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Determinant Factors of Teff Production in Lokka Abbaya Woreda of Sidama Regional State: Ethiopia

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Abstract
One of the important sectors in low-income nations like Ethiopia is agriculture. To provide for the needs of its population in terms of food is the foundation of an economy. It is essential to the nation's economy and gives the people of the nation sources of work. Many people on the African continent rely on the agricultural industry. Agriculture employs 85% of the labor force, accounts for 50% of GDP, 90% of total exports, and supplies 70% of the country's raw materials to the agro-industrial sector (World Bank 2011). Teff, a cereal with small grains that was once produced for human consumption. It has been grown for thousands of years in East Africa (D. Andrea 2008). In Africa, it is a necessary food item. It has been growing under certain climatic circumstances, including those that range from sea level to 2800 meters above sea level, the necessary temperature, rainfall, and soil requirements (D. Milkias and A. Abdulahin 2018). The average output of teff grain per hectare in Ethiopia was 1228 kg. It anticipates increasing production by 2500 kg ha-1 with the employment of modern farming techniques and management strategies (Wato T. 2019). Therefore, the goal of this study is to examine determining factors that affect small farmers' ability to produce teff in the Lokka abbaya woreda of Sidama regional state, as well as to look at related difficulties and challenges in order to provide solutions. The researcher surveyed farmers and obtained questionnaires from the participants. The sample size was determined to be 63 out of all household heads from three kebele.Agriculture is a significant sector in low-income countries like Ethiopia. An economy's cornerstone is its ability to provide the food needs of its population. It provides the people of the nation with sources of employment and is crucial to the nation's economy. On the African continent, the agricultural sector supports a large population. 85 percent of the workforce is employed in agriculture, which also generates 50 percent of the country's GDP, 90 percent of its exports, and provides 70 percent of its raw materials to the agro-industrial sector (World Bank 2011). Small-grain cereal called teff, which was formerly created for human consumption. In East Africa, it has been grown for countless years (D. Andrea 2008). It is a necessary food staple in Ethiopia.
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INTRODUCTION

Ethiopia's potential for agricultural development is enormous. Large areas, arable terrain, a variety of climates, sufficient rainfall, and a large enough labor force are the potential resources. Despite the fact that resources were not used to their full potential, this nation is still underdeveloped (Fenta A. 2018). Although production of cereal crops is one of the crops, it is not enough to meet Ethiopians' needs for food. Numerous people live in poverty and have terrible health conditions as a result of their lack of access to food. The goal of emerging nations' strategies has been to produce more grain crops (W. Ayenew, T. Lakew, and E. H. Kristos 2020). Teff has generated income from the production of cereal, and it increased cultivation from 2.16 million hectares in 2017–18 to 2.9 million hectares in 2021–22. Due to the fact that the majority of Ethiopian farmers are applying backward landraces of teff that are allocated all over the country (M. B. Zegeye, A. H. Fikire, and A. B. Assefa 2022).

REVIEW OF LITERATURE

Numerous studies found that Ethiopia's agricultural productivity was influenced by various factors and noted that farm size, fertilizer, and hired labor were the important variables in determining food crops (Sate, S. & Tafese, A. 2016), while (Tamirat, W., & Tilahun, N. 2020) used a regression model to identify the components that influence agricultural productivity in smallholder farmers. (Wato, T. 2019) conducted a research akin to this on the factors influencing agricultural productivity in Ethiopia. He discovered that a number of variables affect agricultural output. According to (Fenta, A.2018), the household's age and gender are key factors in affecting agricultural output. Only a few other research show that teff is produced nationwide with low productivity (D. Milkias and A. Abdulahin, 2018). Teff production involves extensive land cultivation, although the yield is reduced as a result of low-quality seeds are applying in Ethiopia(M. B. Zegeye, A. H. Fikire, and A. B. Assefa, 2022).

PROBLEM OF THE STUDY

Due to inability to satisfy their needs, low-income countries' agricultural outputs are insufficiently productive (Firdisa, B. 2016). Although the population has been growing, Ethiopia's lack of production is contributing to the country's high level of insecurity (FAO, 2015). One of Ethiopia's important crops is teff. It has been used in "Injera," which is the main food consumed by the majority of Ethiopians. According to analysis, teff accounted for 20% of all farmed areas in Ethiopia in 2020–2021, and it must play a crucial role in ensuring Ethiopia achieves food security (Wato, T. 2019). Most farmers grow it as a cash crop because the market price is two or three times higher than that of other agricultural goods.

Current economic associations reveals that most of the less developed countries are not able to increase teff, wheat , and maize production, for this researchers to investigate the teff production of smallholder farmers influencing factors in Lokka abbaya woreda, and examine issues and problems for producing teff products in the sidama regional state.

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 very specific region lokka abbaya woreda , sidama regional state, Ethiopia.

RESEARCH QUESTIONS

1. What elements affect teff output in lokka abbaya woreda of sidama regional state?
2. What are challenges that small farmers faced by in lokka abbaya woreda in producing teff
3. What is the most effective approach to raise teff productivity in lokka abbaya woreda of sidama regional state?

RESEARCH OBJECTIVES

1. To research the factors that influence Teff production in lokka abbaya Woreda
2. To learn about the challenges faced by small farmers in lokka abbaya woreda in producing teff.
3. To provide pertinent advice for enhancing teff crop output in lokka abbaya Woreda of sidama regional state.

RESEARCH METHODOLOGY

Three phases have been the subject of this investigation. On the basis of the volume of teff production, the first stage has been chosen. The second stage involved selecting three kebeles at random from a group of 22 rural kebeles. Finally, a method created by Cochran is used to establish the study's sample size (1963). Where, n=Sample size total

The three kebele has 3201 household heads. From these house heads, 2025 household heads were Teff producers in 2021/2022 E.C from these first calculate p.

p=producer /target population=63

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

From salasimita=$\frac{725}{3201}$x63=23

From sodosimita=$\frac{616}{3201}$x63=19

From kura kebele=$\frac{684}{3201}$x63=21

Model specification of teff production

The model illustrates the connection between teff's productivity and its contributing components. Teff productivity contains several variables, hence the researcher applies multiple linear regression models.

$Y = \beta_0 + \beta_1 z_1 + \beta_2 z_2 + \beta_3 z_3 + \beta_4 z_4 + \beta_5 z_5 + \beta_6 z_6 + \beta_7 z_7 + ei$

z1, z2 … z_7= explanatory variable.

β_0-intercept to give the mean value of teff product and excluded all variables from the model.

β_1- measures the change in teff (quintal) due to change in the number of oxen other variables heldconstant.

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

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

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 mean 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 mean value of teff (quintal). Due to per birr change of capital, holding other constant

ei= error term

DATA ANALYSIS

The data was collected from 63 smallholder farmers selected in Lokka abbaya Woreda. 63 was based on cross-sectional data, was used for descriptive analysis.

Table: 01 Demographics of respondents, including the respondents' ages and sexes

Sex	No. of respondents	%	Age composition		
			Age interval	No. respondent	Percentage(%)
Female	30	48	20-30	16	25 %
			31-40	14	22%
			41-50	24	38 %
Male	33	52			
			51-60	7	11 %
			61-70	2	4%
Total	63	100		63	100 %

Source: - From the survey

Table 1 shows the data on the proportion of male and female respondents who took part in the survey. Male respondents make up 52 %of the 63 total, while female respondents make up 48%. It suggests that in Woreda's area, men participate at a higher rate than women. The youngest household age of the respondents was 20, while the oldest age group was 70. The age gap between the groups is 50 years. By employing group frequency distribution, classifying the age group into five categories with ten variants, it was discovered that 25 percent of respondents overall land the remaining 38% of households were engaged in farming and were in the 20- to 30 and 41-50-year-old age bracket respectively.

Table: 2 Marital status and educational levels of households

Educational status	No respondents	Percentage (%)	Marital status	No of respondents	Percentage (%)
Illiterate	38	60%	Single	20	35 %
First cycle	2o	32%	Married	37	59 %
Second cycle	5	8%	Divorced	6	6 %
Total	63	100 %		63	100 %

Source: From the survey

According to Table:2, of the total respondents, 38 (or 60 percent) are illiterate,20 (or 32percent) are first-cycle, and 5 (or 8 percent) are second-cycle.60 percent of the respondents are illiterate, according to the data analysis. Teff production is negatively impacted by it. According to the table, 37 people (59%) are married,20 people (35%) are single, and 6 people (6%) are planning to be divorced. Married household heads make up a significant portion of the total respondents and contribute significantly to teff output.

Table: 3 Size and age of family households

Family size	Frequency	Parentages (%)	Ages of family	Frequency	Percentages (%)
0-5	23	36%	0-14	21	33.33 %
6-10	33	52 %	15-64	34	54%
> 10	4	12%	> 65	8	12.67 %
Total	63	100 %	Total	300	100%

Source: From the survey

The size and age breakdown of family households in lokka abbaya Woreda is shown in Table 3. It was noted that 52% of families had between 6 and 10 individuals. These family members are uneducated and have no prior experience making teff, according to earlier studies. The age range of the respondents, between 15 and 64, was represented by 54%. Over 65s made up 8 percent of the age group. According to the report, the over-65 age group depends on the 15 to 64 age groups, with the majority of the produced output going toward consumer

goods.

Table 4. Household productivity used in teff production

No	Variables	Frequency	Percentage (%)
1.	Uses of farmland	79	100 %
2.	Uses of Urea	79	100 %
3.	Uses oxen	79	100 %
4.	Uses improved seed	38	42%
5.	Uses labour	79	100 %
6.	Uses of Dap	79	100%
7.	Uses of the price of capital	79	100%

Source: From the survey

Table: 4 All responders use farmland, labor, urea, dap, capital costs, and oxen in the production of teff. However, only 38 (or 42% of respondents) said they use the enhanced seed to grow teff.51 farmers (58%) utilize a local teff variety instead of high-quality seed. The area of the farm, the amount of urea and dap utilized, the cost of capital, the amount of labor chosen (family labor), and the number of oxen employed are the primary variables of teff output.

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

Variable	Maxi	Mini
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

According to table 5, the maximum yield of teff was 93 quintals, and the smallest yield was 35 quintals. Utilizing urea at its maximum level requires 200 kg of fertilizer, 8 oxen, 16 workers, 2 hectares of land, 200 kg of seed, and 623 birrs in capital.

Analysis of Economic Data

OLS regression analysis was used to make estimates. It is important to carry out various tests to see if the fundamental presumptions of the approach are true before moving further with the estimation of the stated model.

Test for multicollinearity

Multicollinearity is a sign that there is a linear relationship between two independent variables. A variable whose VIF values are larger than 10 indicates the occurrence of severe multicollinearity, according to the decision rule for the multicollinearity test for the given model. No mean value of VIF exceeds 10 as can be shown in table 6, according to the data. According to the researcher, there are no issues with multicollinearity among the explanatory factors.

Table 6: Multicollinearity test (VIF)

Variable	VIF	1/VIF
Capital in birr	6.93	0.144211
Dap in kg	5.21	0.191588
Seed in kg	2.01	0.495641
Urea in kg	1.57	0.643741
Family size	1.44	0.684207
Oxen	1.06	0.937292
Land in hectares	1.05	0.962192
Mean VIF 2.76		

Heteroscedasticity Test

This kind of test is used to look at the variance pattern of error terms or to test the homoscedasticity assumption. If the error term's variance varies for different population subgroups or sample sizes, heteroscedasticity is present. Cross-sectional data are more likely to contain heteroscedasticity than time-series data.

The decision rule is that the problem of heteroscedasticity is not likely to exist if the p-value of the

Breushpogan test is lowe. 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.

The decision rule is that the problem of heteroscedasticity is not likely to exist if the p-value of the Breushpogan test is lower than any of the selected significance levels, which are 10%, 5%, and 1%. The analysis indicates that these demonstrated the same variation among error words and that the chi 2 of 8.22 percent is higher than any significance levels.

If the p-value for the Breushpogan test is low, then the decision rule states that the problem of heteroscedasticity is unlikely to exist.

This kind of test is used to look at the variance pattern of error terms or to test the homoscedasticity assumption. When the variance of the error term is not consistent across population segments, heteroscedasticity is present.

Table 7.Breusch-Pagan test for heteroscedasticity

chi2 (1)	3.01
Prob> chi2	0.0821

Model specification:

It is important to test the model specification to see if any relevant variables have been left out or if any irrelevant variables have been added. There are numerous ways to examine the model's specification error. As portrayed in table 4.8 evaluates According to the Ramsey reset test's decision criteria, a model specification is fit for regression analysis if the p-values mentioned in P>F are more than the selected level of significances, i.e. 1 percent, 5 percent, and 10 percent. The null hypothesis is that the Ho model contains no omitted variables. Since the test was unable to rule out the null hypothesis, it can be concluded that the model has no meaningful omitted variables. Prob> F has a probability of 33.74 percent, which is higher than any

Ho: model has no omitted variables	
Prob> F =	0.3374

Results of the regression analysis

The results of the econometric analysis on the factors affecting teff production are presented in this section. The regression model utilized in this study and the regression analysis' findings are covered in this part

Table 9 Results of regression analysis

F (7, 56) = 72.47 Prob> F = 0.000						
Outputteff	Coef.	Std. Err	t	P>|t|	[95% Conf. Interval]	
Oxen	.7717127	.351561	2.16	0.031	.0643755	1.47600
Land	-1.512106	1.36182	-1.10	0.272	-4.292625	1.228512
Family size	.9400272	.3017891	3.12	0.002	.3451564	1.554913
Seed	.1402643	.0236823	6.32	0.000	.1027435	.1977754
Urea	.3019401	.0427673	7.05	0.000	.2173527	.3885773
Dap	-0.1245576	.0851552	-1.46	0.143	-.2954656	.0443603
Capital	0.171408	0.0228222	7.24	0.000	0.248178	0 .219988
Constant	-84.79273	25.16203	-3.34	0.001	-135.1536	-34.62167
R-squared = 0.8881						
Adj R-squared = 0.8755						

R-square and adjusted R-square values from Table 9 are 0.8881 and 0.8756, respectively. The dependent variable and independent variable's combined variation is 87.56 percent. According to the analysis, all other variables' p-values are significant, with the exception of land and dap.

Regression output 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.

Interpretation of the regression result

According to the regression analysis, every variable's coefficient has the predicted sign. The estimated model is therefore described as follows.

Output

Size of the land and teff output

With a 1% coefficient, the land size is barely noticeable. There is a lot of idle and inactive labor. As a result, the family size must be decreased.

Oxen and teff production

By a margin of 5%, the oxen coefficient was found to be significant. It is an anticipated good indicator. Teff production will grow by 77 percent with every 1% increase in the number of oxen. Teff seed requires frequent ploughing since it is too tiny, heavy, and unbroken in the soil. Therefore, it takes a lot of oxen to plow fields again again

Capital and production of teff

Teff output and capital costs are positively correlated. Teff production increases by 0.17 quintals for every one-birr increase in price. At levels of significance of 1% and 5%, it is strictly significant. The relationship demonstrates that when capital rises, teff output rises as well.

CONCLUSION

In low-income nations like Ethiopia, the agriculture field is the primary economic activity. it's miles the backbone of an economic system however now not in a position to fulfill the food necessities of its people. for this reason, this focused on determinants of agricultural product and investigates the determinants of teff manufacturing in sidama region in the case of Lokka abbaya woreda. Primarily based on cross-sectional information and descriptive facts has been used to research the stated objectives. it may conclude that within the Lokka abbaya, humans are illiterate farmers, circle of relatives head academic status is little one level, and the usage of technology is low. The farmland length is enormously small as we compare it with different areas. The determinant factors of oxen, fertilizers, seed, family size, urea, and rate of capital have high quality effects, but land length and uses of dap harm the teff production.

RECOMMENDATIONS

The researcher provides the following policy implications based on the analysis of the study. In order to limit the number of children, it is necessary to adopt family planning and improve educational backgrounds. The government needs to take steps to educate farmers so they can produce a high output. Utilization of contemporary inputs, technical training, ease of access to seed, fertilizer, and other necessities, etc. Farmers should occasionally interact with one another to exchange experiences and reap the benefits. By offering various enhanced seeds that are more suited for their production, NGOs can also educate the public and modify their attitudes toward using teff production. Investors must assist society by working with governments in a variety of ways to increase the production of teff in the community.

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