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Review paper

Socio-economic analysis on determinants of Improved Teff varieties Adoption in Liban Jewi District, Ethiopia

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Teff is the most preferred staple food and cash income by majority of the Ethiopian population and its center of origin is in Ethiopia. This study was designed to inspect the determinants that affect adoption and to provide police recommendation towards improve teff varieties in the study area in the year 2019. A total of 159 sample respondents drawn from five PAs of the district included in the survey. Primary data for the study were collected from respondents using structured interview schedule. Descriptive statistics and econometric model were employed for analyzing the data. Binary logistic regression was incorporated to analyze relationships between a dichotomous dependent variable and explanatory variables. The model result reviled that age of the household head had negatively and significantly affected adoption whereas gender of the household head, teff farming experience, education level, land size owned, farm income and credit availability of sampled respondents were positively and significantly affected the adoption of improved teff varieties. The overall findings of the study underlined the high importance of extension service provision to improve farmers' access to information and extension advices, facilitating access to credit and improving market condition. Therefore, the government and other Non-Governmental Organization should do their part in creating awareness, facilitating the access and mobilizing farmers to adopt the improved varieties so that farmers can improve their agricultural productivity and then change their livelihood.

Keywords: Livelihood, Government, Variety, Experience

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INTRODUCTION

Background of the study

Ethiopia is predominantly an agricultural country and it has been the backbone of the country's economy for several centuries. It is still the dominant sector contributing 42% of the total GDP (CSA, 2010). According to (Ministry of Finance and Economic Development Ethiopia, 2006), the sector employed more than 83% of the population, and was the source of over 90 % of export revenues. It also provides raw materials for more than 70% of the country's industries. Within the sector, 60% of the agricultural GDP comes from crop

production, whereas, 30% and 7% are generated from livestock and forestry sectors respectively (World Bank, 2007). Therefore, it is clear that countries like Ethiopia, which are comparatively endowed with unskilled labor and arable land, would find it relatively easier to follow an agricultural development path. According to (World Bank 2008), escaping poverty traps in many developing countries such as Ethiopia depends on the growth and development of the agricultural sector.

Following these evidences, successive Ethiopian governments have focused on promoting technology-led initiatives to enhance productivity, particularly in smallholder agriculture(Federal Democratic Republic of Ethiopia/FDRE/, 2010); Gebreselassie, S, 2006). Crop production is a subsector on which the country has unfailingly depended to bring about a livelihood transformation of the poor. Currently, the government is undertaking a strategy of improving agricultural productivity primarily through agricultural intensification, involving an increased use of inputs, including seeds of improved crop varieties(Byerlee, D.*et al*.,2007); (McGuire, 2005).

Crops are the major agricultural commodities on which Ethiopians depend for their daily food (Rashid, S. and Assefa, M. 2006). Cereals are the major food crops both in terms of the area coverage and volume of production and accounts for 95% of agricultural production in Ethiopia and contributed 86.68% of the grain production. Maize, wheat, and teff are the most important cereals in terms of volume, accounting for a total of 77% of all cereal production(ATA, 2016) while maize, teff, wheat and sorghum have made 26.80%, 16.76%, 15.81% and 16.20% of the grain production respectively(CSA, 2016). From the cereal crops, teff is the most preferred staple food by majority of the Ethiopian population and its center of origin is in Ethiopia. Teff has high energy, phosphorus, calcium and iron contents (Fufa Bekabil *et al*, 2011). Moreover, the economic contribution of teff indicates that real teff output on average accounted for 6.1% of the real GDP, while growth in real Teff output accounted for 6.4% of the total growth in real GDP i.e., 0.67% of the 10.7 percent growth in real GDP (Fantu, 2015).

This crop is the major staple food crop to most of the Ethiopian people living in the highlands which comprise more than 65% of the population. However, the national average yield of teff is very low and 1.4 ton per hectare and the development of high yielding cultivars would be very beneficial (CSA, 2013). Hence, the need for improved crop varieties that are high yielding and with the capacity to survive in such a degraded and risk prone environment is important (Spielman *et al.,* 2008). Therefore, there is still a question of yield stagnation due to the low yield potential on the existing teff varieties (Tareke berhe and Niguse Zena, 2008). To improve the productivity of the crop, several improved teff production technologies, mainly improved teff varieties including Boset, quncho, Kora, Dagim and other varieties have been generated and disseminated to the farmers over the last decades; but, the numbers of adopted improved teff varieties are limited to a few (Fufa Bekabil *et al*, 2011).

In Liben jewi district, there was no empirical information so far on the adoption of improved teff technologies. Therefore, improving agricultural productivity and development and thereby improving smallholder farmers' livelihood requires increased efforts in influencing farmer to use yield enhancing agricultural technologies. Therefore, study on the factors that influence the adoption of improved teff varieties is useful for technology development and design of policies and strategies that foster adoption of teff technologies to manage up the livelihood of the district. Hence, the objective of the study was designed to inspect the determinants that affect adoption and to provide police recommendation towards improve teff varieties in the study area to fulfill the existing knowledge gap.

Concepts on Agricultural Technology Adoption

Technology adoption concept and idea of technology adoption was started with the exploration of the economics of technological change (Goshu et al 2008); and the proper adoption and diffusion models applied by (Feder, G.R.E.Just and D.Zilberman, 1985) and then by Green and (Ng'ong'ola, 1993). After a while adoption and diffusion have been conceived as the processes governing the utilization of innovations, and studies of adoption behavior emphasize factors that affect the adoption of agricultural technologies. In a social system adoption of new technology/innovation has been done through adoption by individuals or groups. An author (Feder, G.R.E.Just and D.Zilberman, 1985) said that adoption may be defined as the integration of an innovation into farmers' normal farming activities over an extended period of time. It is also noted that adoption however, is not a permanent behavior. This implies that an individual may decide to discontinue the use of an innovation for a variety of personal, institutional, and social reasons one of which might be the availability of another practice that is better in satisfying farmers' needs. Adoption is a mental process through which an individual passes from hearing about an innovation to its adoption that follows awareness, interest, evaluation, trial, and adoption stages (Bahadur, K.L. and B.Siegfried, 2004). It can be considered a variable representing behavioral changes that farmers undergo in accepting new ideas and innovations in agriculture anticipating some positive impacts of those ideas and innovations.

Adoption decisions of different technologies across space and time are influenced by different factors and their associations. Factors such as personal, socioeconomic, institutional and psychological factors

determine the probability of teff technology. It is obvious that different studies have been conducted to look into the direction and magnitude of the influence of different factors on farmers" adoption decision of agricultural technologies. A factor, which is found to enhance adoption of a particular technology in one locality at one time, was found to hinder it or to be irrelevant to adoption of the same technology in another locality. Although some known determinants tend to have general applicability; it is difficult to develop a universal model of the process of technology adoption with defined determinants and hypotheses that hold to everywhere. The dynamic nature of the determinants and the distinctive nature of the areas make it difficult to generalize what factors influence which technology adoption.

RESEARCH METHODOLOGY

Description of the Study Area

Liban jewi district is one of the twenty two districts in West Showa zone of Oromia region Ethiopia. It is located about 161 km west of Capital city of Ethiopia Addis Ababa and 47 km west direction of Ambo Town. The district capital is Babichi city. Geographically, the city is located at 8° 58′ 19″ N latitude and 37° 32′ 37″ E longitudes with an average elevation of 2293 meters above sea level. This district is bounded with Toke kutaye in the East, Chelia in the West, Midakegn in North, and Jibat in the South. The district has annual rainfall of 900-1800mm. The annual temperature ranges from 16-28 ^{0}C. Administratively, the district made up of 16 kebeles (15 rural and 1 urban kebeles). The total population number of the study area is 70820 (35,376 males and 35,444 female). There are 9155 households with 8339 male and 816 female headed households, respectively in the district. The land use pattern of the district shows that from the total of 32,837 ha, 18,537 ha is cultivated land; 8548 ha is covered with forest, 5467 ha is grazing land and 285 ha with used for other social purposes. The major crops produced in the district are Teff, wheat, Maize, barley and pulse crops(District office of Agriculture, 2019).

Data Types and Methods of Data Collection

Both primary and secondary data were used through formal survey for this study. The formal survey was undertaken through interviews with selected teff producer farmers using a pre-tested structured and semi-structured questionnaire. Secondary data was collected from published and unpublished documents, and internet sources.

Sampling Techniques and Sample Size

Multi-stage sampling methods were used to select the respondents in this study. First Liban jewi district was selected as a study area since the area has high potential for teff production in west Showa zone, at stage two; five peasant associations (PAs) (Mugno tuto, Chacidu masara, Irrensa, Kombolcha sadan and Liban gamo) in Liban jewi district were selected. The PAs identification was made through reviewing secondary data on production potential of teff and dissemination of the teff technologies and area coverage of the crop and; final stage 159 sample respondents were chosen using systematic random sampling technique from each PAs based on probability proportional to size.

Table 1: Distribution of sample households in the district.

No.	Sample kebeles	Households	Sample size
1	Mugno tuto	757	37
2	Chacidu masara	540	27
3	Irrensa	592	29
4	Kombolcha sadan	555	28
5	Liban gamo	768	38
	Total	**3212**	**159**

***Source**: Own computation, 2019*

Method of Data Analysis

Descriptive statistics and econometric analysis were used to analyze the data collected from teff producers. Descriptive statistics in terms of mean, frequency, and percentages were used to describe the characteristics of sample variables. The Chi-square tests and t test were used to see the presence of statistically significant differences and the systematic association between those who adopt and those who do not in terms of the hypothesized variables.

Binary logistic regression was incorporated to analyze relationships between a dichotomous dependent variable and explanatory variables. This model was chosen because it has an advantage that it reveals the relative influence on the probability of adoption of the technology and can predicate the probability on the extent of adoption in a proper way. The logistic regression was fitted employing method of teff technology adoption as dependent variable and the listed demographic, institutional and socio-economic variables as independent variables which is assumed to determine teff technology adoption. The dependent variable is binary, taking values of one if the farmer adopts and zero otherwise. However, the explanatory variables are categorical, continuous and dummy. The justification for using logit is its simplicity of calculation and that its probability lies between 0 and 1. Logit model which helps to test the determinants of adoption can mathematically be specified as follows:

$P\,i = E(Y = 1|Xi) = \beta 0 + \beta iXi$……………………………………………………………………………1

Where Y = 1 means a given farmer participates in production. Xi is a vector of independent variables. β_0 *is the constant and* βi*, i = 1, 2…n are the coefficients of the independent variables to be estimated.*

$Pi = E(Y = 1|Xi) = \frac{1}{1+e-(\beta 0+\beta iXi)}$

$Pi = \frac{1}{1+e^{-zi}} = \frac{e^{z}}{1+e^{z}}$

Where Zi = β0 + βiXi. If Pi is the probability of being adopter, then (1 − *Pi*), the probability of being non-adopter of improved teff variety is 1- $Pi = \frac{1}{1+e^{zi}}$. *Therefore, we can write this equation as* $\frac{Pi}{1-pi} = \frac{1+e^{zi}}{1+e^{-zi}} = e^{zi}$. *Hence* $\frac{Pi}{1-pi}$ *is the odds ratio in favor of adopters.*

In other words, it is the ratio of the probability that a given farmer adopt the technology to the probability that the farmer will not adopt it. Then, if we take the natural logarithm of equations (e) we obtain

$Li = Ln\left[\frac{p(i)}{1-p(i)}\right] = ln\left[e^{\beta o} + \sum_{i=1}^{m} \beta iXi\right] = zi$

If the disturbance term a is taken into account, the logit model becomes

$Li = Zi = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 ... + \beta_iX_i + U_i$………………………………………..2

Therefore, *Li*, which is the log of the odds ratio, is called logit or logit model (Gujarati, 2004). Hence, the above logit model was employed to estimate the effect of the hypothesized explanatory variables on the adoption decision of farmers to use improved teff variety.

The explanatory variables of importance in this study are those variables, which are thought to have influence on adoption of teff technologies. These include personal and socio-economic characteristics, technical and institutional variables (Xi);

X_1= Age of household (years)
X_2= Gender of the farmer (0, Female 1, otherwise)
X_3= Educational Status of the farmer (categorical)
X_4= Experience (Years) of teff farming
X_5= Family Size
X_6= Land size owned (Ha)
X_7= Number of oxen the HH head owned
X_8= Distance to the FTC in km
X_9= Credit availability
X_{10}= Average annual earnings of the farmers /ETB/
X_{11}= Participation on demonstration

RESULT AND DISCUSSION

Improved teff varieties cultivated in the study district

In the study area teff is an important crop used as source of food consumption and cash income for household. Sampled respondents grow a wide range of teff varieties, including local seeds. Out of the total adopter respondents 55.91% sow the most popular variety Boset, 25.81 % sowed Quncho variety, and 18.3 % sowed kora variety which was the least adopted as shown in the table respectively.

Table 2: Types of improved Teff varieties adopted by sample respondents

Improved teff varieties	Frequency	Percentage
Boset	52	55.91
Quncho	24	25.81
Kora	17	18.28
Total	**93**	**100**

***Source**: Author's compilation, 2019.*

The dataset contains 159 sampled respondents and of these, about 58.5% households were adopters i.e. they planted at least more than one of the improved teff varieties shown in table 2 during the 2019 cropping season. Having these facts the adoption level in the study area on improved varieties was indicated in the table below.

Table 3: Percentage of sample households by level of adoption (N=159)

Adoption categories	No. of sample households	Percentage
Adopter	93	58.49
Non-adopter	66	41.51
Total	**159**	**100**

***Source**: Author's compilation, 2019.*

In this study, a total of 11 independent variables were identified. From continuous variables; farm income had statistical significant at 1% level of significance with adoption relation of sample respondents, whereas age of households, farm experience, family size, land size owned, number of oxen owned and distance from the nearest farmers training center had not statistically significant relation with the adoption decision in the study area.

Gender of household head, education level, credit availability and participation on field trial demonstration from dummy/categorical variables had statistical significant at 1% level of significance with adoption relation of sample respondents, in the study area (Table 4). Summary and discussion on socioeconomic and institutional characteristics of respondents of the overall descriptive results of the study is presented in table 4 below.

Gender: In this study the majority (55.34%) were male-headed while 44.67% were female-headed household. High level of adoption of the improved varieties was found among male farmers. The female-headed households' proportion for adopters and non-adopters were 7.53% and 81.82%, respectively. The variable is statistically significant at 1 % significance level for adopters and non-adopters on adoption decision. Female farmers normally tend to be less curious in trying out new innovations unlike their male counterparts.

Land size owned: as shown in the table 4, the average mean land holding size of sample households were 1.08 ha with standard deviation of 0.26 which is a bit less than the national average, which is 1.5 hectare implying households relatively have low farm size. The average land holding for non-adopter group was 1.07 hectares which were a bit lower than adopters.

Farm income: In this study, the household income was estimated based on the sales of crops and livestock and livestock products and the average annual income of sales of sample households who adopt technology was 8795.7 birr/year and mean income of non-adopter of technology was 5675.1 birr/year. Thus, the income of

adopters exceeded the income of non-adopters, because adopters were utilized improved teff technology and they produce more. Therefore, the t-test analysis result revealed that, total annual household income show that there is significant mean difference with the adoption categories of sample respondents at 1% level of significance which consistent with the hypothesized relationship with adoption decision. This implies that, the higher the household income the higher will be the probability of the adoption of improved teff variety in the study area. Similarly, (Sulo T. et al., 2012) reported the same result

Distance to farmers training center (FTC): was hypothesized to influence the adoption of improved teff varieties. In this study, technology adopters were travelled an average distance of 2.13 km while non-adopters were travelled 2.02 km to reach the nearest development center. Compared to households farther away, households near a FTC are considered more likely to have access to development agents, new technologies, and information. However, no significant difference was observed in the distance to a development center from the residence of adopters versus non-adopters.

Education level: In this study 31.55% of the total respondents had illiterate i.e. had no formal education while 38.7, 26.33 and 3.45% completed primary, secondary and tertiary education respectively. The chi-square analysis showed that there is systematic association between the level of education and the adoption of improved teff varieties,

Age: the mean age of sampled respondents was about 49.7 ± 9.8 years with respondents' age ranges from 28-85 years which was an indication that the respondents were fairly in their active years. The mean age of the adopters and non-adopters were 50.01 ± 9.8 years and 49.24 ± 9.87 years respectively. This implies the majority of smallholder farmer's ages are in the category of active labour forces. Result of mean test using indicated that there was no significant mean difference among adoption categories, implying the absence of significant relationship of age with adoption of improved teff varieties.

Family size: The average family size for sample households in man-equivalent was 4.95 with standard deviation of 0.85. On average, adopters had 5.03 active labour forces while non-adopters had 4.84 in man-equivalent respectively. The minimum family size of the sample households was 1 while the maximum was 8 persons. The results showed that there is no significant difference among the adoption categories in the family.

Demonstration: from sampled respondents 44.31 % households have participated in field trial demonstration on improved teff varieties and the rest 55.69% did not participated. The result indicated that participation on demonstration significantly and positively influences the adoption of high yielding teff varieties at 1% probability level. When farmers have a chance to participate in practicing on-farm trial they may develop know-how more about the technologies with their socio-economic conditions, this enhances them to take further measures, either to use or not the agricultural technologies.

Credit availability: was hypothesized as one of the major institutional factors influencing the decision of a farmer to adopt new technologies. In the study area, it was found that 86.02% of the adopters of an improved wheat variety and 36.4% of non-adopters reported obtaining credit from the state (i.e., the Bureau of Agriculture at all levels). Therefore, the analysis result revealed that, access to credit service shows statistically significant association with the adoption decision at 1% level of significance. The result indicating that farmers with access to credit have a higher probability of adopting improved teff varieties than those households with no access to credit. Similar result was reported by (Dawit Milkias, 2020).

Oxen owned: is an important indicator of wealth status for the farm community which is hypothesized to have positive relationship with the adoption of improved teff varieties adoption. The Oxen holding of the sampled respondent is ranging from 0-6 TLU implying the existence of variation among the households in livestock ownership. An Oxen holding in TLU had no statistically significant relationship with the adoption of improved teff varieties which is different with the hypothesized relation with adoption decision. This states that, the increase or decreases in oxen holding size in the households had no significant influence with the adoption decision in the study area.

Farming experience: the mean years of farming experience of adopters of improved teff varieties was 13.7$\pm$5.74, whereas that of non-adopters was about 13.96$\pm$5.6. In this analysis, it was hypothesized that with more farming experience, a farmer can become more or less averse to the risk implicit in adopting a new technology. The study showed no significant difference, however, in years of farming experience between adopters and non-adopters of improved teff varieties. Descriptive results of the study are presented in table 4 below.

Table 4: Socioeconomic characteristics of respondents

Variable	Total sample (N=159)	Adopter (N=93)	Non-adopter (66)	X^2	t-value
Age	49.69(9.8)	50.01 (9.8)	49.24(9.87)		-0.485
Gender (%)				4.16***	
- Male	55.34	92.47	18.20		
- Female	44.67	7.53	81.82		
Education level (%)				5.84***	
- Illiterate	31.55	23.7	39.4		
- Primary	38.7	44.09	33.3		
- Secondary	26.33	26.9	25.76		
- Tertiary	3.45	5.38	1.52		
Mean Family size (no.)	4.95 (1.27)	5.03(1.34)	4.84(1.16)		0.90
Mean farming experience(year)	13.84 (5.7)	13.75 (5.74)	13.96 (5.57)		0.24
Mean of land size owned	1.08 (0.26)	1.09(0.22)	1.07 (0.31)		0.73
Number of Oxen owned(no.)	2.87(1.35)	2.97(1.4)	2.73(1.16)		1.15
Mean farm income(ETB)	7500.6 (3275)	8795.7 (2762.60)	5675.1 (3080.7)		6.68***
Parti. On demonstration (%)				5.56***	
- Yes	44.31	53.76	34.85		
- No	55.69	46.24	65.15		
Credit availability (%)				42.02***	
- Yes	61.19	86.02	36.36		
- No	38.81	13.98	63.64		
Distance to FTC (km)	2.13 (1.2)	2.02(1.2)	2.3(1.2)		1.3

Source: *own survey data, 2019*. Standard deviation in parenthesis, ***, denote significant at 1%, levels of significance respectively.

Logistic Regression of Improved teff Varieties

All of the explanatory variables hypothesized to potentially influence adoption of improved teff varieties were fitted into a logistic model (Table 5), and their individual contributions to the model were assessed on the basis of changes in deviance and the main effect and interactions were further investigated. The model analysis implies that, the existence of relationship between the dichotomous dependent with the explanatory variables for the continuous, dummy and categorical variables for the study. For this study eleven independent variables were hypothesized as factors affecting household level on adoption of improved teff varieties. The logit model results used to study factors influencing the adoption decision of improved teff varieties are shown in table 5. Among the 11 variables used in the model, 7 variables were significant with respect to adoption of improved teff varieties at 1 %, 5% and 10% of the significance level. Whereas the rest variables were found to have no significant influence on adoption decision (Table 5).

Table 5: The maximum likelihood estimates of the logit model

Variables	Coefficient	SE	z	P>|z|	Odds ratio
_cons	-8.8749	2.9989		0.003	
Age of respondents	-0.0654	0.0369	-1.76	0.077*	-0.0146
Gender of household	2.1325	1.0830	2.47	0.049**	0.4864
Education level	0.7491	0.3687	2.01	0.042**	0.1668
Land size owned	4.9518	1.4480	3.49	0.001***	1.1023
Experience	0.7023	0.1571	4.67	0.000***	0.1563
No. of Oxen owned	-0.0619	0.2317	-0.26	0.792	-0.0136
Farm income	0.0248	0.0012	1.94	0.048**	0.0525
Family size	0.1465	0.2666	0.55	0.583	0.0326
Credit	1.6485	0.8596	1.98	0.055*	0.3750
Distance to FTC	0.0366	0.3214	0.11	0.909	0.0081
Demonstration	0.9229	0.5909	1.61	0.118	0.2006

*No. of observation= 159; Wald χ2 (11) =126.56***; Prob>Chi2=0.00; Pseudo R2= 0.5864;*
Log likelihood = -44.6286; ***, **,* denote significant at 1%, 5% and 10 % levels of significance respectively.

The effect of the significant explanatory variables on adoption in the study area is discussed below: Education level of household head was found positively and significantly at less than 5% significance level. The odds ratio indicated in the model with regard to this variable that, other thing being held constant, the odds ratio in favor of adopting improved teff variety increases by a factor of 0.17 as the education level increased by one grade/year. The result confirms the finding of (Alemayehu Keba *et al*., 2020

Land size owned by farmers had significantly and positively influenced the adoption of improved teff variety at 1 percent significance level. The odds ratio result regarding to this variable indicated in the model that, other thing being held constant, land size increased by a hectare, the adoption of improved teff variety production increased by 1.1 percent holding other variables constant. Larger farm size was correlated with the farmer being more likely to adopt technologies in comparison with farmers with a small portion of land. The result is confirmed with(Dawit Milkias, 2020). Land is perhaps the single most important resource, as it is a base for any economic activity especially in rural and agricultural sector.

The model result indicates that age of household head significantly influenced the probability of adopting improved teff varieties at 10 % significance level. The odds ratio implies that a unit increase in age of a household heads will reduce the probability of adopting improved teff technology by 1 percent. In other words, as age increases the probability of adopting the variety decreases. The elders are physically weak to adopt improved teff variety. According to them, age is one of the factors that determine decision making of a person. Household heads with advanced age are more reluctant to accept new technology than younger household heads.

Gender of household head had significant and positive effects on the adoption of improved teff variety at 5 % significance level. The odds ratio implies that being male favors the adoption of improved teff variety by a factor of 0.48. This shows that male headed households are more likely to have better access to information on improved teff technology and more likely to adopt new technologies than female headed households. This result agrees with (Tesfaye Zegeye et al., 2001) and (Mesfin A, 2005). Farm income is the main source of capital to purchase farm and other household inputs. In this study farm income had positive and significant effect on the adoption of improved teff variety at 5% significance level. The value of odds ratio shows that as farm income increases adoption of improved teff variety will increase by 5 percent.

Credit availability was hypothesized to influence the adoption of improved teff varieties significantly and positively at less than 10 percent significance level. The result of the odds ratio result shows that, if the household heads access credit services, the logs of odds ratio in favor of households' adoption of improved teff varieties production will increase by 0.3. From this result it can be stated that those farmers who have access to formal credit from any governmental and non-governmental organization are more likely to adopt improved teff varieties than those who have no access to formal credit (Dawit Milkias and Abduselam Abdulahi, 2018).

Farming experiences was measured by number of

years stayed in teff production and this variable found as hypothesized affected the adoption of improved teff varieties positively and significantly at 1% significance level. The result in Table 5 shows that the odds ratio result regarding to this variable indicated, as the teff farming experience increased by one year, the intensity of adoption of improved teff varieties increased by 0.15 percent holding other variables constant. This was due to the fact that experienced farmers in teff production have better knowledge of adopting technologies, accessing information, timely sowing, cultivating, harvesting than those who are less experienced farmers.

Therefore, this finding concluded that an increase in explanatory variables there had been certain percent increase on the probability of adoption of improved teff varieties.

CONCLUSION AND POLICY IMPLICATIONS

Conclusion

The research results demonstrate that the main factors influencing adoption of teff technology are socioeconomic and institutional variables such as age of household head, education level, farm income, land size owned, teff farming experience, credit availability and gender of the household head in the study area. The latter suggests that more should be done in terms of creating awareness of the direct impact of improved varieties on the livelihoods of smallholder farmers. The factors identified could be useful to design agriculture policies and projects aimed at the adoption of agricultural technology.

Policy implications

From the cereal crops, teff is the most preferred staple food and cash income by majority of the Ethiopian population and its center of origin is in Ethiopia. The adoption of improved teff varieties affected by several household personal, demographic and socio-economic factors together with positively and significantly influenced study variables which can consequently affect the production and productivity of smallholder farmers in the study area. Based on the finding of this study, policies as well as activities directed towards improving the adoption of improved teff variety in the study area should focus on expanding infrastructure and input and output market in the rural area, increase the credit accessibility and strength the institutional arrangement so as to improve the livelihood of rural households. Therefore, the government and other Non-Governmental Organization should do their part in creating awareness, facilitating the access and mobilizing farmers to adopt the improved varieties so that farmers can improve their agricultural productivity and then change their livelihood.

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REFERENCES

CSA, 2010. “Agricultural Sample Survey: Area and Production of Major Crops, Meher Season”. Vol. I. Addis Ababa, Ethiopia.

MoFED (2006). Ministry of Finance and Economic Development. Ethiopia: Sustainable Development and Poverty Reduction Program. Addis Ababa: MoFED.

World Bank, 2007. Development indicators, available at http://web.worldbank.org. Accessed on July 18, 2012

World Bank, 2008. Awakening Africa’s sleeping giant: Prospects for commercial agriculture south of the Sahara, Agriculture and Rural Development Unit, The World Bank, Washington, DC. (http://siteresources.worldbank.org/INTARD/Resources/sleeping_giant.pdf) Accessed on August 13, 2013)

Federal Democratic Republic of Ethiopia/FDRE (2010). Growth and Transformation Plan 2010/11-2014/15. Volume I: Main Text. Ministry of Finance and Economic Development. November 2010. Addis Ababa.

Gebreselassie, S. (2006). Intensification of smallholder agriculture in Ethiopia: options and scenarios. Paper presented for the Future Agricultures Consortium Meeting at the Institute of Development Studies, 20-22 March 2006. DFID.

Byerlee, D., D. Spielman, Dawit Alemu and M. Gautam, 2007. Policies to promote cereal intensification in Ethiopia: A review of evidence and experience. IFPRI Discussion Paper 00707, IFPRI, Washington, DC. (http://www.ifpri.org/pubs/dp/ifpridp00707) Accessed on August 10, 2013.

McGuire, 2005. Getting genes: Rethinking seed system analysis and reform for sorghum in Ethiopia. PhD. Dissertation, Wageningen, University,Wageningen.

Rashid, S. and Assefa, M. 2006. Sources, extents and policies to manage food price risks in Ethiopia: How does it fare with other developing countries? Paper presented at the “Ethiopian Strategy Support Program 2006 Policy Conference,” June 6–8, 2006, Addis Ababa, Ethiopia.

ATA (Agricultural Transformation Agency). 2016. Transforming agriculture in Ethiopia. Annual report 2015/2016.

CSA (Central Statistical Authority). 2016. Agricultural sample survey 2015/16. Volume I. Report on area and production of major crops for private peasant holdings, meher season. Statistical bulletin 584. Central Statistical Agency, Addis Ababa, Ethiopia.

Fufa Bekabil, *et al*, 2011. “Strengthening the teff value chain in Ethiopia.” Mimeo, Agricultural Transformation Agency (ATA), Addis Ababa, Ethiopia

Fantu, 2015: Summary of ESSP Working Paper 89, Productivity and efficiency of small holder Teff farmers in Ethiopia.

CSA, 2013. “Agricultural Sample Survey: Area and Production of Major Crops, Meher Season”. Vol. I. Addis Ababa, Ethiopia.

Spielman et al 2008, an innovation systems perspective on strengthening agricultural education and training in sub-Saharan Africa

Tareke Berhe and Nigusse Zena, 2008. Results in a trial of system of teff intensification (sti) at Debre Zeit, Ethiopia.

Goshu *et al* 2008; Development of Productivity Measurement and Analysis Framework for Manufacturing Companies

Feder, G., R.E. Just, and D. Zilberman. 1985. Adoption of agricultural innovations in developing countries: A survey. Economic Development and Cultural Change 33(2):255-298.

Ng’ong’ola, 1993; Factors Affecting Fertilizer Adoption In Less Developed Countries: An Application Of Multivariate Logistic Analysis In Malaŵi

Bahadur, K.L. and B. Siegfried (2004), Technology Adoption and Household Food Security. Analyzing Factors Determining Technology Adoption and Impact of Project Intervention: A Case of Smallholder Peasants in Nepal, Paper prepared for presentation at the Deutscher Tropentag, 5-7 October 2004, Humboldt University, Berlin.

District office of ARD, 2019: Activity performance reports. Liban jewi district, West showa zone, Oromia region Ethiopia.

Gujarati, D. N. (2004), “Basic econometric book, Fourth Edition”: McGraw-Hill, New York.

Sulo T., Koech, P., Chumo, C. and Chepng‟eno, W. 2012. Socioeconomic factors affecting the adoption of improved agricultural technologies among women in Marakwet County Kenya: Journal of Emerging Trends in Economics and Management Sciences. 3(4): 3-5

Dawit Milkias 2020; Factors Affecting High Yielding Teff Varieties Adoption Intensity by Small Holder Farmers in West Showa Zone, Ethiopia. International Journal of Economy, Energy and Environment. Vol. 5, No. 1, 2020, pp. 6-13. doi: 10.11648/j.ijeee.20200501.12

Alemayehu Keba et al.,2020, Factor affecting adoption and intensity of use of improved maize varieties: The case of Kiremu District, Oromia Regional State, Ethiopia

Tesfaye Zegeye, Girma Taye, D. Tanner, H. Verkuijl, Aklilu Agidie, and W. Mwangi. 2001. Adoption of improved bread wheat varieties and inorganic fertilizer by small-scale farmers in Yelmana Densa and Farta Districts of Northwestern Ethiopia. Mexico, D.F.: CIMMYT and Ethiopian Agricultural Research Organisation (EARO).

Mesfin A (2005). Analysis of factors Influencing Adoption of Triticale and its Impact. The Case Farta Wereda. Msc. Thesis (Unpublished) Presented to School of Graduate Studies of Alemaya University.

Dawit Milkias and Abduselam Abdulahi, 2018: Determinants of Agricultural Technology Adoption: The Case of Improved Highland Maize Varieties in Toke Kutaye District, Oromia Regional State, Ethiopia