

# Value Chain and Market Participation of Maize in North Gondar Zone, Ethiopia

Getahun Abreham Assefa (✉ [gabreham@gmail.com](mailto:gabreham@gmail.com))

University of Gondar Faculty of Agriculture <https://orcid.org/0000-0002-7173-5042>

Yordanos Sete Deresse

University of Gondar Faculty of Agriculture

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## Research

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## Abstract

**Background:** *The smallholder producers in Ethiopia generally and in North Gondar Zone specifically are price takers since they have little participation in the value chain and imperfection of the marketing system. Farmers have low bargaining power to sell their products to the market. Empirical findings on identifying actors of the value chains, and assessing determinants of farmers' participation decision and marketed volume in the study areas in North Gondar is not found. As a result, this study examined the determinants of farmers' participation decision and marketed volume in the study areas in North Gondar Administration Zone.*

**Methods:** *Primary data was got from a total of 350 sample households and 60 maize traders who were interviewed using a pretested questionnaire. Heckman selection model was employed to identify factors that determine market participation decision and its intensity in maize markets.*

**Results:** *The Heckman's selection model result shows farming experience ( $P < 0.079$ ) and relative fertility of land ( $P < 0.000$ ) determines farmers' maize market participation decision positively and significantly whereas rural credit access ( $P < 0.002$ ) affected it negatively. Variables DA visit frequency ( $P < 0.03$ ), distance from market ( $P < 0.053$ ) and Labor force ( $P < 0.002$ ) have positive effect and significant on marketed volume of maize. On the other hand, Farm land size ( $P < 0.040$ ) and level of education ( $P < 0.041$ ) are significant but they have a negative effect on it in North West Ethiopia.*

**Conclusion:** *The area is a potential place to the production of maize. Even though the potential is high there are many determinants and challenges which affect the producer's market participation status and the volume of marketed surplus. Therefore, government must check its land use proclamation and rural financial institution policies and their applications in North Gondar administration zone in Ethiopia.*

## 1. Background

Agriculture continues to be a strategic sector in the development of most low-income nations. It employs about 40% of the active labour force globally. In Sub-Saharan Africa, Asia and the Pacific, the agriculture-dependent population is over 60%, while in Latin America and high income economies the proportions are estimated at 18% and 4% respectively [17]. Like the developing nations, agriculture continues to be the leading sector in Ethiopia's economy, with cereals playing a central role. Empirical evidence show that, cereals account for 65 percent of the agricultural value added, equivalent to about 30 percent of the national gross domestic product. Grain production in Ethiopia is almost totally based on rain-fed agriculture and is characterized by a dominant harvest (Meher) in November and December and a secondary harvest (Belg) in April and May. Production is carried out by small-scale farmers with limited agricultural technology and low yields and by a small percentage of state farms [13].

Empirical evidence in agro-industry value chain in Ethiopia indicates that the sector faces many challenges due to limited market outlets, limited efforts in market linkage activities and poor market information among actors. The small scale, dispersed and unorganized producers are unlikely to exploit market opportunities, as they cannot attain the necessary economies of scale and lack bargaining power in negotiating prices [1]. The smallholder producers in our country generally and in the North Gondar zone specifically are price takers since they have little participation in the value chain and imperfection of the marketing system. Farmers have low bargaining power to sell their products to the market [2 and 11]. All these show that households in North Gondar zone are not well integrated in the crop market particularly in the rural areas where the majority of farmers are located. The producer's market participation status and the volume of marketed surplus were not clearly recognized. Any individual who need brief information about maize value chain activities in North Gondar and Central Gondar Zonal Administrations couldn't get easily without having of studies there.

Therefore, to fix such types of problems, researchers wanted to incorporate the objectives which were assessing value chain of maize, identifying major factors which affect market participation and maize market supply by smallholder producers and, categorizing challenges and opportunities of maize value chain activities in the study area.

## 2. Research Methods

### 2.1 Description of the study area:

The study was conducted in North Gondar Zone. It is located between 11056' and 130 45' North latitude and 35011' and 35050' East longitudes more than 700 Km far from Addis Ababa, the capital city of Ethiopia. The zonal capital is Gondar. The Pick Mountains of the country, the ancient civilized center, Fasil Castle, The Ethiopian Chilada Baboon, Walya Ibex, The Ethiopian Epiphany and The Finding of the True Cross festivals, The largest lake of Ethiopia and sources of the Blue Nile, and more hospitable and hard work people are found in there. The zone is dominated by the agricultural sector especially crop subsector. The dominant crops are Wheat, Barley and Maize. The zone is divided into more than 23 districts [5]. Among the districts Chilga, Takusa and Dabat are the study areas (see the below study Map Fig. 1).

### 2.2 Sources of data and method of data collection

Primary data was collected through well designed questioner and personal face-to-face interview by trained enumerators under the close supervision of the researchers. Secondary data was got from various sources such as reports of bureau of agriculture at different levels, NGOs, zone administrative office, previous research findings, Internet and other published and unpublished materials, which are relevant to the study.

### 2.3 Sampling Procedure

For this study, multistage-stage sampling technique was used to draw sample maize producer farmers. First, three potential districts (Chilga, Takusa and Dabat) from North Gondar Zone are selected through purposive approaches. Relatively good potentiality of maize production, access of infrastructures, low redundancy of researches and etc are some of the reasons why we selected the districts. In the second stage, using the data from each district offices, two

more potential were selected in each selected districts. Those kebeles were Arebur and Guchereb in Dabat, Begmenkir and Achera in Takusa, and Sertya and Eyaho in Chilag district. The intended sample size was determined proportionally to population size of maize grower farmer. Finally, 350 producers who produce maize were selected randomly based on proportion to number of maize producing farmers in each kebele. Group discussion was also one of the research methods to gather data which include as a member agriculture office (crop experts), trade office (marketing experts), cooperative office experts and researchers. And also, selection of sample traders was made based on the number of, wholesalers' cooperatives and retailers participating in Maize marketing. To select sample traders, first the sites where maize market was identified, then, 60 traders, 3 cooperatives and a union were selected.

## 2.4 Methods of Data Analysis

Data from the field was edited, coded, and cleaned to ensure consistency, uniformity, and accuracy. Data was entered into computer software for analysis. STATA 14 computer programs were used to process the data. Two types of analysis, namely: descriptive and econometric were used for analyzing the collected data.

### Descriptive Analysis:

Description of respondent, assessing maize value chain and description of actors and their roles were reported by using and descriptive statistics like percentage, mean and standard deviation. In addition, T-test, F- test and Chi-square tests were used to check the associations and relationships between dependent and independent variables for continuous and categorical variables, respectively.

### Econometrics Analysis

Econometric model was used to identify the factors that affect farmers' participation decision in maize marketing in one hand and determinants of the volume of maize marketed in the other hand. Most recent literatures adopt Tobit and Heckman's two-stage models to identify factors that affect producers to participate in the marketing of maize (sale) or not and also identify factors that determine the quantity of maize marketed.

Ideally, the OLS model is applicable when all households participate in the market. In reality not all households participate in a specific commodity market. Some households may not prefer to participate in a particular market in favor of another, while others may be excluded by market conditions. If the OLS regression is estimated excluding the nonparticipants from the analysis, a sample selectivity bias is introduced into a model. Such a problem can be overcome by following a two-step procedure as suggested by [10].

Tobit model can be also used to address the above mentioned problem; but its assumption that both the participation decision and level of supply determined by the same variable in the same way introduces inconsistency bias into the model. However in reality all producers may not be potential suppliers of a product and a variable that affect participation decision may or may not have similar effect on the volume of a produce supplied to the market. Hence, Heckman's procedure was used in this study.

## 3. Results And Discussion

### 3.1 Descriptive Statistics results

#### 3.1.1 Household characteristics

The average remoteness of market distance from households home was 4 and 6 kilometer approximately for market participants and non-market participants respectively with significant difference between participants and non-participants at below 1% probability level (Table1). This implies that as the distance of the farmers' home farther from the nearest market, market participation will be decreased. Therefore, distance from market affects negatively the farmers' level of participation decision on maize marketing in the study area. The average age of the sample household heads were 47.8 years and 47.9 years for market participants and non-participants respectively without any significance mean difference between age of the household head and the dependent variable market participation as shown in Table 1.

Table 1  
Characteristics of the Sample Households

Users		Non users		T -value	Combined		
variables	mean	Std.dev.	mean		Std.dev.	mean	Std.dev.
dismkt	4.346	2.839	5.623	3.150	-3.939***	5.054	3.077
agehh	47.786	9.831	47.902	8.935	-0.114	47.850	9.332
*** and ** represents significant at 1% and 5% probability levels respectively.							
Source: ours field survey analysis, 2017–2020							

### 3.2. The Maize Products' Value Chain

#### 3.2.1 Value chain actors and their role

The value chain map showed that many actors were involved directly or indirectly in Maize value chain. In our study, the direct actors are those involved in commercial activities in the chain (input suppliers, producers, traders, processors and consumers) and indirect actors are those that provide financial or non-

financial support services, such as credit agencies (ACSI, Amhara credit Services Institute), Garaje (maintenance services providers) government offices, NGOs and researchers.

### A. Input suppliers

As input supplier both the primary and supportive actors were involved in the study area. Primary cooperatives and farmers were playing an important role in the supply of inputs required for maize production (Fig. 1). Although improved seeds, fertilizer, herbicide and pesticide were the inputs delivered to producers in the study area however maize seed provision was the major activities in those providers. These inputs were supplied either in cash or in loan base. As we have seen in the bellow table, small holder maize producer farmers got maize seed from farmers and primary cooperatives in North Gondar which implies that major maize seed suppliers were farmers and primary cooperatives (Fig. 2).

### B. Direct actors

Primary actors in maize value chain in all selected districts were farmers, traders, processors and consumers. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor, and some actors perform more than one role. There are six direct actors which were identified in maize products value chain map in North Gondar. i. producer, ii. Village trader, iii. Wholesaler, iv. Retailer, v. Processor and vi. Consumer.

**i. Producer- Maize producer** farmers are the major actors in the chain who did multiple functions from ploughing up to harvesting and marketing. The major value chain functions that *maize* producers perform include ploughing and establishing the land, sowing, weeding, harvesting and post-harvest handling and marketing the maize product. Maize producers transport the commodities to village or town markets either carrying sack or loading on donkeys. They had several marketing options, directly selling to consumers and collectors. They sell directly more than one-third amount of produced maize directly flowing outlet to collectors. Farm gate, village market and town markets are type of markets used by household heads. Collectors and consumers were the main buyers of maize with percentages of 40% and 27%.

**ii. Collectors/Assemblers:** They take on various roles depending on the level of information farmers have and the market These are traders in assembly markets who collect Maize from farmers in village markets and from farms for the purpose of reselling it to wholesalers and They use their financial resources and their local knowledge to bulk maize from the surrounding They play important role and they do know areas of surplus Collectors are the key actors in the maize value chain, responsible for the trading of 17%, 7% and 16% percent to wholesalers, retailers and consumers, respectively from production areas to wholesale and retail markets in the study The value chain activities of collectors include buying and assembling, repacking, transporting and selling to wholesale markets.

**iii. Wholesalers:** Producers and collectors were the maize grain supplier to Majority of their product was bought from The value chain activities which were performed in North Gondar Administration Zone mostly were repackaging, sorting, grading and drying the grains of maize.

**iv. Retailers:** Retailers involvement in the chain includes buying of maize, transport to retail shops, grading, displaying and selling to Retailers are key actors in maize value chain in the study They mostly buy from wholesalers and sell to Sometimes they could also directly buy from the Consumers usually buy the product from retailers as they offer according to requirement and purchasing power of the Retailers purchase from collectors and wholesalers in village market and sale to consumers especially for individual household In our country, majority of rural consumers were the customers of retailers mostly summer season (June - September). Because in these months, it is rainy season in Ethiopia, and most of the farmers become hunger and there was no enough food available on the hands of Because of this retailers can gain high benefit through adding some values on maize products by re branding the maize The activity what we observed during the data collection time was put as Retailers gave three artificial brand names for their maize grains which are Yenjera maize, yetela maize and yedabo This means:

“Ye Enjera” maize refers the type of maize but it rebranded as a unique for making Ethiopian domestic food which is known as “Enjera”.

“Ye Tela” maize refers the type of maize but I is considered as very suitable grain for making local alcohols which is known as “Tella”. The last one is “Ye Dabo” maize which refers maize grain which is smart for making bread locally known as “Dabo”. By using such types of rebranding activities and others the retailers were more beneficial during that time when the demand was high.

**v. Processors:** In this study area, there are two types of processors i.traditional (local and modern maize processors (floor factory). As shown in the figure (Fig. farmers and retailers were the sources of their maize product for local The value addition activities here were preparing “Tel” means traditional maize alcohols and making bread, and other processed maize products like roasting and Finally the processors could sell to The modern processors in the study area were floor They got their maize from maize collectors and Finally they added some value on the maize by changing the grain to floor; they could sell mostly for restaurants, café, hotels and local processors.

**vi. Consumers:** Consumers are those purchasing the products for About two types of maize consumers were identified: households and For household consumption during non-rain season, producers and retailers are The study result indicated that producers, wholesalers and retailers are suppliers of The study result identified two types of consumers: household and 51% and 36 % maize supplied from producers and retailers respectively for household consumers during non-rainy However, for hotels, cafes and restaurants, Retailers and farmers were the main sources of maize supply to the Hotels and cafes here used the maize especially for preparing Pizza.

## 3.2.2 Maize Value chain map

As we understand from its name, maize value chain mapping is the process of developing a visual representation of the basic structure of the value chain of maize in North West of Ethiopia. A maize value chain map illustrates the way the product flows from input level to end markets (hotels, cafes, restaurants and households) and reports the primary and supportive actors with their respected roles.

## 3.2 Determinants of maize market participation

Econometric Analysis: Maize is produced to supply in to market and household consumption in the study areas. Various variables were assumed to determine the market participation decision and its marketed surplus by sampled households. Under this section, the result of the Heckman selection model (ML) is given for maize. The Heckman selection model was employed in order to control the selectivity bias and endogeneity problem; and obtain consistent and unbiased parameter estimates.

Before running the heckman selection analysis, the variables which were included in the model were checked for the existence of multicollinearity, heteroscedasticity, omitted variable and outlier problems. First, we have checked the multicollinearity problem associated with the explanatory variables. There are two methods to check the multicollinearity problems. For continuous variables, variance inflation (VIF) is used to detect the problems of multicollinearity. The VIF value less than four are believed to have no serious problems related to multicollinearity.

All continuous explanatory variables did not have serious multicollinearity problems because the values of VIF for each were below four. The second method of detecting multicollinearity problem is through contingency coefficients for high degree of association for discrete variables. Correlation coefficients with an absolute value higher than 0.75–0.8 are taken as an indicator of multicollinearity. Based on the regression output, there was no serious multicollinearity problem in discrete variables because the contingency coefficients were below 0.75. Therefore, all of the independent variables were included in the model.

In the second, the problem of heteroscedasticity was checked by using the white test. The test for heteroscedasticity after regression suggests that the errors are of the different variance. The null that the errors have constant variance is rejected. Therefore, there is the problem of heteroscedasticity in this data set. Although there are different types of heteroscedasticity corrected standard errors such as Hc1, Hc2 and Hc3. In the application, Hc3 is preferred for datasets with small sample size i.e less than two hundred fifty observations (Long and Ervin, 2000). However, Hc1, Hc2 and Hc3 are asymptotically equivalent and one shouldn't be preferred over the other (Mackronium and White, 1985). As a result, since our number of observation isn't less than 250 and the above three correction methods are equivalent then we took Hc3 among the three one for correcting the existed heteroscedasticity problems.

estat imtest, white White's test for Ho: homoskedasticity

against Ha: unrestricted heteroskedasticity

chi2(112) = 143.5 Prob > chi2 = 0.0000

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

Ovtest Ramsey RESET test using powers of the fitted values of Adoptionstatus

Ho: model has no omitted variables F(3, 347) = 3.22; Prob > F = 0.21000

Lastly, problem of outlier is tested after post estimation. Outlier can be identified if the absolute value of their studentized residual exceeds two. According to the test, there was the outlier problem in this data set. This problem was corrected by directly dropping the three observations in which their absolute value of studentized residual was greater than two. Because of this, our number of observation was reduced to 350 from 353. Based on the Heckman's selection assumption out of fifteen explanatory variables, seven of them were found to determine the participation decision in maize market (Table 2).

Table 2  
Results of determinants of maize market participation

VARIABLES	HECKMAN SELECTION			
	COEFFICIENTS	STANDARD ERROR	T-RATIO	MARGINAL EFFECT
farexpe	.016*	.009	1.75	.006
gender	-.327	.198	-1.65	-.126
landsiz	-.009	.030	-0.32	-.003
ageh	.004	.008	0.61	.001
davistfre	.016*	.009	1.69	.006
Creditacces	-.461***	.147	-3.12	-.181
fertlandl	.345***	.096	3.57	.136
distextin	-.034	.025	-1.38	-.013
cooperative	.292*	.151	1.93	.115
nonfarmincom	.055	.150	0.37	.021
hhsiz	-.027	.029	-0.93	-.010
dismarket	.053**	.025	2.10	.021
Labour	.146***	.036	3.96	.057
distancefrooad	.003	.014	0.26	.001
maritalstatus	-.042	.089	-0.47	-.016
Number of observations	350			
*, ** and *** represents significance at 5% and 1% probability levels respectively				
Source: ours field survey analysis, 2017–2020				

### Farming experience

As expected farming experience determines farmers' participation decision positively and significantly with 10 percent significant level. The positive and significant relationship between the variables indicates that as farming experience of farmers' increases, the probability of market participation also increases. The marginal effect confirms that when farming experience increases by one year, the probability of participating in maize marketing increases by 0.6%.

### Credit access

the expected influence of credit access was assumed positive but the result indicates that the reverse one. The relationship between credit access use and market participation have negative. The result is consistent with [1]. The marginal effect confirms that when the household head was being credit user, producer's market participation decision level decreases by 46.1% unit. That means as some respondents pointed out that, farmers who had large loan from informal lenders were enforced to take credit from formal lenders and this loan was used automatically for loan repayment and smooth consumption purpose rather than used as an input for maize production. In addition to that, short period of loan repayment might be one reason. Almost all of farmers have got a short term credit access with less than one year by Amhara Credit Services Institute (ACSI).

### Distance from market

the variable was expected to have a negative relationship with the dependent variable. However, as we observe in the below table, distance of market from farmers' home had a positive relation with market participation. The reason was that local markets which mean the nearest markets has much maize supply than the farthest one. Due to this, a farmer prepares its own market strategy and selects the market which has low maize supply and high demand. Because of this reason distance from market center and farmers' market participation has a positive relation.

**Labour:** Based on the bellow model results, coefficient of the variable is significant at less than one percent probability level. The marginal effect of the variable i.e 0.057 shows that the probability of being market participation increases by approximately 5.7% with increase of labour by one unit. The explanations of this result is that those farmers who have large number of labour force can produce more maize production and which lead farmers to participate in market due to having of marketed supply. This finding is in line with [13].

### Cooperative

This variable is statistically significant at less than 10 % significant level with expected sign. The result predicts that farmers who are cooperative members are more likely to participate than those who are not. The marginal effect of the variable cooperative membership status of the household 0.115 indicates that the probability of being market participant increases by approximately 11.5% with one unit increase in the cooperative participation status of the household head. The result explained that if the farmer is a member of in farmer based cooperatives, he/ she can get different information /market information and that

information and skill will be used as an input for his day to day activities. If information is available, farmers can easily participate in marketing activities. Cooperative membership has a positive impact on different farm performance in general and market participation in particular. The similar finding is found in the result of [15].

### Relative fertility of land

The variable is statistically significant at less than one percent significant level with expected sign. The result predicts that relative fertility of land has a positive relationship with the dependent variable. The marginal effect of fertility of land 0.136 indicates that the probability of being market participation is increased by approximately 13.6% if the fertility of land is good. The dependent variable (participation decision) is a binary variable that takes the value 1 if the household head had participated in maize, 0 otherwise.

## 3.3 Factors of the volume of maize market in North Gondar

Out of fourteen hypothesized variables in the outcome equation of the model, seven variables were found to be significant as factors of the volume of maize market (Table 3).

Table 3  
Maize market supply equation model

variables	Heckman selection		
	coefficients	Standard error	T- ratio
farexper	-.020	.051	-0.40
landsiz	-.316**	.154	-2.05
ageh	.077*	.043	1.77
edu	-.294**	.144	2.04
davistfre	.111**	.052	2.12
tlu	.868***	.140	6.02
fertlandl	.752	.676	1.11
distextin	.058	.052	.42
cooperative	-.536	.505	-1.06
nonfarmincom	-.102	.775	-.13
dismkt	0.279*	.144	1.93
Labour	.973***	.321	3.03
distancefroad	.010	.073	0.14
accsstomkinfo	-.991	.791	-1.25
Lambda	.310	.151	2.05
Rho	0.18		
Sigma	.188		
Wald chi <sup>2</sup>	71.68		
Censored observations	156		
Uncensored observations	194		
Number of observations	350		

### DAvisit frequency

This variable affects both farmers' maize market participation level and marketed supply of maize positively and significantly at below 10 percent significant level. Farmers' frequently contacts with development agent determines the readiness to accept new ideas and adoptions, and easy to get supply, demand and price information and this enhances farmers' decision to produce more and increase volume of sales. As expected, DAvisit frequency; increased the volume of maize supplied to the market by 11.1%, and it increases the level of market participation by 0.6% unit with its unit increment while the remains are constant. The result is consistent with the findings of [11 and 12].

**Education level;** Formal education of the household head has a negative coefficient for the maize probability model and is statistically significant at 5%. This means that a higher level of education is associated with a reduction in the probability of participating in the maize market. It is consistent with the result of [4, 13]. The possible explanation for this is that farmers with a higher level of education engage in farming on a part time basis while they commit to their full time jobs. However, farmers with low level of education farm as full time farmers since they may haven't any qualification for other jobs. This provides the

potential for higher outputs and hence ability to participate. In general, the possible explanation for this might be the fact that most of the young household heads are motivated towards other occupations than cultivation

### Land size

The total size of farm land owned by a farmer is among the variables that could influence both participation and supply as unexpected, it was expected household heads with large land size allocated more land to maize cultivation and got more maize production. However, It was found that a negative and significant relationship which indicated that as the as market land size of the household increase by 1 hectare, volume of market supply decreased by 9.73%. The implication is that, having of large land size discourages farmers to use their own land efficiently i.e productivity of land will be decreased due to problems related with management [7 and 9].

TLU: The total number of livestock unit owned by a farmer is among the variables that could influence supply as expected, it was expected household heads with large total number of livestock unit being encouraged to participate in more maize cultivation activities and got more maize production. It was found that a positive and significant relationship which indicated that as the number of TLU of the household increase by 1 unit, volume of market supply increased by 86.8%. The finding is consistent with the result of [16].

### Distance from market

As we observe in the bellow and above table, distance of market from farmers' home affects positively both market participation and marketed supply of maize. The marginal effect of the variable 0.279 indicates that as the distance rises by one unit, the volume of marketed supply rises by 27.9%. The implication is that farmers who are in far away from the market are more productive and can use their time for agricultural production activity than those farmers who are closest to market center because they cannot easily affected by different conditions or factors like alcoholism and others.

Labour: Based on the bellow model results, the marginal effect of the variable 0.057 shows that the probability of being market participation increases by approximately 5.7% with increase of labour by one unit. The explanations of this result is that those farmers who have large number of labour force can produce more maize production and which lead farmers to participate in market due to having of marketed supply. This result is consistent with [3, 6 and 8]. Therefore, this seems reasonable since households with a large number of active household labors can reduce their cost of production and produce surplus to be market-oriented.

**ageh** :the age of the household head affects the maize marketed supply as expected. It was found that a positive and significant relationship which indicated that as farmers' age increase by one unit, volume of market supply increased by 7.7%. The implication is that as age of the household head increases, production of maize will be rise and an aged farmer can accumulate his/her own capital. By using this capital, aged farmers can employ cheap labour force and can rise amount of marketed supply of maize their by increasing production of maize (Table 3).

Table 4: SWaOT analysis

<b>Strength on production and marketing</b>	<b>Weakness on production and marketing</b>
<b>Production</b>	<b>Production</b>
* Their own seedling preparation in addition to seed suppliers	* Poor input utilization
* Good labor exchange coordination	* Inapplicable of extension service
* Experienced through time	* produce mostly for consumption
	* poor seed quality of Amhara seed enterprise
<b>Marketing</b>	<b>Marketing</b>
* produce more even there is market failure	* Poor marketing linkage
	* Price reduction
<b>Opportunity on production and Marketing</b>	<b>Threat on production and marketing</b>
<b>Production</b>	<b>Production</b>
* Use of family labor	* Diseases, Labor intensive
	* palatable by animals dog, "Jart"
<b>Marketing</b>	<b>Marketing</b>
* entry of local traders	* Illegal traders harm farmer

## 4. Conclusion

The area is a potential place to the production of maize. Even though the potential is high there are many determinants and challenges which affect the producer's market participation status and the volume of marketed surplus. Among the primary actors in maize value chain in all selected districts, retailers were more beneficial during Ethiopian summer (Rainy season).Both the primary and supportive actors were involved as input supplier however, major maize seed suppliers were farmers and primary cooperatives.

The most important variables that affect farmer's maize market participation decision in North Gondar were fertility of land and credit access. Better market participation was occurred when there was high maize production and surplus through using of fertile farm land. Whereas, rural credit access other influential variable which affected the dependent variable negatively and significantly was. Most of the maize producer farmers were the participants of Amhara Credit and Saving Institute and they could get loan. However, those rural credit beneficial farmers couldn't able to participate on maize marketing activities because of misuse of the credit and having of short period of loan repayment. As we conclude that rural credit access leads farmers to be poor of the poor rather than being a catalyst for maize market participation.

## Abbreviations

BoA: Bureau of Agriculture; DA: Development Agent; GDP: Gross Domestic Product; IFPR: International Food Policy Research Institute; IPMS: Improving Productivity and Market Success; Km: Kilo Meter; ML: Maximum likelihood; MMP: Maize Market Participation; NGOs: Nongovernmental Organizations; SWOT: Strength, Weakness, Opportunity and Threat; TLU: Total Livestock Unit; UoG: University of Gondar; VMM: Volume of Maize

## Declarations

### Acknowledgements

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### Authors' contributions

GAA developed the proposal; developed research questionnaire, performed data management, coding, wrote the report and preparing the manuscript. YSD prepared research questionnaire, analysis, editing and evaluating the manuscript. All authors read and approved the final manuscript.

### Author details

Department of Agricultural Economics, College of Agriculture and Environmental Sciences, University of Gondar, P.O. Box 196, Gondar, Ethiopia

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### Competing interests

The authors declare that they have no competing interests.

### Availability of data and materials

The author wants to declare that they can submit the data at any time based on publisher's request. The datasets used and/or analyzed during the current study will be available from the author on reasonable request.

### Consent for publication

The authors have agreed to submit for Environmental Systems Research journal and approved the manuscript for submission.

### Ethics approval and consent to participate

Ethical clearance letters were collected from University of Gondar research and community service directorate and North Gondar Zone administrative office to care for both the study participants and the researchers. Before data collection and field visit, each districts and sub districts have got official letters. The study area was already informed the reason why the study has done and by whom. There was high clarity of objectives and other study issues for all study participants and others. Because of that the research was done without compromising anybody's interest.

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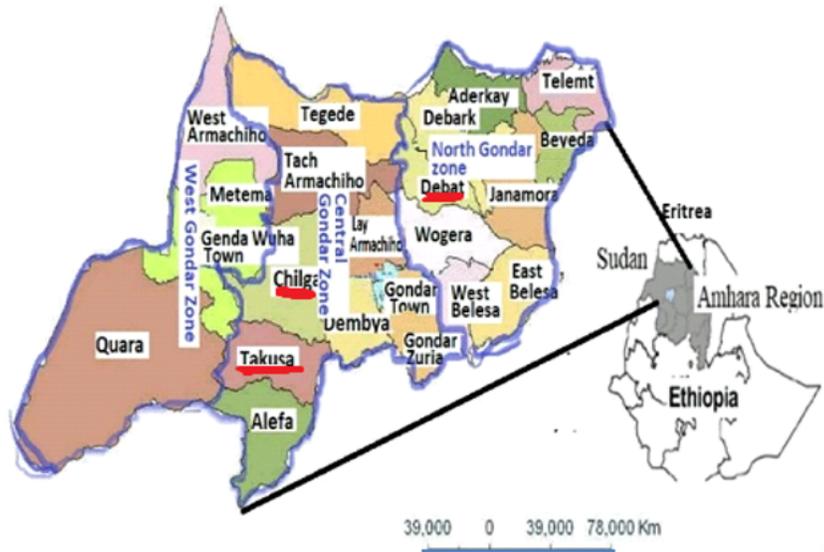
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## Figures



# MAP OF NORTH GONDAR BY WOREDA

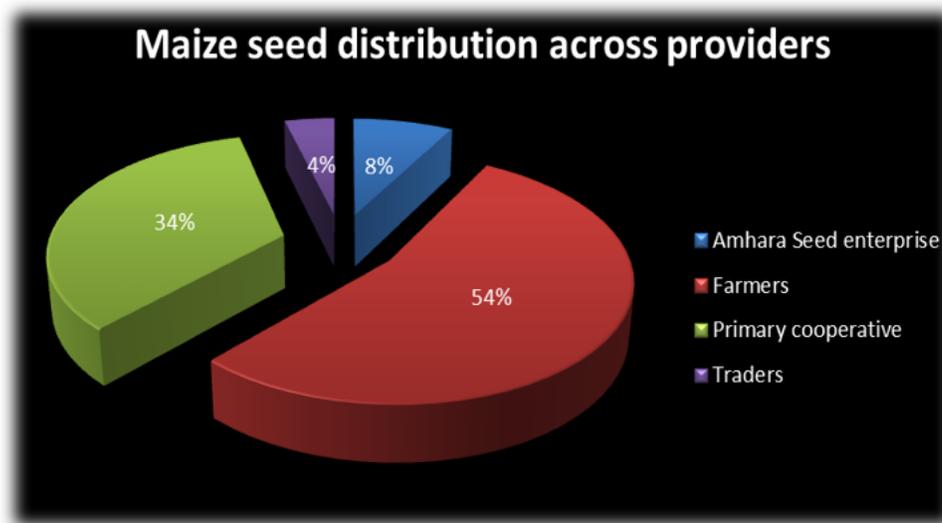


### Legend:

“ “The underlined by red line were the sampled districts.

Figure 1

Location of the study area. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

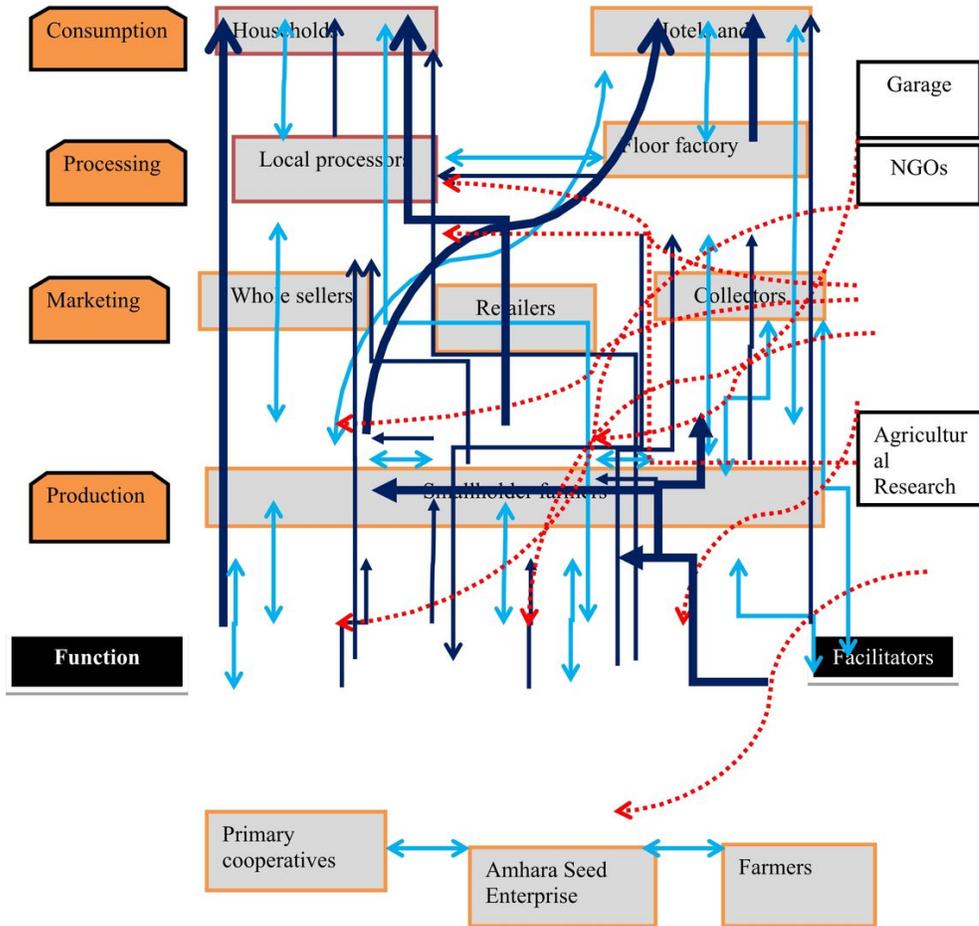


Sources: ours survey analysis, 2017—2020

Figure 2

Maize seed distribution across providers

**Fig. 3: Maize Value chain map of North West Ethiopia**



**Figure 3**  
Maize Value chain map of North West Ethiopia

### Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Rawdataformaize.xlsx](#)