, and cattle size (TLU) positively and significantly. However, distance of the nearest market center and farmers' perception towards potato production had a negative effect on it. The results of Tobit model also showed that extent of potato technology adoption status was affected by Development agent visit frequency; member of Farmers' cooperative and hired labours positively. While level of education has a negative effect on it. In this study, level of education has better role to adopt potato technology. However this variable has not progressive effect on the extent of adoption of the potato technology in the study area because of diminishing of marginal productivity on the potato production, as potato output is rising, and consequently the relatively educated farmers shift their need to other better income generating alternatives like producing cash crops.

**Recommendation:** The study recommends strong attention should be provided in building infrastructural facilities that enhance potato technology adoption and its extent through improving farmers' awareness by training and experience.

**Keywords:** Tobit, Adoption, Potato varieties, Level of education and Extent.

## 1. Background

Comparing with other sectors, the agriculture sector is the backbone of the Economy in developing countries in general and in Ethiopia specifically. The international trade relations on exporting side, domestic job creation opportunities, in generation of hard currency and others are highly covered by this sector in Ethiopia. In addition to that more than eighty % of the citizens of the country are involved in agriculture production as a major means of livelihood. Agricultural research and technological improvements are crucial in reducing poverty [1]. However, productivity of this sector is so poor due to use of low level of improved agricultural technologies, risks associated with weather conditions, diseases and pests, etc. In addition, due to the ever increasing population size, land size per farmer is declining leading to low level of production to meet the consumption requirement of the house. To lift the agricultural productivity as well as its level of production, it is better to adopt new technologies in the agriculture area [2]. Since potato production and its output is relatively high in this country, therefore, applying and distributing of improved seed variety of potato for farmers has a high effect to enhance decline food security and poverty respectively. Comparing with other countries. Ethiopia is one of the main potato producing countries in Africa as 70% of its arable lands in the highlands are suitable for potato production [3]. As the world's top non-grain food commodity, potato has an important role to play as a popular source of affordable food for the world's growing urban populations. With global production over the past two decades expanding rapidly, potato is increasingly a highly dependable food security crop.

Potato also generates more employment in the farm economy than other crops, and serves as a source of cash income for low-income farm households. Potato has huge potential for increment of income and nutrition status, level of food security level and it is in Ethiopia where the potential of this crop is increasingly being realized and explored by farmers, private investors, and policy makers. Even though, average yield of national is quiet far less achievable yields, ample opportunities exist to unleash this crop's potential for increased food security and income sources even though potato is expected to be the considered crops among others for assuring sustenance in DabatWoreda, farmers' adoption status of new potato technology which will have potential yield varieties is not good. The reasons include socio-cultural factors and farmers' attitudes to risk. Given increasing demand for food because of increasing rate of population growth and decreasing land holdings in the study area, farmer's adoption of new agronomic technologies is crucial. It becomes essential to investigate and forward policy and institutional options in encouraging the adoption of high/yielding potato new seed varieties and better managing performs as part of strategies used to meet challenges in low agricultural production and decreasing availability of agriculturally productive land. In particular, in DabatWoreda there was no any research which was done on this issue to say about the potato adoption of new varieties status by farmers and to design appropriate development policy and strategies. Therefore, to fill this gap this study was needed with points on such as finding the key factors of improved potato variety adaptation and its extent.

## 2. Research Methods

### 1. Description of the study area

This study was done in one of the woredas of North Gondar zone in the Amhara Regional State, Ethiopia. The zone is dominated by the agricultural sector, which employs about 90 percent of the working force. The zone is divided into 18 woredas of which one is urban and 546 *kebeles*. Dabat is one of the woredas in north Gondar Zone of Amhara National Region State of Ethiopia. It is bordered on the south by Wegera, on the west by TachArmachih, on the northwest by Tegeda, and on the northeast by Debarq. It is located 245 km from Bahrdar capital of Amhara region and 75 km from Gondar town. There are two towns in Dabat include Dabat and Wekin. This district comprises 26 rural and 4 urban *kebelea* administrations. The majority of the inhabitants 97.7% practiced Ethiopian Orthodox Christianity and 2.4% are Muslim. The farming system of the study area is largely characterized by crop-livestock production system (mixed farming systems) [4]. Among the *kebeles*, Charbita, Wekin and Dabatzuria were the study areas.

### 2. Data type, sources and method of data collection

In this study quantitative and qualitative data were applied by using secondary as well as primary data sources. Well organized questionnaire, observation and key interview were the tools for data gathering. Four enumerators were participated to conduct the data collection process and it was undertaken in 2017. The survey was carried out in July 2018.

### 3. Sampling technique

Three *kebeles* (Charbita, Wekin and Dabatzuria) were the study sites which were the potential area for potato production and that is why those were selected purposively. Accordingly, respondents were selected in those three *kebeles* based on probability proportional to sample size (Table 1). Lastly, one hundred fifty representatives were selected from the above three *kebeles* based on simple random sampling technique. For the purpose, four enumerators (three persons who have completed two years college training and working in the rural area as development agent and one person who is completed high school) were recruited and were trained before the pre-test. This formula was used to calculate the sample sizes of the study. Yamane's formula was used to calculate the sample sizes of the study. Where,  $n$  is the sample size,  $N$  total population and  $e$  is the level of precision at 80% degree of confidence interval. When this formula is applied to this study the following  $n = \frac{N}{1+N(e)^2}$  [5].

Where,  $n$  is the sample size,  $N$  total population and  $e$  is the level of precision at 80% degree of confidence interval. When this formula is applied to this study the following:

$$n = \frac{N}{1+N(e^2)} = 150 = \frac{4000}{1+4000(.0064)}$$

Table 1. Distribution of sample households by kebeles

Kebele	No.households	sample
Charbita	1497	56
Wekin	1248	47
Dabatzuria	1255	47
Total	4000	150

Sources : own survey analysis, 2018

#### 4. Method of data analysis

##### 1. Descriptive statistics

The descriptive statistics tried to present the results related with the social, economic and institutional characteristics of the selected respondents through %, tables, figures and numbers.

##### 2. Econometric analysis

The logit and Tobit regression models were applied to analyze factors that affect potato new variety adoption and the extent of this technology adoption in DabatWoreda respectively.

#### 3. Results and Discussion

##### 3.1. Descriptive statistics

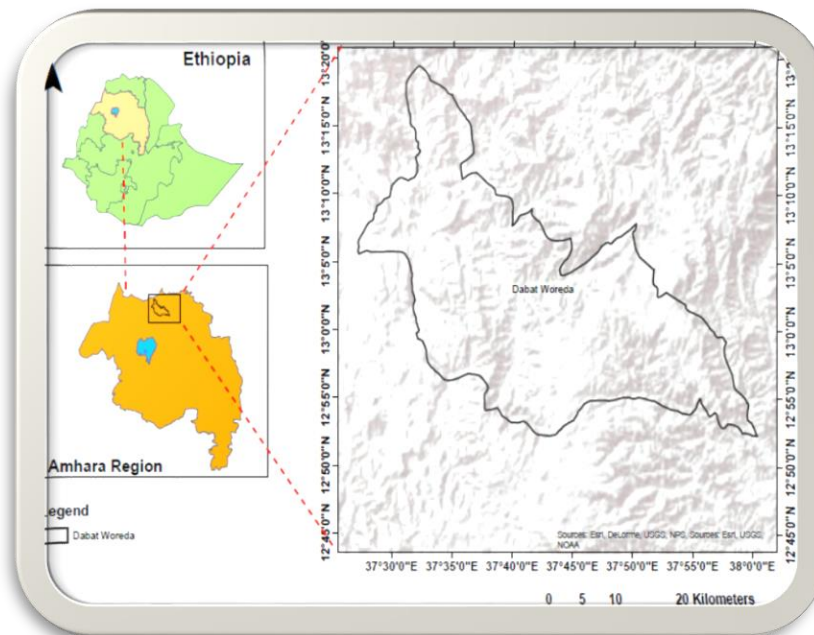
###### 3.1.1. Household characteristics

The average age of the sample household heads were 47.8 years and 47.9 years for adopters and non-adopters respectively without any significance mean difference between age of the household head and the dependent variable adoption status.

###### 3.1.2. Adoption category

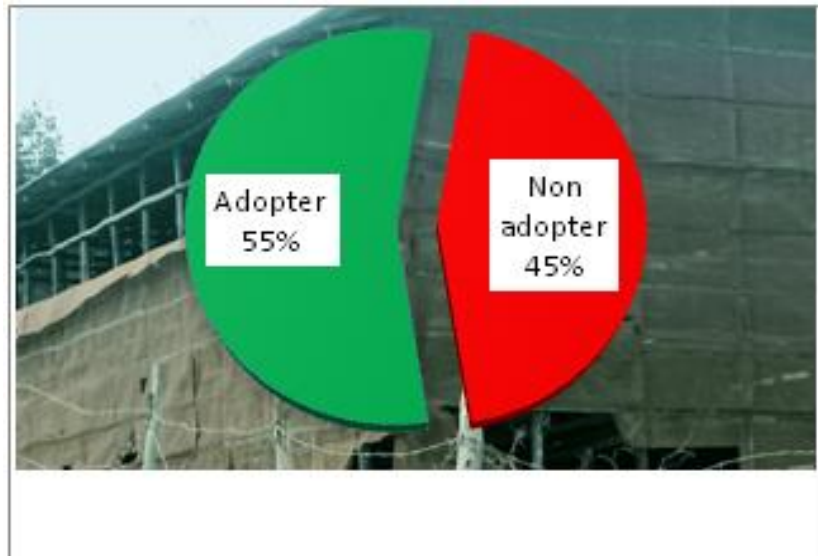
Farmers' adoption of new variety of potato technologies were influenced by demographic, socio-economic, institutional and psychological factors. Adoption of this technology by farm households measured in terms of improved potato variety adopters and non-adopters.

Figure 1. Map of the study area



According to the descriptive statistics result which was explained in Figure 1, around 55% and 45% of the sampled households were adopters and non-adopters respectively (Figure 1).

Figure 2. Category of adoption on improved potato technology



Sources: own data analysis, 2018

### 3.2. Econometric analysis

#### 3.2.1. Determinants of the adoption of improved potato varieties

As discussed before, logistic regression was applied to identify the main determinants of adoption of improved potato varieties status. Before going to the model regression output, the covariates which were expected to be included in the model were checked for the existence of heteroscedasticity, multicollinearity, and omitted variable problems. At first, we tried to see the multicollinearity problem associated with the explanatory variables. For this purpose, variance inflation (VIF) for continuous variables and contingency coefficients for high degree of association for discrete variables were applied. Based on the regression output, in both tests problem of multicollinearity was not happened as the VIF result showed as less than 1 and the contingency results were less than 0.4 for this data that is why the reason the problem was not occurred. In the another, the problem of heteroscedasticity was tested through white test. The test for heteroscedasticity after regression suggests that the errors are of the different variance. The null that the errors have constant variance is rejected. Therefore, there is the problem of hetroschedasticity in this data set. Though there are different types of hetroschedasticity corrected standard errors such as Hc1, Hc2 and Hc3.

In the application, Hc1, Hc2 and Hc3 are asymptotically equivalent and one shouldn't be preferred over the other [6]. However, Hc3 should be preferred for datasets with small sample size i.e less than two hundred fifty observations. As a result, since our number of observation is less than 250 we took Hc3 for correcting the existed hetroschedasticity problems.

estatimtest, white

White's test for Ho: homoskedasticity

against Ha: unrestricted heteroskedasticity

chi2(112) = 143.54

Prob>chi2 = 0.0000

In addition to that, the problem of omitted variable was checked by using the Ramsey Regression Equation Specification Test (Ramsey RESET). The null that there is not omitted variable in the model is accepted suggesting that the model has no problem of omitted variable bias.

ovtest

Ramsey RESET test using powers of the fitted values of improved potato variety adoptionstatus

Ho: model has no omitted variables

F(3, 146) = 3.22  
 Prob> F = 0.21000

Lastly, problem of outlier is tested after post estimation. Outlier can be identified if the absolute value of their studentized residual exceeds two. According to the test, there was the outlier problem in this data set. This problem was corrected by directly dropping the three observations in which their absolute value of studentized residual was greater than two. Because of this, our number of observation was reduced to 150 from 153. 14 independent variables which were hypothesized to influence farmers' adoption status of potato new variety, 6 explanatory variables were significant below 10% probability level. Access to credit (crittaces); as a liquidity factor, the more farmers have access to source of finance, the more likely to adopt agricultural technologies that could possibly increase potato yield. As the Logit model result indicates in (Table 2), access to rural credit had positive and significant influence on adoption of potato technology at 1% statistical significance level. The marginal effect result also shows that, farmers' those who had access to loan, keeping other things constant, had 2% higher probability of adopting potato technology compared to non-adopter farmers. This finding was consistent with [7].

Table 2. Maximum likelihood estimates of logit model and the effects of explanatory variables on the probability of adoption of improved potato new varieties

variables	coefficients	Robust Hc3 Stand. error	Odds ratio	P-value	Marginal effect
constant	-.45		.635	.41	-
perception	-1.28***	.557	.278	-2.3	-.27
agehh	.014	.023	1.014	.63	.003
leveduhh	.306***	.072	1.357	4.20	.073
davistfre	.034	.025	1.034	1.34	.008
tlu	.238***	.060	.788	3.92	-.057
fertplot	-.18	.253	.587	.71	-.128
distextin	-.026	.063	.974	-.41	-.006
cooperative	-.016	.41	2.75	.40	.244
dismarket	-.161**	.072	1.175	2.22	.039
farexper	-.013	.027	3.531	0.50	-.003
healthsth	.401*	.246	.87	1.66	.08
crittaces	.856**	.401	.424	2.14	.20
dismiard	.046	.041	.954	1.11	-.011
hrdlabuor	-.114	.091	.892	-1.25	-.0274863

Sample size.....150 LRχ<sup>2</sup> (14) = 105.15 Prob> chi2= 0.0000 Pseudo R2= 0.3795h

\*, \*\* and \*\*\* refer to significance at 10%, 5% and less than 1% probability levels respectively

Source: Model output, 2018

### 1. Farmers' perception towards potato

It was another significant variable which was found to had a negative and significant effect on the dependent variable at a probability level of below one percent. The marginal result of these variable 0.27 shows that, the probability of being potato technology adopter decreases by around twenty seven percent with one unit additional negative farmers' perception on potato production. A farmer whose name is WeretAyalew who was questioned gave the following sentences related to potato production in the study area.

"ድንችን ማምረት በብዙት ድህነትን ማምረት ጥንቁቅ ነው፤ ደህና ገቢ ለማድረግም ረጅም ሪት ራሱን ማታለል የለበትም።"

The English version of his idea is that "producing potato in large means choosing the chance to be poor ; rich farmers do not cheat themselves by producing irrelevant output." To make it clear, the perception of farmers towards potato production is not good because there is no market linkage to sell the surplus output in the nearest market since the productivity of potato in the area is high. And also, if there is high rain during the production period, the output has a probability to be damaged. Because of this reason, relatively rich farmers are less likely to invest their time and energy for adopting potato technology.

## 2. Health of the respondent (healthsth)

This model assessment outcome displays health status of the respondents had a positive and significant effect at 10% probability level. The above outcome displays that healthier respondents had higher probability to adopt potato technology than non-adopters. Its marginal effect 0.081 shows that the probability of being potato technology adopter rise by approximately 8% with one unit rise in health status of the respondent.

## 3. Level of education of the household head (leveduhh)

Education level is the key variable that is found to explain farmers' potato technology adoption behavior. A paper showed that it has significant encouraging influence on potato technology adoption [8]. This variable is also statistically significant at less than one percent probability level with expected sign in this paper. The outcome foresees that educated respondents are more likely to use potato technology than those who are not. Farmers who are relatively well educated can attend in meeting and can get information and knowledge for their agricultural production increment and they can be informed about technology functions. This finding was similar with [9]. The marginal effect of the variable level of education of the household head 0.073 shows probability of being potato technology adopter rises by an approximately seven% with a one unit change of farmers' level of education.

## 4. Livestock holding (TLU)

Number of livestock owned by households is found to have positive and significant ( $p < 0.01$ ) effect on the probability of potato technology adoption. This implies that income from livestock may encourage farmers to adopt potato technology easily. The marginal effect shows that for each additional TLU that the household head's level of probability to adopt potato technology increase approximately by 6% unit; other variables held constant. The finding is also consistent with [9]. The positive coefficient for livestock may, therefore, be explained by the fact that economically well-off farmers have the necessary equity to acquire seed and other complementary inputs than poorer farmers [10-11].

## 5. Distance of the nearest market (dismarket)

The sign of the factor of this variable displayed a negative relation with dependent variable and is significant at less than 5% probability level. This directs that the far in the distance of the market from farmers' destination decreases the likelihood for the household to become potato technology adopter. As a farmer is closer to the market, there would be advanced chance to use potato technology since access to services like market information. However, if the market center is very far the result is the reverse one. The marginal effect of the variable shows that the probability of being technology adopter is better approximately by about 4% with 1 Km increase in distance of market center from respondent's home. The result was consistent with [12-13].

### 3.2.2. Factors that affect the extent of the adoption status of potato technology

The level of the adoption status of potato new variety in Dabatworeda was affected by different factors as shown in Table 3. Having extension contact (davistfre) has been highly significant and in fact has the highest positive effect on the intensity of technology adoption. Development agents are important sources of information for potato growers. They also provide advice to farmers regarding the choice of appropriate potato seed variety and the appropriate seed type for agro climatic zones to be planted on the other hand. Access to information influences farmers' profitability as farmers become equipped with information by the extension agents. This may influence the extent of their agricultural technologies adoption status as they know which agricultural investments are more profitable to them.

Easy to get extension facilities have been found to be a key aspect in potato technology adoption. Farmers are usually informed about the existence as well as the effective use and benefit of new technology through extension agents. Extension agent acts as a link between the innovators (Researchers) of the technology and users of that technology [14]. Extension services also provide farmers with the required agronomic knowledge which allows farmers to accept or reject technologies [15-16]. Hence the positive and strong effect of extension contact on farmers' potato new variety adoption intensity has been as expected.

Table 3. Factors that affect the extent of the adoption status of potato technology

Tobit regression

Number of obs = 150 LR chi2(14) = 111.8 Prob&gt; chi2 = 0.0000

Log likelihood = -436.38234 Pseudo R2 = 0.1136

Variables	Coef.	Std. Err.	t	Marginal effect
_cons	-4.03	9.25	-0.44	
agehh	.035	.13	0.27	.04
marstats	-1.28	2.15	-0.60	-1.3
davistfre	.29**	.14	1.97	.23
tlu	1.99***	.33	5.91	1.9
Landsiz	-.59	.47	-1.24	-.6
distextin	-.90**	.40	-2.24	-.90
cooperative	4.62*	2.44	1.89	4.6
leveduc	-4.02*	2.39	-1.68	-4.0
dismarket	-1.40***	.44	-3.15	-1.4
farexper	-.034	.149	-0.23	-.03
hhsiz	.55	.44	1.25	.6
Creditaccess	1.26	2.45	0.51	1.3
dismaird	-.169	.24	-0.68	-.17
hrdlabuor	1.87***	.51	3.63	1.9
sigma	14.20	1.17	11.89	

Distance as measured by the distance of the household's home from extension and market center (dismarket and distextin) had an adverse and significant influence on the extent of potato technology adoption. As expected, the farther the household lives from such centers the less likely for the farmer to intensify the application new potato variety on their farm. So, proximity to extension and market centers has a strong effect on the level of adoption status of potato technology by rural farmers. A finding which was done by [16] was consistent with this result.

Level of education of the household head (leveduhh): controlling for other factors, which affect the extent of farmer's adoption of potato technology, level of education of the household head has a statistically significant influence (at 10%) on the willingness of farmers to adopt the potato technologies as we have expected. However, unlike our expectations formal education has not been a significant determinant of adoption of potato technology extent. In fact, it negatively affected farmers' level of adoption status. Farmers who have undergone formal education are less likely to remain in the farming business. Livestock size (TLU): In rural context, livestock holding is an important indicator of household wealth. In addition, livestock is considered to be a source of income, food and drafting power for crop cultivations. The number of livestock owned by farmers was positively associated with adoption decision in most adoption literature. As the Tobit model result indicates in (Table 3), livestock size is positive and significantly correlated with adoption in intensity of potato technology at 1% level of significance. The marginal effect result also shows that keeping other things constant, when livestock size (TLU) of potato technology adopters increase by one unit the intensity of adoption increase by 19%. The result is also supported by earlier studies having more units of livestock was positively related to the adoption of agricultural technologies because it serve as proxy for wealth status [17].

Farmer's participation in cooperative institutions (cooperative) was found positively driving the intensity of adoption of potato technology practices. Other factors kept constant, being a member of cooperatives was found to favour the farmers' likelihood of adoption of the package by the factor of 4.6, and the result was statistically significant at 1% level. This could happen given the fact that cooperatives are among the strongest social institutions that play important role in adoption of technologies. Hired labour (hrdlabuor) influenced adoption of potato technology intensity positively possibly because the hired labour increased labour availability within the household to implement the technologies. In this region household members are usually the main source of labour and when it is not sufficient hired labour is sought. Hired labour is used by wealthy farmers in exchange for cash or food. This result was consistent with the result with [18] who found hiring of labour to be positively related to probability of adoption agricultural technology.

#### 4. Conclusion and Recommendation

North Gondar zone is a potential place to the production of potato. Even though the potential is high, there are many determinants and challenges which affect the farmers' level of potato technology adoption extent in the study area. Among the determinants of these factor and challenges the majors are: DA visit frequency, total livestock unit; cooperative and hired labours are the factors which affect it positively. While distance of farmer's home from extension center Farmer's home from nearest market and level of education have a negative effect on it. In terms of the probability of farmer's potato technology adoption is affected positively by factors such as level of education, credit access and others.

Based on these findings, the following recommendations are provided. Education level of the household head was an important factor for the extent of potato technology adoption. However, education level and extent of adoption were negatively and significantly related. Therefore, proper attention has to be given to initiate farmers to participate in potato technology adoption and to increase volume of production. This can be achieved through encouraging relatively educated farmers to participate in improved potato technology adoption activities and assigning them in training related with modern farming activities and production strategies to make them role model for others. The responsible body tries to show them how education benefits educated persons who are potato technology adapters. Development agent visit frequency had a positive and significant effect on the extent of potato technology adoption. Development agents play an important role in the introduction, distribution and implementation of agricultural improved technologies in agricultural activities. Farmers who conduct with development agents have good awareness about adoption activities. So, strengthen distribution and contacts of development agent should be promoted to increase adoption participation and volume production. Government should encourage farmers to strengthen the cooperative movements in order to be able to have access to a better mode of transport through mobilization of their resources.

The perception of farmers towards adoption of potato technology is positively linked. However; the problem is occurred when on its extent of adoption. Therefore, proper attention should be taken for these issues through creating market linkages, by inviting them in workshops and through trainings. The researchers recommend that further study be undertaken to determine factors affecting smallholder farmer's level of potato technology adoption status.

#### 5. Acknowledgements

The authors would like to thank the University of Gondar farming and research site at Dabattown for its unlimited support for this research work during data collection period. Moreover, we thank enumerators and Woreda experts for their valuable response during data-collection process.

#### 6. References

1. D.H. Sanaullah Noonari. Economic analysis of potato production in Pakistan. *Journal of Biology, Agriculture and Healthcare*. 2016, 100-107.
2. D.C. Getahun Abreham. Impact of rural credit access on farmers' income growth: in the case of wogera wereda, North Gondar, Ethiopia. *International Journal of Economics*. 2018, 1-9.
3. A.H. Struik. Analysis of seed potato systems in Ethiopia. *American Journal of Potato Research*. 2010, 537-552.
4. Bureau of Agriculture, Amhara Regional State Agricultural office report, Bahir Dar. <https://www.weforest.org/amhara-national-regional-state-bureau-agriculture-and-rural-development>. Date accessed: 22/09/2017.
5. ST. Yamane. *Statistics: An introductory Analysis*. 2nd Edition, Newyork: Harper and Row. 1967; 919.
6. J. MacKinnon. Some heteroskedasticity consistent consistence with variance matrix. *Journal of Econometrics*. 1985; 29(3), 305-325.
7. K. Abebeab. Adoption of improved potato varieties in Ethiopia: The role of agricultural knowledge and innovation system and smallholder farmers' quality assessment. *Journal of Science Direct*. 2013; 22-32.



8. B. Melesse. Review on Factors affecting adoption of Agricultural new technologies in Ethiopia. *Journal of Agricultural Science and Food Research*. 2018; 9(3), 1-4.
9. B Kafle. Adoption of improved potato varieties in Nepal: a case of. *The Journal of Agricultural Sciences*. 2012, 1-21.
10. M.K. Franklin Simtowe. Determinants of agricultural technology adoption. *Quarterly Journal of International Agriculture*. 2011; 325-345.
11. T.M. Kudi, M. Bolaji, M.O. Akinola, I.D.H. Nasa. Analysis of adoption of improved maize varieties among farmers in Kwara State. Nigeria. *International Journal of Peace and Development Studies*. 2011; 8-12
12. C. IsacMuwara. A influence of demographic characteristics on adoption of improved potato varieties. *Journal of Agricultural Extension and Rural Development*. 2015, 114-125.
13. J.O. Julius, Z. Yuan, K. Norman, O.O. Sylvester, B. Ian, S.G. Elmar, A. Elly, T.A. Justin. Determinants of the use of certified seed potato among smallholder farmers: the case of potato growers in Central and Eastern Kenya. *Journal of Agriculture Science*. 2016; 101-104
14. M.M. Kariuki. Factors determining adoption of new agricultural technology. *Journal of Economics and Sustainable Development*. 2015, 1-10.
15. J.O. Saka, V.O. Okoruwa, B.O. Lawal, S. Ajjola. Adoption of improved rice varieties among small-holder farmers in South-Western Nigeria. *World Journal of Agricultural Sciences*. 2005; 42-49.
16. A. Tesfaye. Determinants of crop diversity and composition in Enset-coffee agroforestry homegardens of Southern Ethiopia. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*. 2013; 114(1), 1-10.
17. A.A. SalihElagab Elsheikh. Factors affecting adoption of improved varieties of sorghum, millet, groundnut and sesame in North. *Agricultural Research & Technology: Open Access Journal*. 2018; 1-8.
18. B. Kassa, B. Kassa, K. Aregawi. Adoption and impact of agricultural technologies on farm income: Evidence from Southern Tigray, Northern Ethiopia. *International Journal of Food and Agricultural Economics*. 2014; 91-106.

The Publication fee is defrayed by Indian Society for Education and Environment ([www.iseeadyar.org](http://www.iseeadyar.org))

**Cite this article as:**

Getahun Abreham, Yordanos Sete. Adoption of Improved Potato Variety: the case of Dabat Woreda, Ethiopia. *Indian Journal of Economics and Development*. June 2019, Vol 7 (6), 1-9.

Received on: 10/05/2019

Accepted on: 19/06/2019