Analysis of Gender and Determinants of Market Supply of Onion in Dugda District, East Shoa, Ethiopia

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Abstract: *This article identified factors affecting onion farmers' volume supply in gender perspective in Dugda district, Ethiopia. The main objective of the research was identifying the determinants factor affecting market supply on both male-headed and female-headed farmers separately helps where to focus to increase production and volume of supply. The estimated volume of production of onion was about 1849.1 tons and 1836.0 tons of onions were sold in the study area in 2015/2016. The data used in this study were collected from 157 male and 54 female headed households that were randomly selected from eight kebeles of the district. The survey was conducted to collect the primary data from sample respondents. Complementary, secondary data were collected from various sources. The data were analyzed using descriptive statistics and inferential statics like t-test and chi-square. Multiple linear regressions were estimated to identify determinants of onion volume supply in male-headed household and female-headed household. The findings revealed that quantity produced, onion farming experience, participation in non-farm activities and level of aspiration determined household's market supply of onion in male-headed household. Quantity of onion produced, experience and access to market information determined household's market supply of onion in female-headed household. Therefore, Female-headed farmers should increase their bargaining power through an organized central market information system at the district level, accessibility of appropriate data on buyers by providing their names, addresses and prices.*

Keywords: Determinants, Gender, Female-headed, Male-headed, Market supply, Onion

1. Introduction

The Governments of Ethiopia have a plan to upgrade vegetables marketing and empower women to actively play their part in alleviating poverty and food security. However, vegetable production and marketing needs organized production and market which can minimize wastage, bankruptcy and secure sustainable quality production. Vegetable marketing and production intervention strategies which do incorporate women onion producer would have a positive effect on sustainable production and women empowerment (Saikou, 2014). In line with this, Ethiopia's current Growth and Transformation Plan (GTP) provides room for intensive production, commercialization of vegetables and women empowerment. Therefore, the country's development policy calls for hastening the transformation of the sector as a means for achieving sustainable development and economic growth (MoFED, 2010).

Fifty percent of the population in Ethiopia is women and they are an essential component in the reduction of hunger. Hence, women's empowerment is an important aspect of poverty reduction and one of the means of achieving Millennium Development Goals. Agriculture is one of the major strategies for attaining the Millennium Development Goal. Women's contribution towards agricultural production and marketing cannot be overlooked (Almaz, 2015).

If the existing system identify and take into account factors that determine market supply of onion in gender perspective, problem identification and structured support can mitigate and reduce poverty and improve sustainable production (Almaz, 2015). Despite the fact that researches done on onion (Abay, 2007; Taha, 2007; Tadesse, 2008; Adugna, 2009; Kamrul *et al*., 2009; Mahilet, 2012; Patil *et al*., 2012; Almaz, 2013; Kiruthika, 2013; Asif And Abdus, 2015; Laxmi *et al*., 2017; Khating, 2017; Khating *et al*., 2018), almost all focused on production aspect and overlooked gender disaggregated information. Since, increasing production is not a sufficient condition for benefiting smallholder farmers unless supplied to the market. Moreover, studies on factors affecting

market supply of onion in a gender perspective helps to formulate appropriate policies that improve the livelihood of female-headed and male-headed farmers; to design appropriate policies for the improvement of onion marketing and to empower women farmers. Hence, the objective of this article is, therefore, to identify determinants of female-headed and male-headed farmers' market supply of onion in Dugda district.

2. Methodology

This research was carried out in Dugda, a district which is found in eastern Shewa zone of Oromiya National Regional State. The study area is located at a distance of 130 km from Addis Ababa. Multi-stage sampling technique was used to draw the sampling units of the study. Formal survey was conducted with onion producers. At the first stage, Dugda district was selected purposively due to extensive coverage and production of onions in the district. Melkasa and Adami Tulu Agricultural Research Centers have released improved onion varieties particularly for the study district and improved agricultural inputs utilization as well as conducting wide demonstrations on onion cultivation in Dugda district. Onions were selected as the most important crop to be considered for the purpose of this study due to the fact that it is high-value commodities and are mainly produced in Dugda district and in Ethiopia as a whole. Onions are major vegetable products that are exported as cash crops. In 2015/2016 production season, out of the total area of the district 95,945 ha, total cultivated land was 55,828 ha of which 10,937 ha were covered by onions implying relatively it covered second large area next to tomatoes compared to other vegetables (BoARD, 2015).

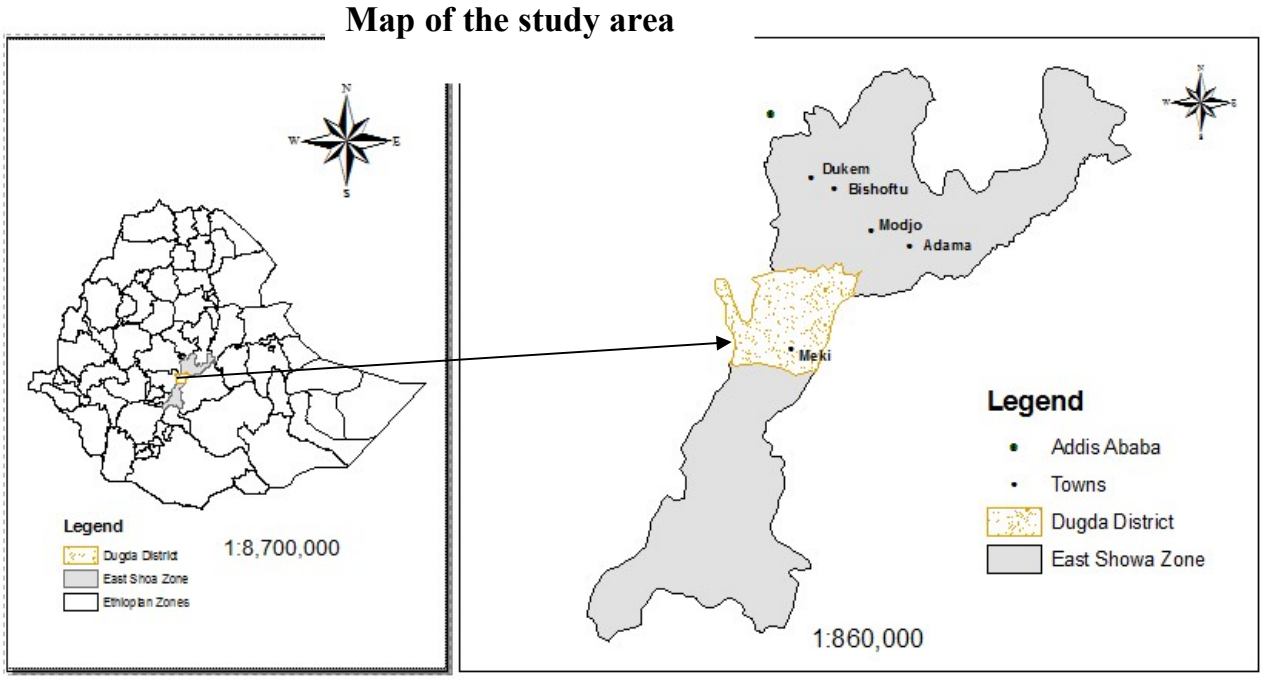

Figure 1. Location of the study area

Dugda district has 39 *kebeles* [1]and out of which 16 *kebeles* are major growers of tomato. In the second stage, eight *kebeles* in the district were selected randomly. The sampling frame of this study was freshly prepared and it was to include producers of onion in the *kebeles* of Dugda district. The third stage of the sampling procedure, respective sampling frame was stratified as male-headed and female-headed households. Finally, the numbers of respondents were determined by using probability proportional to size sampling procedure (John, 2014). A total of 54 female-headed households (FHH) and 157 male-headed households (MHH)

[1] Under Ethiopian government structure, "kebele" is the smallest administrative unit below district and consists of a number of villages (i.e. it is a collection of village). It is part of a district

were selected using simple random sampling methods. Then the predetermined size of the sample farmers from each *kebele* was randomly selected using systematic random sampling technique. To determine the required sample size, this study used a simplified formula developed by Yamane (1967) at 95% confidence level and 10% non-response rate. A pilot survey was carried on 20 non-sampled respondents on actors to check suitability of questionnaire to socio-economic and cultural setups.

The analysis was made with the help of descriptive and econometric tools by using Stata SE-version12 software's were employed. Data analysis employed descriptive statistics (such as percentage and mean comparison), inferential statistics such as t-test and chi-square to describe differences between MHH and FHH farmers. Besides, multiple linear regression econometric model was used to identify determinants of onion quantity supplied. Different studies employed different models in order to identify the factors that determine market supply (Kindie, 2006; Abay, 2007; Rehima, 2007; Bosena, 2008; Adugna 2009; Ayelech, 2011; Almaz, 2012, 2017). The commonly used ones are the well-known multiple linear regression model.

Among the different variables that would explain market supply the most important variables, according to the reviewed literature, include family labor, educational level, extension service, ownership of water pump, production level, irrigable land holding, distance to market, achievement motivation, level of aspiration, participation in non-farm activities, Experience, utilization of credit, participation on social organization and market information were found to be important determinants (Abay, 2007; Kindei, 2007; Rehima, 2007; Bosena, 2008; Ayelech,2011; and Almaz, 2013and 2017).

Following Green (2003), the multiple linear regression model is specified as:

Yi = F(X1, X2, X3,X4, X5, X6, X7, X8, X9, X10, X11,X12,X13,X14)

Where Yi= quantity of onion supplied to market

X1= Family labor	X6= Access to market information	X11= Level of Aspiration
X2= Education level of head of Household	X7= Participation in non- farm activities	X12= Participation in social organization
X3= Utilization of Credit	X8= Experience in onion farming	X13= Distance to the nearest markets
X4= Quantity of production	X9= Irrigable land in onion	X14= Ownership of water pump
X5= Extension contact	X10= Achievement motivation	

Econometric model specification of supply function in matrix notation is the following.

$Yi = \alpha i + BiXi + Ui$

Where:

Yi = onion supplied to the market

β = a vector of estimated coefficient of the explanatory variables

X = a vector of explanatory variables

Ui = disturbance term

Before running the model all the hypothesized explanatory variables will be checked for the existence of multi-collinearity and heteroscedasticity. There are two measures that are often suggested to test the existence of multi-collinearity. Namely: VIF (variance inflation factor), Contingency coefficients.

In order to identify factors influencing onion marketable supply both continuous and discrete variables were hypothesized based on economic theories and the findings of different empirical studies. The dependent and exogenous variables, their definitions, symbols and hypothesized signs are shown in Table 1.

Table 1. Symbol, definition and hypothesized sign of variables

No	Definition	Symbol	Type of variable	Hypothesized
1	Onion quantity supplied (2015/2016) in quintals.	QUANS	Continuous	dependent
2	Education level of household head (1= illiterate, 2=read & write, 3= primary cycle,4= secondary cycle,5= tertiary cycle, 6=preparatory, 7=higher)	EDUCA	Discreet	(+)
3	Family Labor (man equivalent).	LABOR	Continuous	(-)
4	Farm experience of household (years).	EXPER	Continuous	(+)
5	Utilization of credit (1=, if yes; 0=, otherwise)	UTLCR	Dummy	(+)
6	Farmers' participation in social organization in score.	PRTSC	Continuous	(+)
7	Participation in income generating non-farm activities (1=Yes, 0=No)	OFFRM	Dummy	(+)
8	Distance of the respondents' house from input and output market (km).	DSTNT	Continuous	(-)
9	Actors getting extension service(1=yes; 0=no)	EXSINC	Dummy	(+)
10	Awareness of price information (1=Yes, 0=No)	MRTINF	Dummy	(+)
11	Ownership of water pump	H_2OPU	Dummy	(+)
12	Irrigable landholding of the respondents in hectare	IRRGL	Continuous	(+)
13	Quantity produced in quintal	PRODU	Continuous	(+)
14	Achievement motivation (1=low, 2= medium,3=high)	ACHIV	Discrete	(+)
15	The level of aspiration (1=low, 2= medium,3=high)	LEVEL	Discrete	(+)

3. Results and Discussion

As indicated in Table 2 below, the estimated volume of production of onion was about 18490.58quintals, of which 18359.57 quintals of onion were sold (99.29%). Sampled respondents indicated that 99.29% of onion produced was marketed and the remaining percentage of total production was accounted for by spoilage, seed and home consumption. Out of the total onion marketed, 76.7% and 23.3% of onion was marketed by MHH (male-headed households) and FHH (female-headed households), respectively. The average production of onion for FHH and MHH was about 77.8 and 91quintals, respectively (Table 3).

The average age of MHHs was 38.73 years compared to 45.07 years for FHHs. MHH have on the average about 2.75 man-equivalent of family labor while FHH had 2.72 man-equivalents. MHH have on the average about 7 years on onion farming experience while FHH have almost 10 years of experience, which was significant at 1% probability level. This indicates that FHH had higher onion farming experience and lower family labor compared to MHH (Table 3).

Table 2. Production and marketing status of onion

Status of onion by Households	FHH(54)		MHH(157)		All Case(211)	
(in quintal)	Total	Mean	Total	Mean	Total	mean
Production Of Onion	4199.48	77.77	14291.10	91.03	18490.58	87.63
Sold Onion	4168.17	77.19	14191.40	90.39	18359.57	87.01
Consumption Of Onion	2527.00	46.80	6968.00	44.38	9495.00	45.00
Onion Used For Seed	0.00	0.00	2063.00	13.14	939.00	4.45
Spoiled Onion	604.00	11.19	14291.10	91.03	2667.00	12.64

Source: Own survey (2016)

The results depicted at Table 3 show that, there were statically difference between average land owned by FHH (0.55ha) and MHH (0.78ha) and there were statically significant at 10% (t=-1.78*). Of which, the average total land sizes under onion were about 0.09 and 0.10 ha for FHH and MHH, correspondingly. The analysis of field data shows that there is significant difference between FHH and MHH producers in participation in different social organization at 1 % significant level (t=2.93***).

Even though it was not statistically significant (t=-1.15), FHH and MHH sold onion by 2.97 and 3.26 Ethiopian Birr [2]. FHHs traveled shortest distance from the nearest market (7.81km) than the male-headed households (8.26km).

[2] 1$=18.15 Eth Birr

Table 3. Scio-demographic characteristics' of onion producers

Lists of Variables	FHH (N=54)	MHH (N=157)	All cases (N= 211)	t-value
Age of the respondent	45.07	38.73	40.35	3.47***
Family labor	2.72	2.75	2.74	-0.11***
Distance	7.81	8.26	8.15	-0.58
Experience in onion farming	9.59	7.13	7.76	3.50***
Total land holding	0.55	0.78	0.72	-1.78*
Total land covered by onion	0.09	0.10	0.10	-0.37
Production of onion	77.77	91.03	87.63	-0.86
Sold onion in quintal	77.19	90.39	87.01	-0.86
Current price	2.97	3.26	3.18	-1.15
Total income	21790.53	28396.95	26706.21	-1.10
Participation in social org.	2.56	3.39	3.18	-2.93***

Source: Own survey (2016) *** & *significant at 1% and 10%probability level respectively.

The chi-square test indicates that there is a significant difference regarding contact with extension agents at 10% significant level ($\chi 2$ =2.92) between the two groups. Thus, about 57.4% of FHH and 43.9% of MHH had visit from extension agents during 2015/2016 production season. Majority of the MHHs (68.8%) were did not take credit compared to their FHH counterparts. Moreover, 90.7% and 84.1% of FHH and MHH respondents had got market information, respectively. This implies that FHH has more access to market information and Use of credit as compared to MHH in the area. The Chi-square statistics is also evidence for presence of statistical difference between the two groups at less than 1% significance level on access to information.

Table 4. Scio-economic characteristics' of onion producers

Lists of Variables		FHH (N=46)	MHH (N=123)	All cases (N=169)	χ^2-value
Extension	Yes	57.4%	43.9%	47.9	2.92*
	No	42.6%	56.1%	52.6	
Credit	Yes	75.9%	31.2%	57.3	32.85***
	No	24.1%	68.8%	42.7	
Water pump	Yes	46.3	46.3	46.3	0.01
	No	53.7	53.7	53.7	
Market information	Yes	90.7%	84.1%	85.8%	10.17***
	No	9.3%	15.9%	14.2%	
Non-farm	Yes	44.4	53.5	46.4	0.68
	No	46.5	53.5	54	

Source: Own survey (2016) ***& *&significant at 1% and 10%probability respectively.

The result of this study indicated that, FHH respondents were put under three categories of level of aspiration. Based on this, 63.0%, 22.2% and 14.8% were low, medium and high level of aspiration, respectively. Whereas, majority (84.7%) of MHH were rated as high level of aspiration compare with their female counterparts. Achievement motivation was defined as the need in an individual to perform different roles with some degree of excellence. As presented in Table 5, the MHH respondents were put under three categories of achievement motivation. Based on this, 72.2% respondents in FHH were under low achievement motivation. This indicating that the existence of difference between FHH and MHH with respect to level of aspiration and achievement motivation, which is significantly different at 1% probability level.

Table 5. Psychological characteristics onion producers

Lists of Variables		FHH (N=57)	MHH (N=154)	All cases (N=211)	χ^2-value
ACHVE	Low	72.2%	24.8%	37.0%	39.5***
	Medium	20.4%	42.7%	37.0%	
	High	7.4%	32.5%	26.1%	
LEVEL	Low	63.0%	6.4%	20.9%	96.82***
	Medium	22.2%	8.9%	12.3%	
	High	14.8%	84.7%	66.8%	

Source: Own survey (2016) ***=Significant at 1% probability level.

As indicated in Table 6, the majority (53.7%) of FHH are illiterate while only 3.2 percent of MHH are illiterate group. The Chi-square statistics is evidence for presence of statistical difference between the two groups (χ2=128.01, p=0.000).

Table 6: Educational level of the sampled tomato producers

Table 6. Educational level of the sampled tomato producers

Education of HHH	FHH (N=46)	MHH (N=123)	All cases (N=169)	χ^2-value
Illiterate	53.7%	3.2%	16.1%	128.01***
Read & write	24.1%	1.3%	7.1%	
Primary cycle	9.3%	6.4%	7.1%	
Secondary cycle	9.3%	31.8%	26.1%	
Tertiary cycle	3.7%	33.1%	25.6%	
Preparatory	0	17.8%	13.3%	
Higher	0	6.4%	4.7%	

Source: Own survey (2016) ***=Significant at 1% probability level.

The estimates of the multiple linear regression models for male and female headed households are presented in Table 7. The market supply functions were found to be significant as evidenced by significant F-value at 1% level of probability (Table 7)., The adjusted coefficients of multiple determinations indicate that the variation in onion quantity sold per quintal associated with the factors of market supply specified in the models was 99%, in MHH, FHH and pooled data set.

Table 7. Determinants of onion quantity supplied to the market

Variable	Pooled (N=211)		MHH (N=157)		FHH (N=54)	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
EDUCA	0.007	0.3	0.054	1.55	-0.002	-0.06
LABOR	-0.003	-0.17	-0.018	-0.84	-0.019	-0.61
DSTNT	0.003	0.49	0.005	0.77	0.008	1.01
EXPER	0.009	1.47	0.018	1.97**	0.019	1.71*
IRRGL	-0.014	-1.13	-0.001	-0.05	0.084	0.97
PRODU	0.999	2032.3***	0.999	2823.48***	0.999	919.48***
EXSINC	0.064	1.09	0.063	0.82	-0.012	-0.15
UTLCR	0.090	1.71*	0.099	1.52	0.080	0.88
H2OPU	0.024	0.47	0.079	0.89	0.000	0
MRTINF	0.046	0.74	0.025	0.35	0.214	1.89*
OFFRM	0.075	1.34	0.156	1.94**	0.0276	0.3
PRTSC	0.006	0.37	0.010	0.54	-0.018	-0.64
ACHIV	-0.030	-0.73	0.0065	0.12	0.068	1.28
LEVEL	0.078	1.64	0.148	1.86*	-0.013	-0.21
Constant	-0.959	-6.3***	-1.645	-5.23***	-0.924	-5.37
Adjusted R2		99%		99%		99%

Source: Model Output, ***, **, and * significance at 1%, 5%, and 10%, respectively.

The regression coefficient of onion production variable was positively related with quantity supplied and significantly at 1% probability level in both FHH and MHH and confirmed the hypothesis.

The result shows that a one quintal increase in the onion production causes a 0.99 quintal increase in the amount of marketed supply both male and female household heads. Total onion production influenced the amount of marketed supply of onion positively showing that farmers who produce more sell also more, which is consistent with the general expectation. This is in line with Abay (2007) who illustrated an increase of onion production by farming households has augmented marketable supply of the commodities significantly.

The finding in Table 7 above, agrees with the hypothesis is that farming experience has showed positive and significant effect at 5% and 10% significant level for MHH and FHH, respectively. Thus, the result implied that, as farmer's experience increase by one year, onion supplied to the market increased by 1.8×10^{-2} quintals and 1.9×10^{-2} quintals for male headed and female headed households, respectively. This is in line with Abay (2007) and Almaz (2013).

Participation in non-farm activity of the household heads positively affected quantity supplied. On average, if an onion male producer participates in non-farming income generating activities' causes a 0.16 quintal increase in the quantity of onion supply. On average, if an onion female producer gets access to market information the amount of onion supplied to the market increases by 0.21quintal. This suggests that information improves level of sales that affects the marketable surplus.

As confirmed with the hypothesis, level of aspiration is positively associated with male farmers' onion market supply. If an onion male producer has high level of aspiration the amount of onion supplied to the market increases by 0.15 quintal.

4. Conclusion

The findings of this study had important policy, education and research implications; because, determinants of market supply of onion play a substantial role by generating income and improving livelihood of both FHH and MHH farmers. It is important to understand these factors for the benefit of poor men and women farmers. The survey results indicated that the average onion production of female-headed producers were lower than male-headed producers. Their achievement motivation and level of aspiration were less than their male counterparts. These implying FHH had weak desire and ambition to achieve in onion production and marketing supply. Moreover, their need to perform different roles with some degree of excellence in onion production and supply to the market was also lower than their male counterparts. Therefore, training and capacity building, adult education and continuous supervision by concerned bodies are vital to enhance motivation and aspiration. Majority (52.6%) of FHH and MHH had no contact with extension agents. Besides, male-headed producers have less farming experience than female-headed producers. Hence, contact with extension agent and sharing of experience is the important component for improving the whole system. Farmers with longer farming experience have wide knowledge and skill, which enables them to perceive risks and constraints related to effective transfer of new technologies. Development agents should arrange periodic experience-sharing sessions among FHH and MHH producers and provide field visits, conduct training on production skills, and promote field demonstrations and trial.

The results of this study also showed that onion farming experience and quantity of onion produced determined household's market supply of onion for both FHH and MHH. Therefore, supporting the efforts of research centers in improved seed production, multiplication, distribution and farm trial should be strengthened in order to supply producers with yield increasing techniques and management innovations. To achieve the country's Growth and Transformation Plan (GTP), concerned bodies should focus on increasing productivity by providing improved seeds, training on production skills, and technical support to farmers in agronomy practices, and technical aid for farmers in post-harvest handling. Encouraging farmer groups to engage in increasing the production and productivity of onions per unit area of land is important. Finally, it is concluded that, access to market information determined household's market supply of onion in FHH. Thus, Female-headed producers should increase their bargaining power through an organized central market information system at the district level, accessibility of appropriate data on buyers by providing their names, addresses and prices.

Conflicts of interest

The author declares that there is no conflict interest regarding the publication of this paper in the journal.

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