Nat. Volatiles & Essent. Oils, 2021; 8(4): 5552-5562

NVEO
Natural Volatiles & Essential Oils

Determinant Factors Of Teff Production In Agriculture Sector Of Oromia Regional State: Ethiopia

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ABSTRACT

Agriculture is one of the significant sectors in low-income countries like Ethiopia. It is the backbone of an economy to meet the food requirements of its people. It provides sources of employment to the people of the country, and it is a vital contribution to national income. In the African continent, a large number of people depend on the agriculture sector. 85% of the labour force has been working in agriculture, 50% GDP, 90% of total export, and 70% supply of raw material to the country agro-industrial sector from agriculture sector **(World Bank, 2011)**. Teff is a small-grained cereal that was grown as a food crop. Its' cultivating in East Africa for thousands of years (D. Andrea 2008). It is a required food in African countries like Ethiopia and Eritrea. It has been growing specific environmental conditions like from sea level up to 2800 m above sea level, required temperature, rainfall, and soil conditions (Seyfu 1997). In Ethiopia, the average teff grain yield was 1228 kg ha -1. It is expecting 2500 kg ha-1 to improve the production use sophisticated cultivations and management practices (Tefera and Belay 2006). Hence, this study focuses on studying the determining factors of teff production of small farmers in Oromia regional state; investigate various issues and challenges of teff production, to give appropriate suggestions to overcome the problems in teff production of small farmers. The researcher conducted a farmer survey and collected a questionnaire from the respondents. Out of total household heads, the sample size determined 72 from three kebele. It includes 33 samples in Kebele, 23 sample households in Ayala Kebele, and 16 Households in GomboreKebele considered. From their response, required recommendations are to be given to the policymakers to take important decisions for improving teff production in Ethiopia.

Keywords: Agriculture sector, Teff production, Ethiopia economy, determine factors

INTRODUCTION

Agricultural production is having great potential in Ethiopia. The potential resources are vast area, fertile land, diverse climate, adequate rainfall, and sufficient labor force. Even though, this country remains underdeveloped because resources were not utilizing optimum manner **(Avele,**

2006). Cereal crop production is one of the crops, its' not sufficient to meet the food requirement of Ethiopian people. Millions of people lack food their health condition is the poor and low standard of life. The strategy of developing countries has been focusing on increasing cereal crop production **(EEA, 2000).** Teff has produced from cereal, and it expanded cultivation from 2.14 million hectares in 2004-05 to 2.7 million in 2010-11. Teff has cultivated 1.3 tonnes per hectare in Ethiopia. It was limited because most Ethiopian farmers are using traditional landraces of Teff that are distributed all over the country (Seyfu, 1997).

1.2. REVIEW OF LITERATURE

Many of the studies revealed that determinants of agricultural productivity in Ethiopia. **Mege, Bila, and Ihenacho (2006)** stated that farm size, fertilizer, and hired labor were the significant factors for determining food crops, and **FeyisaChuke (2007)** reveals determinants of agricultural productivity smallholder farmers using a regression model. A similar study took by **SenaiHailu, (2006)** determinants of agricultural productivity in Ethiopia. He found various factors are influencing determining agriculture productivity. **T.D. Senha (1991)** stated that the age and sex of the household is the significant factor for determining agricultural productivity. Few other studies indicate teff production all over the country at low productivity **Seyfu, (1993)**. Related to teff production cultivated land on a big scale but at the same time the yield is lower because of low-quality seeds are using in Ethiopia **(Engdawork, 2009).**

1.3. PROBLEM OF THE STUDY

The agricultural outputs of low-income countries are low productivity due to this insufficiency to meet their requirements **(Ayele, 2006)**. The population size has been increasing, but the productivity is not sufficient as influencing the insecurity situation in Ethiopia (FAO, 2001). Teff is one of the significant crops in Ethiopia. It has been using in “Injera,” and it is the main diet of most Ethiopians. Analysis indicated that in 2011-12 estimated that teff made up 20% of all cultivated areas in Ethiopia, and it has to play a vital role meet the requirement of food security in Ethiopia **(Seyfu, 1993)**. It is a cash crop the market price is 2 or 3 times higher than other agricultural products by most farmers. Recent economic associations stated that most of the developing countries are not able to increase teff, maize, and wheat production, for this researchers to study the teff production of smallholder farmers influencing factors in AdeaBergaworeda, and investigate issues and problems for producing teff products in the Oromia regional state.

1.4 RESEARCH GAP

The above literature review reveals that the researchers focused on increasing agricultural productivity by various factors, and limited studies in teff production using sub-standard seeds

reveals in their studies. No research has conducted determinant factors on teff production in a specific region Oromia regional state, Ethiopia.

1.5 RESEARCH QUESTIONS

1. What are the factors that determine teff production in Oromia Regional State: Ethiopia?
2. How is the best way to improve teff productivity in Oromia Regional State: Ethiopia?

1.6 RESEARCH OBJECTIVES

1. To investigate the determinants of Teff production in AdeaBergaWoreda
2. To find out issues and problems for producing teff production of small farmers in AdeaBergaworeda.
3. To give appropriate recommendations for improving teff crop production in Oromia regional state, Ethiopia

1.7. RESEARCH METHODOLOGY

This study has focused on three phases. The first stage has been selected based on the extent of teff production. In the second stage, identified three kebeles as a simple random sample from 20 rural kebeles. Finally, the sample size for the study is determined based on a formula developed by Cochran (1963). n=

Where, n=Total sample size. The three kebele has 2200 household heads. From these house heads, 1995 household heads were Teff producers in 2007/2008 E.C from these first calculate p. p=$\frac{\text{producer}}{\text{target population}}$ =72

So by using the above-stratified sampling formula proportional number of the respondent in each kebele is calculated as follows.

1. From Mankichokebele ($\frac{1000}{2200}$)$\times 72 = 33$
2. From Ayalakebele ($\frac{700}{2200}$)$\times 72 = 23$
3. From Gomborekebele ($\frac{500}{2200}$)$\times 72 = 16$

Model specification of teff production

The model shows the relationship between the productivity of teff and its factors. The researcher uses the multiple linear regression models because teff productivity has more than one variable.

$$\mathbf{Qit = \beta_0 + \beta_1 X_1 t + \beta_2 X_2 t + \beta_3 X_3 t + \beta_4 X_4 t + \beta_5 X_5 t + \beta_6 X_6 t + \beta_7 X_7 t + U_t}$$

$\mathbf{X_7 t}$=amount of the price of capital. $\mathbf{U_t}$= error term

$\boldsymbol{\beta_0}$-intercept to give the mean value of teff output and excluded all variables from the model.

$\boldsymbol{\beta_1}$- measures the change in teff (quintal) due to change in the number of oxen other variables held constant.

β_2-measures the change in the mean value of teff production per quintal changes in teff farm size (hectare), other things to be zero.

β_3- measures the change in the mean value of teff production due to change in family size, other things the same.

β_4-measures the change in the mean value of teff production due to per kilogram change of selected improved seed, other things the same

β_5-measures the change in the mean value of teff production (in quintal) due to change in urea (kg) holding other things constant.

β_6- Measures change the average value of teff (quintal) due to the change dap in kg of household head, other to be constant.

β_7- measures the change in the average value of teff (quintal). Due to per birr change of capital, holding other constant

2. DATA ANALYSIS

The data was collected from 72 smallholder farmers selected in AdeaBergaWoreda. The survey was used for descriptive analysis, and based on cross-sectional data.

Table: 01 Households demography-Sex and age composition of respondents

Sex	No. of respondents	Percentage (%)	Age composition		
			Age interval	No. respondent	Percentage (%)
Female	22	31 %	20-30	16	22 %
			31-40	20	27 %
			41-50	21	28 %
			51-60	11	16 %
Male	50	69 %	61-70	4	7 %
Total	72	100 %		72	100 %

Source: - From the survey

From table: 1 represents the information about the number of male and female respondents who participated in the survey. Out of 72, the male is 50, and female respondents are 22, 69%, and 31%. It implies that the male respondents' participation is more than the female in Woreda's region. The age of the respondents' youngest household age was 20, the oldest age group 70. The difference between the age group is 50. By using group frequency distribution, grouping into five categories with ten variations between the age group found that below 30 and above 60 were recorded only

29% out of total respondents. The remaining 71% of households are in the age of 30-59 age group were active in farming.

Table: 2 Marital status and educational levels of households

Educational status	No respondents	Percentage (%)	Marital status	No of respondents	Percentage (%)
Illiterate	38	53 %	Single	16	22 %
First cycle	24	34 %	Married	52	72 %
Second cycle	10	13 %	Divorced	4	6 %
Total	72	100 %		72	100 %

Source: From the survey

Table:2 refers total respondents, illiterate are 38 (53%), 24 (34%) are first cycle, 10 (13%) are second cycle. The analysis of the data implies that most of the respondents are illiterate 53%. It is a negative impact on teff production. The table observed that 52 (72%) are married, 16 (22%) are unmarried, and 4 (6%) were to divorce. From the total respondents, the married household heads have a large contribution by participation in teff production.

Table: 3 Size and age of family households

Family size	**Frequency**	**Parentages (%)**	**Ages of family**	**Frequency**	**Percentages (%)**
0-5	26	36 %	0-14	145	48.33 %
6-10	43	60 %	15-64	149	49.67%
> 10	3	4 %	> 65	6	2 %
Total	72	100 %	Total	300	100%

Source: From the survey

Table:3 reveals the size and age of family households in AdeaBergaWoreda. It observed that 60% of household family size in 6-10 members. Based on, earlier studies these family members are illiterate and whose have no experience producing teff production. It showed 49.67% of respondents' age group between 15 and 64. Above 65 of age group were accounted 50.33%. Based on the analysis, it can say that the above 65 age group depends on 15-64 age groups, most of the produced output left for consumption purposes.

Table 4. Household productivity used in teff production

No	Variables	Frequency	Percentage (%)
1.	Uses of farmland	72	100 %

2.	Uses of Urea	72	100 %
3.	Uses oxen	72	100 %
4.	Uses improved seed	38	53 %
5.	Uses labour	72	100 %
6.	Uses of Dap	72	100%
7.	Uses of the price of capital	72	100%

Source: From the survey

Table: 4 Farmland, labor, urea, dap, price of capital, and oxen are using by all respondents in the teff production. However, only 38 (53%) respondents use the improved seed to produce teff production. 34 (47%) farmers are not using quality seed and use a local variety of teff. The main determinants of the teff production are farm size, urea, dap, price of capital, selected seed number of labor (family labor), and the number of oxen used.

Table: 5 Levels of factors of production and yields of teff

Variable	Maximum	Minimum
The output of teff in quintals	93	35
Farm size in hectares	2	0.15
No of oxen	8	1
No of labor	16	4
Selected seed in (kg)	200	25
Number of urea in kg	200	125
Dap uses in kg	200	130
Price of capital in birr	623	350

Source: From the survey

From table: 5 represents the maximum level of teff output was 93 quintals and the minimum 35 quintals produced. Using Urea at the maxi level is 200kg, Oxen of 8, 16 numbers of labor, 2 hectares of land, 200 kg. of dap, seed, and 623 birrs of capital.

Econometric Analysis

For estimate purposes, employed the OLS regression analysis. Before going estimate the specified model, it is significant to undertake different tests on whether the basic assumptions of the method meet or not.

Test for multicollinearity

An indication for a linear relationship between independent variables is called multicollinearity. A decision rule for the multicollinearity test for the model stated is a variable whose VIF values are greater than 10 indicates the existence of severe multicollinearity. As observed from table-6, no mean value of VIF is higher than 10. The researcher concluded that there are no problems of multicollinearity between the explanatory variables.

Table 6: Multicollinearity test (VIF)

Variable	VIF	1/VIF
Capital in birr	6.94	0.144111
Dap in kg	5.22	0.191589
Seed in kg	2.02	0.495642
Urea in kg	1.55	0.643746
Family size	1.46	0.684208
Oxen	1.07	0.937291
Land in hectares	1.04	0.962198
Mean VIF 2.76		

Test for Heteroscedastic

This type of test is using to examine the pattern of the error terms variance are constant or to test the assumption of homoscedasticity. Heteroscedastic is present if the variance of the error term is not constant variance for different segments of the population or sample size.

Heteroscedastic is more likely to exist in cross-sectional than time-series data.

The decision rule is if the p-value of the Breushpogan test is higher than any of the chosen significance levels 10%, 5%, and 1% indicated no probable, the problem of heteroscedasticity. Thus, the result highlights that chi 2 of 8.22% is higher than any significance levels, and the study concludes these showed the same variance among error terms.

Table 7.Breusch-Pagan / Cook-Weisberg test for heteroscedasticity

chi2 (1)	3.02
Prob> chi2	0.0822

Model specification: To test the model specification is significant to check out whether one/more relevant variables have been omitted, from the model or one/more irrelevant variables included in the model. There are different methods to check the specification error of the model. As depicted in

table 4.8 tests the null hypothesis that the Ho model has no omitted variables, as a decision rule according to Ramsey reset test, a model specification is fit for regression analysis if the p-values stated in P>F is greater than the chosen level of significances i.e. 1%, 5% and 10%. According to this test, the model has no relevant omitted variable since the test has failed to reject the null hypothesis. Prob> F is 33.74% which is greater than any of the significance levels of the specified model of the study. Table 4.8.Ramsey RESET test for omitted variables

Ho: model has no omitted variables	
F (3, 61) =	1.15
Prob> F =	0.3374

Results of the regression analysis

This section presents the findings from the econometric results on the determinants of teff production. The section covers the regression model used in this study and the results of the regression analysis.

Table 9 Results of regression analysis

F (7, 64) = 72.48 Prob> F = 0.000						
Outputteff	Coef.	Std. Err	t	P>|t|	[95% Conf. Interval]	
Oxen	.7707129	.353565	2.18	0.033	.0643856	1.47704
Land	-1.532107	1.38188	-1.11	0.272	-4.292729	1.228515
Family size	.9500273	.3027892	3.14	0.003	.3451363	1.554918
Seed	.1502644	.0237824	6.32	0.000	.1027537	.1977751
Urea	.3029402	.0428674	7.07	0.000	.2173028	.3885776
Dap	-0.1255577	.0850555	-1.48	0.145	-.2954757	.0443602
Capital	0.172409	0.0238221	7.24	0.000	0.248189	0 .219999
Constant	-84.89274	25.16404	-3.37	0.001	-135.1637	-34.62179
R-squared = 0.8880						
Adj R-squared = 0.8757						

From table 9 highlights R-square and adjusted R-square values are 0.8880 and 0.8757. The total variation between the dependent variable and independent variable is 87.57%. It showed from the analysis, except for land and dap remaining variables' p-value is significant.

Regression result interpretation

The regression result, all coefficient of the variable has attained their expected sign. Thus, the estimated model is specified as follows.

Output

Land size and teff production

The coefficient of the land size is insignificant at 1%. Unproductive and inactive labor is a high amount. Hence, the family size has to be reduced.

Oxen and production of teff

The coefficient of oxen was found that significant by 5%. It is an expected positive sign. 1% increase in the number of oxen will lead to a 77% increase in teff output. The teff seed is too small, heavy, and unbroken soils so that its land should be tillage by high frequency. Hence, it needs many numbers of oxen to tillage lands again and again. Therefore teff production and the number of oxen have direct relationships.

Family size and production of teff

The coefficient of family size showed significant by 1%, its result positive sign. 1% increase in family size increase to 95% in teff output. Therefore teff production and family size have direct relationships.

Urea and production of teff

The coefficient of urea was found to be strictly significant by 1%, level of significance, and showed a positive sign. 1% increase in fertilizer in the unit lead to a rise of 30% in teff output.

Seed and production of teff

The coefficient of seed found to be significant by a 1% level of significance showed a positive sign. One unit rises in the quantity of improved seed leads to a 15% increase in the teff production. Thus, the more farmers used the quality seeds higher the level of teff production.

Dap and production of teff

The coefficient of dap was found insignificant at any percent level of significance and in the same fashion with land size. It may be due to when we use more dap, the land becomes acidic, and the production will decrease.

Capital and production of teff

The price of capital and teff production has a positive relationship the one-birr increase in the price capital of teff increases teff production by 0.17 quintals. It is strictly significant at 1%, 5% levels of significance. The relation shows capital increases teff output also increases.

3. CONCLUSION

In low-income countries like Ethiopia, the agriculture field is the main economic activity. It is the backbone of an economy but not in a position to meet the food requirements of its people. Hence, this focused on determinants of agricultural product and investigates the determinants of teff production in Oromia regional state in the case of AdeaBergaWoreda. Based on cross-sectional data and descriptive statistics has been used to analyze the stated objectives. It may conclude that in the Oromia region, people are illiterate farmers, family head educational status is infant stage, and the usage of technology is low. The farmland size is relatively small as we compare it with other areas. The determinant factors of oxen, fertilizers, seed, family size, urea, and price of capital have positive effects, but land size and uses of dap harm the teff production.

4. RECOMMENDATIONS

Based on the study analysis, the researcher gives the following policy implications. The educational background has to be enhanced and use family planning which helps reduce the family size. For getting a high yield, the government should take initiatives to create awareness for the farmers. Usages of modern inputs, technical training, facilitate seed, fertilizer, other requirements, etc. Periodically, the farmers should interact with each other to share experiences for obtaining the benefit. NGOs also to create awareness among the people to change their attitude towards using teff production by providing different improved seeds which are more suitable for their production. Investors must serve the society collaborating with governments, in various aspects to improve the society's teff production.

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