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Determinants of Chickpea Marketed Surplus Among Smallholder Farmers in Humbo and Damot Gale Woredas, Southern Ethiopia

Besufekad Belayneh* Tewodros Tefera Thomas Lemma
Hawassa University, School of Environment,Gender and Development Studies. P.O.Box 05.Hawassa, Ethiopia

Abstract
This research was aimed to study the chickpea (Cicer arietinum L.) marketed surplus among smallholder farmers in the Humbo and Damot Gale Woredas. A multi-stage sampling technique was used in order to determine the sample respondents. By using simple random sampling technique four sample Kebeles were selected. Cross sectional data were collected from 182 farm households who produced chickpea in 2015/16 production season. Primary data were collected from sample households using structured questionnaire. Descriptive statistics and econometric model were employed to analyze the data. To identify determinants of marketed surplus of chickpea, Ordinary Least Square (OLS) model was employed. The study suggest interventions such as intensification strategies which increase yields through proper management and use of inputs, rural infrastructure improvement increases the likelihood of market orientation and marketed surplus of chickpea.
Keywords: Chickpea, Marketed surplus, Household, South Ethiopia

1. Introduction

Pulses are important components of crop production and cash crop in Ethiopia and contribute considerably to attain food and nutritional security (Tewodros, 2013). Pulse crops occupy about 13% of croplands in Ethiopia and are the second most important elements in the national diet (CSA, 2015). In Ethiopia, Chickpea is a less labor-intensive, widely grown, important food crop and source of cash (Shiferaw et al., 2007).The Southern Nation, Nationalities and Peoples Region (SNNPR) production of chickpea accounts 3% the total chickpea production in the country (Rashid et al.,2010). Chickpea productions of Humbo and Damot Gale *Woredas* in 2015/16 production season were 1,984,000 kg and 282,600 kg respectively, among this legally marketed amount of chickpea crops were 767,000 kg and 150,000 kg respectively (Humbo WoANR, 2017; Damot Gale WoANR, 2017).

The study *Woredas* have sufficient potential and environmental settings for production of chickpea. Some studies investigated the major constraints of chickpea crop production in the study sites. Tewodros (2013) reported that land shortage, low soil fertility and disease on chickpea crop were the major constraint limiting chickpea production in Damot Gale *Woreda*. On the other hand, the chickpea market of the study areas had grown substantially in recent years**,** although the current market is still under developed (Rashid et al., 2010). A study in the Rift Valley of Ethiopia including Humbo and Damot Gale *Woredas* found that limited access to credit, poor market linkage and price volatility were also problems of chickpea crop producers (Frehiwot, 2010). However, in the aforementioned study the chickpea crop marketing is not well explored.

The available literature on pulses dwell on the performance of the existing cultivars and biofortification of chickpea cultivars (Legesse et al., 2017; Gemechu et al., 2011; Lemma et al., 2013); wilt/root rot diseases in major chickpea growing areas (Tebkew and Chris, 2016); analysis of chickpea value chain in Southern Ethiopia (Tewodros, 2013). The available information on determinants of marketed surplus of chickpea is not sufficient. Moreover, the recent expansion of chickpea in SNNPR also deserve new studies. Hence, this study designed to address the research gap to provide valuable information for practitioners, researchers, policy makers and producers. The study analyzed the determinants of chickpea marketed surplus in the Humbo and Damot Gale *Woredas* of SNNPR.

2. Methodology

2.1. Description of the Study Area

The study was conducted in Southern Nation, Nationalities and Peoples Region (SNNPR), Humbo and Damot Gale *Woredas* of Wolayta Zone. Humbo is one of the *Woredas* in Wolayta zone. The administrative center of Humbo is Tebela. The *Woreda* is located in $6^0$43' N latitudes and $37^0$45' E longitudes and 1100 to 2300 m.a.*s.l.* The agro-climate zone of the area comprises *Woina-dega* (30%) and *kola* (70%) (HumboWoANR, 2017). Based on the 2007 census conducted by the CSA, this *Woreda* has a total population of 125,441, of whom 63,017 are men and 62,424 women; about 6,247 or 4.98% of its population are urban dwellers.

Damot Gale is located in 7 ^{0} 58′ N latitudes and 37 ^{0} 52′ E longitudes and altitude of 1501 to 2050 m.a.s.l. The administrative center of Damot Gale is Boditi. The *Woreda* agro-climate zone of the area is characterized by *Woina-dega* (Damot G

ale WoANR, 2017). Based on the 2007 Census conducted by the CSA, the Woreda has a total population of 151,079, of whom 74,227 are men and 76,852 women; and about 24,133 or 15.97% of its population are urban

dwellers.

2.2. Research Design

2.2.1. Data Types, Sources and Methods of data Collection

The study used both primary and secondary sources of data, which is qualitative and quantitative in nature. The primary data were collected using questionnaire. Secondary data were obtained from various sources such as reports of Bureau of Agriculture and Natural Resources at different levels, CSA, NGOs, previous research findings, journal articles, e-books and other published and unpublished materials which are found to be relevant to the study.

To generate the necessary data from the primary sources, different procedural approaches such as face to face interview with sample respondent households were used. Most of research data were collected through questionnaires by means of household survey. The farm household survey data collected by using enumerators since most of farm households was not able to read and write. A total of 6 enumerators from *Woreda* office of agriculture and natural resources who speak the local language were selected and trained on the method of administering the interview schedule in general and on the content of the questionnaire in particular. The enumerators had a qualification of a minimum of college diploma. Before administrating the survey, questionnaire pretesting was conducted by enumerators to test the contents of the questionnaire, to measure how long it takes to fill a questionnaire and validate interviewing approaches. The pretesting was conducted in a Gacheno Kebele administrative. Then, the questionnaire was revised and content, which was unclear, was modified and removed. The field data collection were took 15 days, and all efforts were exerted to supervise on field level to check and correct gaps.

2.2.2. Sampling Technique and Sample Size Determination

Sampling Technique

In this study, multi-stage sampling technique was used. In the first stage, all *Kebeles* of the two *Woredas* (Damot Gale and Humbo *Woredas*) were stratified into chickpea producers and non-producers. From the 65 Kebeles about 40 Kebeles were found to be chickpea producers. Secondly, by using simple random sampling techniques, 4 sample Kebeles out of 40 pulse crops producer Kebeles were selected. Following the kebele selection, households were stratified in to producers and non-producers of chickpea crops. Finally, chickpea producing sample households were selected from chickpea producing stratum using systematic random sampling technique.

Sample Size Determination

An important decision to be taken while adopting a sampling technique is about the size of the sample. Hence, the sample size of the study was determined based on the scientific formula that designed to find out the appropriate size of the survey research. In the study, the Khotari (2004), sample size determination formula used in order to decide the size of sample population:

$$n = \frac{Z^2 * N * p * q}{e^2 (N - 1) + Z^2 * p * q}$$

Therefore, by using the formula using Z= 1.96 to 95%, p = 0.5, q= 1-p and e^2= 0.07, N = 2,616 values and the sample size calculated n = 182 (165 male and 17 female) which is the necessary sample size of the study.

Where: **N=** total households, n = size of the sample, Z= standard variation at a given confidence level, P= proportion of successes, q = proportion of failures, $e^{2=}$ acceptable error.

2.3. Methods of Data Analysis

2.3.1 Ordinary Least Square Model (OLS)

OLS regression model was used to analyze determinants of marketed surplus of chickpea in Humbo and Damot Gale Woredas. The reason for using this model was that all sample farmers who produced chickpea were suppliers to the market in 2015/2016 production season. The OLS regression model was specified as Y=f (Farm size, Age of household head, Sex of household head, Education status, Households size, Farming experience, Access to credit, Market price of output, Livestock holding, Membership to cooperatives, Extension contact, Distance to the market, Off- farm income activities, Access to market information, Input used). The estimated coefficients indicate the amount of change in the dependent variable due to a unit change in the independent variable keeping other factors constant.

In matrix form, the supply function can be specified as:

$$Y = \beta X + U$$

Where: Y = the volume of chickpea supplied to the market in Kilogram
β = a vector of estimated coefficient of the explanatory variables
X = a vector of explanatory variables, U = Disturbance term

Before fitting the independent variables in the OLS regression model, multicolinearity, heteroscedasticity and omitted variables test were performed. Multicollinearity was tested using variance inflation factor (VIF). To

address heteroscedasticity and omitted variables, Breusch-Pagan and ovtest were conducted using STATA software version 12.

3. Results and Discussion

3.1. Socio-Economic and Demographic Characteristics of Respondents

The average age and family size of the sample households were 40.1 years and 6 persons, respectively. The household respondents' average experience in farming was 11.4 years. On average chickpea producer households own about 0.29 hectares of land for chickpea production and owned 4.24 livestock measured in TLU. The sample households located 5.9 kilometer away from the nearest market place (Table 2).

The households on average obtained an annual gross off-farm income of 1080.5 Birr. The lagged price of chickpea per quintal was 2063.20 (Table 2). The majority of the respondent households were applied improved variety (93%), access to credit (79%), and member of cooperative (77%). Overwhelming majority (91%) of respondents attained formal education (Table 2).

3.2. Determinants of Chickpea Marketed Surplus

The overall goodness of fit of the regression model measured by the coefficient of determination (R^2) and F value was statistically significant at 1%. The R^2 values of 0.7178 indicate that the independent variables included in the regression explain 71.8% of the variations determine the chickpea marketed surplus. The OLS regression model used to identify determinant factors influencing the marketed surplus of chickpea indicate that out of 13 explanatory variables five were found to affect the marketed surplus of chickpea significantly. These were cultivated area, seed variety and distance to nearest market, access to credit and livestock holding (TLU).

Cultivated area

The chickpea cultivated area was found to influence marketed surplus of chickpea positively at1%significance level. The finding implies that the larger the cultivated land allocated to chickpea production the larger the amount produce and thereby raising the amount produce available for sale. Thus, a hectare increases in cultivated area under chickpea production increase the amount of chickpea sold by 170 kilograms. The result is consistent with the findings of Shewaye et al., (2016) it was found that the larger the cultivated land size allocated to haricot bean production the larger the quantity produce and thereby increasing the quantity produce available for sale in Misrak Badawacho District of Southern Ethiopia.

Improved Seed variety

As expected improved seed variety was found to affect marketed surplus of chickpea positively and significantly at 1% significance level. This implies that, households who have access to improved seed of chickpea was more likely to supply large amount of chickpea to the market. The result is consistent with the findings of Yaynabeba and Tewodros (2013). They reported that the haricot bean producers who had ease of access to input supply like improved seed varieties participated in the market more by increasing amount of haricot bean marketable surplus compared to those who did not have access to improved variety.

Distance to the nearest market

Distance to the market negatively and significantly influences the marketed surplus of chickpea. This means that as chickpea producers residence home distance to the market increases, the amount of chickpea sold by smallholder farmers' decrease. It was significant and negatively affects the level of marketed surplus at 10 %. The possible explanation for this is that as distance from the market increases, transport costs also increase and this discourages resource constrained smallholder farmers from selling high volumes to the market. The result showed that a kilometer increases in distance to the nearest market decrease the marketed surplus of chickpea by 5 kilograms, keeping other factors held constant. The result is consistent with the findings of Byron et al., (2012) it was found that farmers located in villages with large distance to market and poor road quality between the village and the market place sold fewer potatoes.

Access to credit

It was found that credit access positively and significantly influences amount of chickpea marketed at 5% probability level. This means that credit services are the most important sources to solve financial constraints that hold back agricultural marketing related to marketing and transaction costs. Thus, households who had access and use credit sell 64 more kilograms of chickpea than non-users keeping another factors constant. This outcome is reliable with the findings of Tewodros (2013).

Livestock holding

This variable affected chickpea marketed surplus significantly and positively at 5% level. Livestock holding (TLU) is a proxy for wealth under Ethiopian farmers' condition and sometimes it considered as an asset. The feasible explanation is that resource endowed households have more TLU which they can use for traction and transportation, a development which reduces production and market related transaction costs. The resource-endowed households are likely to have finances from which they are able to hire labor, purchase inoculants, and buy improved seed varieties and thus can produce chickpea on larger portions of land compared to the resource

constrained smallholder farmers. The result indicated that a unit increase in number of livestock (TLU) owned by the households increases marketed surplus of chickpea by 9kilogram per year. Study by Nuri et al., (2016) on kocho market participation suggests that an increase in the value of livestock owned leads to an increase in enset sale.

4. Conclusion

Resource endowment of households such as landholding size and livestock holding, access to seed variety and credit and proximity to market were found influencing marketed surplus of chickpea in the study area. Increasing the cultivated area was not best option as land is scarce resources and limited supply. Rather intensification strategies which increase productivity per unit area are an important pathway. Moreover, yield improving strategies such as proper management land and efficient application of inputs increases productivity and thereby the likelihood of market orientation. Enhancing access to credit through formal financial institutions increases investment in agricultural inputs and supply of chickpea grain to the market. Improving rural infrastructure in the form of establishing all weather roads would assist farmers to supply more amounts of chickpea in to the market because it reduces transportation cost and it supports the integration of markets.

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Table1: Sample Size and Sample Distribution by Kebeles

Sample Kebeles	Chickpea Crops Producing households	Selected Size of ample
Gututo Larena	550	39
Abala Sipa	823	59
Taba	776	48
Gacheno	467	36
Total	2,616	182

Source: Own computation based on data from WoANR (2017).

Table 2: Socio-economic and demographic characteristics of chickpea marketed surplus

Variables	Variable Description	Mean	Std.dev.
Age	Number of Years	40.1	7.7
Household size	Number of individuals of family	6	1.7
Farm experience	Number of years	11.4	9.6
Cultivated area	Measured in Hectares	0.29	0.07
Distance nearest market	Measured in Kilometer	5.8	3.0
Lagged Market price	Measured in Birr	2063.2	584.6
Off-farm activity income	Measured in Birr	1080.5	2045.04
Livestock holding	Measured in Tropical livestock unit	4.2	2.4
		%	
Sex (male, %)	1=male,0=female	84.07	
Improved Seed variety (%)	1= yes, 0= No	92.86	
Access to credit (%)	1=yes, 0=No	78.57	
Cooperative membership (%)	1= yes, 0=No	76.92	
Education status (%)	1= formal education, 0=No	91.21	

Note: ***, ** and * represents significance at 1%, 5% and 10% probability levels, respectively.
Source: Own computation of survey data, 2016/17

Table 3: OLS results for determinants of marketed surplus of chickpea

Variables	Coefficient	Robust Std. error	t value
Cons.	0.3091503	1.901721	0.16
Age	-.0128045	0.0086798	-1.48
Sex of HH	0.1690853	0.3383849	0.50
Education status	0.0070496	0.0220231	0.32
Family size	-0.00818	0.0503656	-0.16
Farm experience	-0.004414	0.0063852	-0.69
Cultivated area	1.66301***	0.4658451	3.57
Seed variety	0.56219***	0.1356124	4.15
Lagged Market price	0.2736551	0.2308479	1.19
Distance nearest market	-0.0532744*	-0.0288756	1.84
Access to credit	0.6375506**	0.2600976	2.45
Cooperative membership	-0.0052607	0.1759857	-0.03
Off-farm activity income	-0.0087883	-0.0098338	0.89
Livestock holding (TLU)	0.0867891**	0.0313724	2.77
Number of obs=182, F (13, 168) =6.92, Prob. >F=0.000 ,R-squared=0.7185,Root MSE = 0 .9812			

Note: The dependent variable is the amount of chickpea marketed/sold.
*, ** and *** represents significance at 10%, 5% and 1% probability levels, respectively.

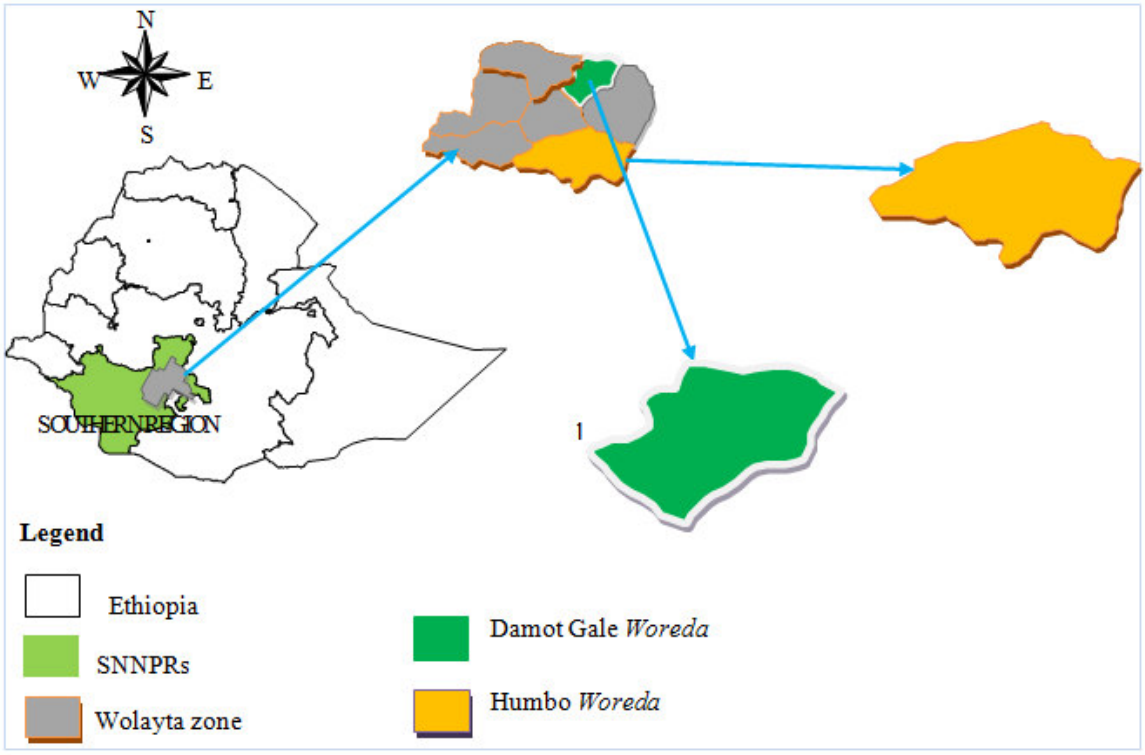

Figure 1: Geographical map of the study areas