

# Factors Determining Supply of Wheat: A Study in Lemo District of Ethiopia

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Received: 09<sup>th</sup> July 2021

Revised: 25<sup>th</sup> August 2021

Accepted: 08<sup>th</sup> September 2021

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**Abstract:** The main goal of the research is to analyze the factors that influence wheat supply. The research is based on a survey done in Ethiopia's Lemo area. Two stage sampling technique was followed to select 120 wheat farmers distributed over four kebeles among the eight kebeles of the district having the same agro ecological features. In Ethiopia, kebele is a small administration unit under each and every District. Thirty farmers were selected from the document maintained in the District Agriculture Office by using Random sampling method. The findings of the regression analysis revealed that the current price, total farm productivity, quantity of consumption, and weather were all major factors in determining supply. Some policy implications like developing transport infrastructure, continuing with the price support policy, emphasis on the quality of the wheat product by delivering improved variety and designing the needed extension method and promotion of wheat consumption were recommended.

**Key words:** Supply, regression, subsistence farmers, Lemo district, Ethiopian.

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## 1. Introduction

### 1.1 Background

Wheat is grown on around 247 million hectares, with a global yield of over 768 million tons. It is second only to rice in terms of productivity and geographical covered. Wheat produces around 35% of the world's calories and 15% of its protein. Wheat is the primary source of nutrition for more than 60% of the world's population. The Asian, Canada and America area produces and consumes around 90% of all wheat farmed worldwide. Wheat is primarily a high - energy or high -calorie food with 64.7 % carbohydrate (Seyfu, 1993). Wheat bran is used as a cow and poultry feed, wheat hulls are used in the making of

insulating materials, cement, and card board, and are also used as litter in poultry keeping, and wheat straw is used as a cattle feed. Wheat is cultivated in a wide range of altitude and climatic conditions. It may grow up to 3000 meter above ocean water level and requires a hot, sticky atmosphere. It thrives in areas with high moisture, long hours of sun, and a steady force of water. The temperature needed for blooming is in the range of 26.50 C to 29.50 C and at the time of growing the temperature should be between 200C and 260C (BFED, 2012). The total area coverage of the Southern region is estimated about 17million ha. Out of this area, about 4.5million ha of land is suitable for wheat cultivation (BFED, 2012). This records a tremendous increase in the response from the part of farmers to produce wheat in Ethiopia. These natural and government supports which leads lot of researches to find alternative or substitute grains in this district. Ethiopia is the second populated country in the African continent after Nigeria. Population is increased in the aggressive rate, but food production is not be fulfilled the demand for the total population. Particularly during pandemic period, people who are not able to produce more. There are lot of factors which are influencing the prices of grains in side of the nation, like inflation, lock down, less production capacity etc.

The food insecurity issues are forcing the government to find out substitute crops for the teff, maize and sorghum at various places in Ethiopia. Further research is needed to analyze the supply behavior of wheat farmers to continue with the policy of encouraging this crop as substitute for teff, maize and sorghum, which are the staple crops in Ethiopia.

Some conditions such as higher price of factors of production and lower future price of grains creating more risks to production of grains particularly wheat. And lengthy process and procedures and marketing costs also affecting take the production to the market in time. The entire market supply of food grains will be quite low, which will have an impact on wheat producers' profitability, wheat dealers' business, and consumers. Present study is an attempt towards analyzing the supply of wheat at farm level.

### **1.2 Studies in Ethiopia**

Even though agriculture sector sharing considerable amount to the GDP, less number of researches are focused in the agriculture sector in the Ethiopia. Research on peasant responses to economic incentives, in particular, is very lacking. The study by Mulat (1984) showed that the principal determinant of market supply of teff was the level of output. Its coefficient was positive and highly significant. An increase of teff output by 1 quintal (per adult unit) resulted in an increase of market supply by about 0.57 quintal. For horse bean and chickpea, Goaring (1974) found negative price elasticity of supply. In contrast, Bisrat

(1976) showed that the subsistence sector responded positively to price incentives in terms of supply. He maintained that at higher price peasants increase their fertilizer consumption, provided that the risk factor and inaccessibility to extension agents were not limiting factors. In 1982, a mission of the Food and Agriculture Organization (FAO) and the World Bank concluded that one of the primary issues behind Ethiopian agriculture's slow performance was a lack of price incentives. The research was predicated on the notion that peasants had a positive reaction to price increases. For most markets, the effect of seasonality on grain price levels was regarded as considerable. According to ménage- position data on planter grain selling habits, the large number of Ethiopian growers vended their grain to the request shortly after crop owing to painful deals when prices were low. "According to a preliminary assessment from the GMRP household survey, farmers sold approximately 85 percent of their grain between October and March. Because of their limited revenue to fulfill their financial responsibilities, which in most cases have to be settled quickly after harvest, and possibly because the returns to storage were not significant under current smallholder conditions, most farmers were unable to take advantage of seasonal price disparities" (Legesse and Asfaw, 1989). In utmost cases, the influence of seasonality on marketing perimeters between markets wasn't significant. Because the maturity of the factors that impact seasonal price rises are similar in magnitude across market. This suggest that individual dealers will demand a enough harmonious periphery throughout the marketing season.

This finding could indicate that private temporal arbitrage has a low incentive. In the year 1996, the study of 219 private grain dealers in Ethiopia plant that further than half of them kept grain for more than two months on average (Gebremeskel, 1997).

### **1.3 Aim of the study**

The research was designed to investigate the factors that influence wheat supply in the Lemo District of Ethiopia

## **2. Method**

### **Regression Analysis**

For agricultural commodity markets, relatively simple generalized 'theory' models have been found to have wide applicability. One typical example, applied to the markets for cocoa, coffee, tea, wool, cotton, sugar, and wheat, involves basic relationships to describe the determination of quantities supplied (Engle and Yoo, 1987, Branson and Norvell, 1983, and Hallam, 1990). Lal *et al* (1996) identified volume of production, wages paid in kind and total consumption as most important

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factors affecting marketed surplus of paddy. Thakur *et al* (1997) concluded that volume of production, price received, volume of consumption, and wages in kind significantly influenced marketed surplus of paddy in India. Adapting from those, the following model was specified to analyze the factors determining the supply of wheat.

$$SUP = f(PCR, PCR_{t-1}, PRCOTH, AREA, FACEXP, PROD, CONS, DM, WEATH)$$

Where;

SUP - Quantity of wheat marketed in qtl/HH

PCR - Price of wheat supplied in Birr/qtl

PCR<sub>t-1</sub>- One year lagged price of wheat in Birr/qtl

PRCOTH - Price of other crops production in the farm in Birr/qtl

AREA - Total acreage of wheat cultivated in ha

FACEXP- Expenditure on factors of production in Birr

PROD - Total production of wheat in qtl/HH

CONS - Quantity of wheat consumption in the HH in qtl/year

DM - Distance from market in km

WEATH - Weather =1 for favorable, 0 for unfavorable

As to total production, it was decided to take the predicted value to avoid its endogeneity with volume of consumption. To predict total production, the appropriate function is Cobb Douglas function and then by transforming to log linear function the variable could be used in the supply model.

That is,  $Y = AL^{b_1}K^{b_2}C^{b_3}e$ , Where,

Y=Total Production of wheat

A=Constant

L=Area under wheat cultivation in ha

K=Labor used in wheat production in man days

C= Variable expenses incurred in wheat production in Birr

$b_1, b_2, b_3$  =Coefficients to be estimated

e=error term

The linear form of the above equation is:

$$\ln Y = \ln A + \ln b_1 L + \ln b_2 K + \ln b_3 C + \ln e$$

### 3. Findings and Discussions

#### 3.1 Descriptive Analysis of Wheat Production, Consumption and Marketing

In the process of production two main things are to be recognized, as in the first case production is expected to make the growers self-sufficient in food grains. The surplus amount over consumption is marketed in the opposite situation concerning Table 1, Shurmo kebele was to dominate the other kebeles in terms of wheat cultivation area (44%). It is also possible to relate the cultivation area with that of total production of wheat for this kebele.

**Table 1: Cultivation area of wheat in sample households by kebele (in ha)**

Kebele	Min	Max	Total		
			Area	Percentage	Mean
Shurmo	0.5	2.25	36.75	44	1.23
Shurmo Dach	0.06	1.25	16.06	19.2	0.54
Ambicho	0.13	1	15.58	18.6	0.52
Kidigissa	0.25	0.75	15.25	18.2	0.51
<b>All kebeles</b>			<b>83.64</b>	<b>100</b>	<b>0.69</b>

#### 3.2 Wheat Production Patterns

The same is true for Shurmo kebele to dominate in terms of total production (42%) over other kebeles as described in Table 2. Average production of wheat is almost the same in other three kebeles at 15 qtls.

**Table 2: Total production of wheat in sample households by kebele (qt/hh)**

Kebele	Min	Max	Total Production	Percentage	Mean
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Shurmo	15	49	989	42	32.97
Shurmo Dacho	8	29	471	20	15.1
Ambicho	6	29	470.5	19.9	15.68
Kidigissa	8	25	426	18.1	14.2
<b>All kebeles</b>			<b>2356.5</b>	<b>100</b>	<b>19.64</b>

### 3.3 Wheat Consumption Patterns

It was stated before that utilization of wheat, was in the form of bread by majority of producers (96%) while the second forms of consumption were injera (60%) and local alcohol (60%). As indicated in Table 3, the highest consumption per household (37.5%) was in Shurmo kebele and the least consumption (16.6%) in Shurmo Dacho kebele.

**Table 3: Consumption of wheat in sample households by kebele (in qtls/hh)**

Kebele	Min	Max	Consumption	Percentage	Mean
Shurmo	3	18	396	37.5	13.2
Ambicho	2	15	251.5	23.8	8.38
Kidigissa	4	15	233	22.1	7.77
Shurmo Dacho	0.5	12	175	16.6	5.83
<b>All kebeles</b>			<b>1055.5</b>	<b>100</b>	<b>8.79</b>

### 3.4 Wheat Marketing

Quantity of wheat marketed by sample households, as presented in Table 4 was the highest (49.5%) in Shurmo kebele. On the other hand, Kidigissa kebele supplied the least amount on average (13.9%).

Table 4: Supply of wheat by sample households by kebele (in qtls/hh)

Kebele	Min	Max	Total		
			Quantity	Percentage	Mean
Shurmo	5	22	387	49.5	12.9
Shurmo Dacho	1	15	173	22.1	5.77
Ambicho	1	8	113.5	14.5	3.78
Kidigissa	1	15	109	13.9	3.63
<b>All kebeles</b>			<b>782.5</b>	<b>100</b>	<b>6.52</b>

In order to estimate the marketed surplus of wheat, summary of area, production, consumption and quantity marketed are presented in Table 5.

It is indicated in the table that Shurmo kebele dominated in terms of wheat area, production, consumption, and supply. Out of total average production, 33.2% is supplied to market while 44.76% is consumed and the rest is used for other purpose in the household/farm. Marketed surplus of wheat was the highest in Shurmo Dacho and Shurmo kebeles (38.21 percent and 39.13 percent respectively). In Kidigissa (25.56 percent) and Ambicho kebele, it was the lowest (24.11 percent).

Table 5: Summary of wheat area, production, consumption, and supply averages per hh.

Kebele	Average wheat area (ha)	Average production (qt)	Average consumption (qt)	Average supply (qt)
Shurmo	1.23	32.97(100)	13.2(40.04)	12.90(39.13)

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Shurmo Dacho	0.54	15.10(100)	5.83(38.6)	5.77(38.21)
Ambicho	0.52	15.68(100)	7.77(49.55)	3.78(24.11)
Kidigissa	0.51	14.20(100)	8.38(59.01)	3.63(25.56)
All kebeles	0.69	19.64(100)	8.79(44.76)	6.52(33.20)

Figures in parentheses are percentages of average consumption, and average supply out of total production with respect to sample kebeles.

Price received by the sample farmers for the wheat supplied during the year 2003/04 are tabulated in Table 6. For the entire sample, the average price obtained was Birr 193.42/qtl. Farmers in Shurmo kebele obtained the highest price of Birr 215/qtl, followed by Ambicho (Birr 204.93/qtl), Shurmo Dacho (Birr 184.30/qtl), and Kidigissa (Birr 169.43/qtl).

**Table 6: Current price of wheat by kebele during the year (2003/2004) (in Birr/qtl)**

Kebele	Min	Max	Mean
Shurmo	190	240	215
Ambicho	190	228	204.93
Shurmo Dacho	165	215	184.30
Kidigissa	140	200	169.43
Total			193.42

### 3.5 Factors influencing Wheat Supply

There are two factors which have more impact on supply of wheat in Ethiopia namely production and consumption. Because of both are contributing to supply of wheat by producers and by the markets. Everything produced is either to be consumed or supplied to the market or to be stored for unborn time.

Hence, a regression model was designed to study the relationships between the determining factor of supply and the marketed surplus of wheat. The following factors were studied to influence wheat supply: the current price, one year lagged price, actual consumption in the household, total production of wheat in the farm, distance to the market, and weather. Table 7 shows the regression analysis results, and the conclusions taken from them are described below.

**Second order test for the regression estimates**

The collinearity data in the coefficient table in the appendices show that there is no multicollinearity concern among the independent variables addressed elsewhere. This may be checked by looking at the Tolerance and VIF (Variance Inflation Factor) columns. Tolerance for all variables is less than one while VIF for each variable is not more than 10 as a threshold value for multicollinearity. A variable, Total Acreage for Wheat Production, is checked for the presence of multicollinearity with total production using correlation diagnosis and by considering Tolerance and VIF.

Since the cross section data were used to estimate the model, problem of autocorrelation was not expected to affect the statistical properties of the coefficients. This Was Further Proven from the DW statistics (1.279).

**Table 7: Regression results of wheat supply model**

Variables	Coefficients	Elasticities
Current Price (PRC)	0.04982** (2.711)	1.477
Lagged Price (PRC <sub>t-1</sub> )	0.05200** (2.417)	1.549
Predicted Production (PROD)	0.359*** (5.703)	1.054
Consumption (CONS)	-0.401*** (-3.758)	-0.53
Distance from Market (DM)	0.111 (0.867)	
Weather (WEATH)	1.824*	

	(2.893)
Constant	-19.926
	(-5.564)
R <sup>2</sup>	0.608
Sample size	121

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Note: Dependent Variable – Marketed surplus of wheat in quintals.

: Figures in parentheses are t-values

\* - Significant at 10% level of significance

\*\* - Significant at 5% level of significance

\*\*\* - Significant at 1% level of significance

#### **Inferences from the model estimation**

According to the summary of the regression analysis results, model was having goodness of fit greater than 60%, which was sufficient to explain the interaction of the factors on the dependent variable,

#### **Current and Lagged Price**

In this study, the coefficient of current price of wheat, which is 0.04983, shows a positive relation to wheat sold or supplied to market. Here, producers checked the price of wheat for their best benefit and this led the determinant to be significant at 5% level. As shown in the table, the same is true for lagged pricing.

Wheat supply is elastic at 1.478 in relation to present price. This means that, ceteris paribus, a 1% change in the price of wheat product results in a 1% change in the quantity of wheat product supplied by producers from their respective mean levels.

In other words, the supply is influenced by the price that purchasers are willing to pay.

In a study by Ramos and Lopez (1997), the short term price elasticity of wheat was found to be 0.222 in several nations, however in a study by Ashaba ( 2009) in Uganda the elasticity estimate with respect to guaranteed price was almost unitary (0.99).

The formula used to get the above result is:

$$E = \frac{\Delta Q / Q}{\Delta P / P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}, \text{ Where P and Q are average price and marketed surplus of wheat respectively}$$

### Production

Total output, as projected, had a substantial impact on wheat availability to market. Its determination power was explained by a coefficient 0.359. It was also highly significant at 1% level with a 't' statistics of 5.703. Hence, the elasticity of quantity supplied to production was 1.054 showing that with every percentage change of additional production, the farmers sold 1.054 percentage. This finding backs up Ashaba ( 2009) analysis, which found that elasticity estimations revealed that farmers' paddy supply to the government was more than unitary in relation to paddy output (1.16)

### Consumption

Consumption was negatively correlated with wheat supply explaining when consumption has increased the wheat quantity sold decreased. This is obvious to conclude that consuming more of what is produced resulted in less quantity supplied.

From the result of Analysis the researcher came to know that the coefficient of consumption is -0.401, its significance being 0.000 and with 't' statistics of -3.753. This shows consumption is significant to explain the quantity supplied of wheat. Wheat supply elasticity in relation to consumption is -0.54, which is inelastic.

### Weather

The study found that weather has a major impact on wheat supply to the market. Its coefficient was 1.824 and with significance of 0.005 and 't' statistics of 2.893. This demonstrated that weather had a significant impact on wheat supplies. From the value of coefficient it could be realized that good weather could increase the wheat supply by 1.824 qtls

**Table 8: Percentage analysis of marketing problems of wheat producers**

S.N	Description	Number of Respondents	Percentage (%)
1	Supply of almost all wheat product to the market with the existing price just after the harvesting time to cover other costs for that time	113	93.3

2	Shortage or absence of processing machine	116	88.3
3	Unavailability of transport means together with low infrastructure	87	73
4	Low quality of wheat product to get higher price	64	54.2
5	Shortage of family workers to cultivate wheat and other crops	55	45
6	Shortage of rain water in terms of duration especially in time of maturity	32	26.7
7	Flooding of the production area more than required important for wheat production	26	21.7
8	No more wheat to supply to the market over consumption	19	16

From the above data, the critical problems are those stated by No.1, No.2, No.3, and No.4 with their decreasing order of importance. The other problems are also experienced in order of their importance as indicated in the table.

From side of processors/traders, the major problems according to their decreasing order of importance are listed below and the type of traders are both whole sellers and retailers.

The product is not properly dried by the producers because of lack of know-how (100% of the interviewees)

1. Early harvesting of wheat (75% of the interviewees)
  2. Quality problem of wheat, presence of materials like dust particles, sand and other seeds (50% of the interviewees)
  3. Fluctuation of price even during harvesting time (50% of the interviewees)
- Slow uptake by the consumers (25% of the interviewees) during harvesting

*Source:* Author's findings

#### 4. Conclusion

Supply of agrarian goods is characterized by numerous factors, which are linked to both natural and manmade events. This draws a distinction between agricultural and non-agricultural commodities when it comes to entertaining natural and artificial circumstances. The consequence of the relation of the below occurrences determines supply of the commodity to the demand of the market by producers. In analyzing supply of wheat to the market it is necessary to

consider the different factors and elements in the point of view of production up to arrival to the market. All steps involving in the process between productions and marketing are resisting with its own determinant factors. This leads to arising of the main determining factors of supply of the agrarian goods to the market.

In this research, grounded on the results attained through analysis and observed features, it's possible to conclude that the supply of wheat was utmost of the time linked to the current price, lagged price, total production and consumption. And weather also influencing the supply of wheat besides the above determinant factors. People who are cultivating wheat they have to be aware of all environmental conditions and factors before commencement of production process as well as supply of wheat.

With expectation of improve the efficiency of marketing and minimizing the issues on marketing of products, producers must minimize all costs involving in the marketing and try to maximize the value of goods.

Producers have to justified that how to produce the agriculture products and keep ready particularly food grain based on the results obtained from the analysis of information obtained from the respondents. To retain the status of success in the process of production and marketing for long time, there should be few necessary measures that have to be taken either by the producers themselves or the responsible body (from side of the government) to make production and marketing smoothly.

This research was carried out on the nature of the sector, the situational condition of the producers, and challenges faced in the process of production and marketing of wheat. From the findings of the study, the following significant measures are provided to concerned stake holders particularly policy makers.

1. Wheat production had a considerable impact on wheat supply, according to the regression analysis results. Hence, efforts must be taken to increase the production level by delivering improved variety of wheat to producers.
2. The study also provided that current price as well as lagged price had impact on the quantity of wheat supplied. Therefore, there is a need of the price support policy programs to increase the amount of units of wheat marketed by the wheat producers. Developing a market information system in grain markets in general and about wheat market in particular would help the wheat producers in making marketing decisions.
3. Significant influence of consumption on the marketed surplus is an indication for the caution needed in policy decision regarding intervention in wheat marketing. Thus, results reveal the substance nature of wheat farming in the Lema District of Ethiopia for extra consumption not to hinder to improve the market supply of wheat.

4. Another factor that determines the marketable surplus of wheat is the weather. Hence necessary steps must be taken to educate wheat farmers on timely cultivation of wheat by predicting possible weather parameters.
5. Majority of sample farmers reported that absence of adequate processing facility and distress sale of wheat immediately after harvest were major problems. The policy makers should find the feasibility of constructing storage facilities in the rural areas with necessary processing facilities for keep wheat to balance the demand and supply.
6. Transportation is another burning issue for the wheat farmers to move wheat from production place to markets. So, to protect general interest of the people, transport infrastructure in the research area has to be modernized. This one would help the farmers to get the right price in right time.
7. Wheat traders have stated that there is a quality issue. Hence, training the wheat farmers in enhancing and maintaining the quality of wheat would serve as double purposes of raising the income and increasing the nutritional quality of the food consumed by the people. By providing training farmers to gaining the knowledge of production and supply of grain, their standard of living will be improved.

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