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Determinants of outlet choices by smallholder onion farmers in Fogera district Amhara Region, Northwestern Ethiopia

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Market outlet choice for small holder onion producers is mandatory, since onion crop is a perishable horticultural crop. This study was aimed at assessing determinant of market outlet choice by smallholder onion farmers in Fogera District of Ethiopia. A stratified random sampling technique was employed, to select 150 onion producers in the study area. Multivariate probit model was employed to identify the factor affecting onion market outlet choices. The result of multivariate probit model showed that literacy status, owning transport facility, livestock holding, onion yield and access to extension service significantly influenced the choice of onion market outlet. The common underlying factors of market channel choice were also identified. Based on the results, the study recommended that the government and stakeholders should focus on strengthening the existence of formal and informal education, onion production system, improving extension system, strengthening the existing rural-telecom and rural-urban infrastructure development and improving crop-livestock production.

Key words: Onion, determinant, channel choice, multivariate probit model.

INTRODUCTION

Onion is one of the most important horticultural crops produced on smallholder farmers in Ethiopia. The onion crops have contributed to Ethiopian economy by exports of bulbs and cut flowers (Desalenge and Aklilu, 2003). Onions can be produced throughout the year in Ethiopia due to the mild climate and the rainy season that provide water for irrigation. The area coverage of onion also increase from time to time because of it high profitable per area and availability of small scale irrigation. Onion is produced both under rain fed and irrigation. In Ethiopia, onion production under irrigation constitutes much of the area than rain fed. According to central statistics agency (2008) 453,608.8 (ha) was covered by vegetable of which onion covered a total of 15,628.44 ha. The estimated annual production of vegetable was 18,124,613.5 quintal (Qt). Among these, onion constituted 1,488,548.9Qt.

Despite an enormous potential and a favorable environmental and socioeconomic advantage, the

average yield of onion in the Ethiopia is low as compared to other African courtiers due to use of low level of improved agricultural technologies, risks associated with weather conditions, diseases and pests, poor management etc (EIA, 2012; Aklilu, et al., 2015). Moreover farmers living in the fogera district produce large amount of vegetables every year. For instance, in 2014 production year the district contributes 2, 500,908 quintals onions with 10,258 hectares of land coverage of onion crop. This indicates that the district contributes the regional onion production.

Onion productions in Fogera district are producing mainly for market demand by irrigation during dry season. Despite onion is an economically important crop, onion market channel choices study have not yet been undertaken and assessed in the study area. In order to maximize the benefits that they may earn, farmers have to make appropriate decisions as to where they should sell their product. However, there are various factors that affect households' decision to select appropriate channel for delivering their products to the market. Identifying these factors is very important in terms of pinpointing possible areas of interventions that may help farmers to maximize benefits out of their onion production and marketing activities. The study attempts to identify marketing channels of onion and factors affecting these outlet choice decisions by onion producer's households in fogera districts of South Gondar zone Ethiopia.

MATERIALS AND METHODS

Descriptions of study area

This study was conducted in south Gondar, specifically in Fogera district. It is one of the 126 districts in the region. It has an area of 117,405 hectares divided administratively in to 32 Kebeles (30 rural and 2 urban). The population size was 233,529. The total number of households who engaged in agriculture was 42,746 of which 26,277 are onion producers. The capital is Woreta located at the North East on the main road to Gondar from Bahir Dar (Fogera district agriculture office, 2015).

The district is known for its plain nature where flat land accounted nearly 76%. The mean annual rainfall is 1216.3 mm, with Belg and Meher cropping seasons. Its altitude ranges from 1774 up to 2410 masl allowing a favorable opportunity for wider crop production and better livestock rearing (IPMS, 2005). The current land use pattern includes 59.03% cultivated land, 22.73% pastureland, 18.24% water bodies and the rest for others (Fogera district agriculture office, 2015). Most of the farmland was allocated for annual crops where cereals covered 52,759.99 hectares; pulses cover 9819.98 hectares; oil seeds 6137 hectares; root crops 1034.29 hectares; and vegetables 882.08 hectares. The major crops include teff, maize, finger millet and rice in order of area coverage (Fogera district agriculture office, 2015).

Source of data, methods of data collection and sampling procedure

In this study both quantitative and qualitative were collected from primary and secondary sources. The cross-sectional survey was conducted using structured questionnaire, key informant interviews, and focus-group discussions. Focused group discussions were held and key informants were interviewed from different organizations. The sample frame of the study was the list of small farmers in Fogera district and Kebeles Administrations (KAs). A stratified stage sampling technique was used to draw sample units.

In the selection process, Fogera districts agricultural office experts were consulted. There are two urban and 30 rural Kebeles in the district, out of which 12 administrative Kebeles are producing onion. These Kebeles were selected purposively and stratifies based on agro ecology (lowland and upland agro ecology). From each of agro ecology, two Kebeles Administrations (KAs) were randomly selected based on lottery method (Four KAs were selected). Then, the intended sample size from each sample Kebeles were determined proportionally to household size of onion grower farmer. Finally using the household list of small onion producers, the predetermined size which is 150 of the sample farmers from each Kebeles were randomly selected using systematic random sampling technique.

Method of data analysis

Producers are more likely to choose the right mix of market channels to increases maximize sales and help to reduce some risks than a single market channel. Different studies in Africa used different empirical methods to analyze the determinants of choice of market channels. Most commonly used analytical approaches include discrete choice regression models like the binary probit or Logit (Bongiwe and Micah, 2013), Multinomial probit or Logit (Mamo and Degnet, 2012; Berhanu et al., 2013; Tewodros, 2014; Mukiama et al., 2014; Mekonen, 2015), other empirical studies used Tobit (Anteneh et al., 2011).

The limitation of previous studies on choice of market channels are, they do not consider the possible inter-relationships between the various market channels (Green, 2008). These studies mask the reality faced by decision makers, who are often faced with the alternatives that they may be choose simultaneously and/or sequentially as complements, substitutes or supplements. Some recent empirical studies of market channels choice decisions assume that, farmers consider a set (or bundle) of possible channel choices that maximizes their expected utility (Hoffman and Duncan 1988; Arinloye et al., 2012, 2015). Thus, the selection decision is inherently multivariate and attempting univariate modeling excludes useful economic information contained in interdependent and simultaneous choice decisions. Based on this argument, the study adopted multivariate probit (MVP) econometric technique to simultaneously model the influence of the set of explanatory variables on each of the different market channel choices, while allowing the unobserved and/or unmeasured factors (error terms) to be freely correlated (Belderbos et al., 2004). The correlation may be positive and negative correlation between different market channel choices (Belderbos et al., 2004).

The selection of market outlet i by farmer j is Y_{ij}^{j} defined as, the choice of farmer j to transact in Market channel i $(Y_{ij}^A = 1)$ or $(Y_{ij}^A = 0)$ expressed as follows:

$$Y_{ij}^A \begin{cases} 1 \, if Y_{ij}^A = X_{ij}^A \alpha_{ij} + \varepsilon^A \geq 0 \Leftrightarrow X_{ij}^A \alpha_{ij} \geq -\varepsilon^A \\ 0 \, if Y_{ij}^A = X_{ij}^A \alpha_{ij} + \varepsilon^A < 0 \Leftrightarrow X_{ij}^A \alpha_{ij} < -\varepsilon^A \end{cases}$$

(1)

Where α_{i_j} is a vector of estimators and ε^A is a vector of error terms under the assumption of normal distribution, Y_{ij}^A is the dependent and variable for channel choice of assembler,

wholesaler and retailers, and X_{ij}^A is the combined effect of the explanatory variables.

Univariate probit estimation of choice of each type of market outlet would be misleading for the expected problem of simultaneity. The selection of one type of market outlet would be dependent on the selection of the other, since smallholder farmers choice decisions are interdependent, suggesting the need to estimate them simultaneously. To account for this problem, a seemingly unrelated multivariate probit simulation model was employed (Long 1997; Cappellari and Jenkins 2003; Degye et al., 2013; Arinloye et al., 2015)

$$Assem_j = X_1'\beta_1 + \varepsilon^A$$
$$Whole_j = X_2'\beta_2 + \varepsilon^B$$
$$\mathrm{Re}\,ta_j = X_3'\beta_3 + \varepsilon^C$$

(2)

$$\begin{pmatrix} \varepsilon^A \\ \varepsilon^B \\ \varepsilon^C \end{pmatrix} ......N \left[\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \begin{pmatrix} 1 & \rho_{12} & \rho_{13} \\ \rho_{21} & 1 & \rho_{23} \\ \rho_{31} & \rho_{32} & 1 \end{pmatrix} \right]$$

(3)

$$E\left(\varepsilon/X\right) = 0$$
$$Var\left(\varepsilon/X\right) = 1$$
$$Cov\left(\varepsilon/X\right) = \rho$$

(4)

Where $Assem_j$, $whole_j$ and $Reta_j$ binary variables take value 1 when farmer j selects an assemblers, wholesalers and retailers respectively, and 0 otherwise; x_1 to x_3 are vectors of independent variables determining the respective channel choices variables; $\beta's$ are vectors of simulated maximum likelihood (SML) parameters to be estimated; ε^A to ε^C are correlated disturbances in a seemingly unrelated multivariate probit model; and ρ's are tetrachoric correlations between endogenous variables.

In the trivariate case there are eight joint probabilities corresponding to the eight possible combinations of successes (a value of 1) and failures (a value of 0). If we focus on the probability that every outcome is a success for instance, the probabilities that enter the likelihood function of the market channel choices simulation are explained as

$$\Pr\left(Assem_j = 1, Whole_j = 1, \mathrm{Re}\,ta_j = 1\right)$$
$$= \phi_3\left(\beta_1'X_1, \beta_2'X_2, \beta_3'X_3, \rho\right)$$
$$= \Pr\left(\varepsilon^A \le \beta X_1, \varepsilon^B \le \beta X_2, \varepsilon^C \le \beta X_3\right)$$

(5)

Where ϕ_3 is the multivariate normal density function.

Dependent variable

Market outlets (MktOut): Marketing channels or outlets are those pathways where agricultural products pass through to reach consumers. i.e the actual buyers or the ultimate user of onion producer. Therefore, the dependent variable for the model is more than two binary outcomes taking value 1 when farmer j selects an assembler, wholesaler, and retailer's market channels, respectively, and 0 otherwise.

Independent variables

Literacy status of the household head (EDU): It assumes a value of 1 if the household head attained formal education and 0 otherwise. It is believed that if a farmer attained formal education of any level there is a possibility that the farmer would choose appropriate channels. This is supported by Bongiwe and Micah (2013) as a result; education is hypothesized to make better decisions in channel choice.

Total livestock holding (TLU): This is a continuous explanatory variable measured in tropical livestock unit. Farmers who specialize in livestock assumed to affect farmers decision in choice of market outlet. Study by Rehima (2007) on pepper marketing showed that, TLU showed a negative sign on quantity of pepper sales. TLU is expected to have positive effect on market outlet choice in this study.

Ownership communication devices (OwnComm): This is the dummy variable value 1 for own communication device and 0 otherwise. Ownership of communication device by the household head is used as a proxy to measure market information access. Farmers who own communication device such as radios, mobiles and TV have better access to extension used to adopt better market outlet. In this study it is hypothesized that ownership of communication device affect onion market outlet positively.

Ownership of transport assets (OwnTrans): This is the dummy variable value 1 when farmers own transport asset and 0 otherwise. Specifically vehicles, carts and animal transports would be used to measure the availability of product transportation facilities by households. This variable expected influence market outlet choice of onion producers (Key et al., 2000).

Access to market information (Distance to urban centers): This is a continuous variable using the best proxy a proximity to urban centers measured in Kms or walking minutes (continuous). Farmers nearer to urban centers are more likely to be informed. Jari (2009) stated that availability of market information boosts confidence of household who are willing to participate in the market and affect market outlet. The better information farmers have about the product market, the better would be the choice he/she makes on the channel selection. This is supported by Jeffrey et al. (2009) as a result; access to market information is hypothesized to affect outlet choice decision by onion producers.

Lagged market price (LMP): This is also the variable, measured in log normalized price of onion (Birr) per quintal and is expected to affect the market channel choice. Because, lagged prices can stimulate production and thus marketable supply of onion for the next year producers are motivate to sell their product to market outlet. According to Myint (2003), if prices in one year are bad, farmers will often respond by planting less in the next year. This will lead to lower production and higher prices, thus encouraging more plantings in the following year and a consequent fall in prices. This cyclical nature of production and prices is quite common. This makes producers to supply onion product directly related with price offer. As a result, this variable hypothesized to affect outlet choice decision by onion producers.

Access to credit (CRE-ACC): This is dummy variable taking value of one if farmers takes loan and zero otherwise, which indicates credit taken for onion production and marketing. Access to credit would enhance the financial capacity of the farmer to purchase the inputs, thereby increasing onion production and market share size. Therefore, it is hypothesized that access to credit would have positive influence on level of production and sales. Therefore, farmers who do have access to credit do produce more production this will push farmers to sell to different market outlet.

Agro ecology (AgroEco): This variable is a dummy taking the value zero if the agro ecology is upland and one if the agro ecology is lowland, which consists of a number of characteristics of the agro ecology. Tura et al. (2016), founded that agro ecology positively and significantly affects the probability of market participation by teff smallholder farmers. This variable hypothesized to have relationship with outlet choice decision of onion producers.

Income from non/off farming activities (NOFI): This variable is a dummy taking value one if the farmers are involve in Non/Off Farming activities and zero otherwise. Farmers who gain more income from non/off farm income want to supply their onion to any nearest market outlet with low price. This income may strengthen farming activity on one side and may weaken it on the other side. As result, off/non farm income is hypothesized to influence market outlet choice decision of onion producers.

Access to extension service (AExte): this is also a dummy variable which takes the form of one if farmers have access to credit and zero otherwise. Farmers who has access to extension improves household intellectual capital, which improves vegetable (onion) production, divert production resources to markets and choice market channels. Therefore, access to extension has direct effect on market channel choice decision by onion producers.

Onion yield (productivity): It is a continuous variable measured in quintals per hectare. Farmers who produce more onion yield per hectare are expected to supply more onion and choice market channels to the market than those who produce less. Therefore, the variable is hypothesized to affect channel choice positively.

Production costs (Prodcost): This is a continuous variable which measures the log normalized value of all inputs for growing and sale onion crops (Birr) per quintal per season. To produce an onion, these inputs would include so many units of seed, fertilizer, irrigation water, labor, transport and other cost, etc. According to Charity (2015) the cost of information significantly influenced direct sale at the market and brokers at positively and negatively respectively. In this study it is hypothesized that production cost affect market choice either positively or negatively.

RESULTS AND DISCUSSION

Characterization of households by market channel choices

Onion producers in the study area sell their product into three market outlet. These were wholesalers which accounts for 66.7% of total sells followed by assemblers (40%) and retailers (21.33%). But the role of agricultural

cooperatives in smallholder farmers marketing is recognized as essential, they are limited onion producers reported cooperatives as alternative market outlet in their onion marketing which is 8% of the total sample households. This should be seen as serious policy concern for the government and other stakeholders in this sector.

The mean household characteristics by onion market outlets are provided in Table 1 below. The mean age of household heads which had access to assembler, wholesaler and retailer onion market outlets was 43.8, 43.28 and 44.87 years, respectively. However, age of household does not statistically influence the choice of market channels. The average distance travelled to onion producers sold to the assembler market outlet was on average 2.03 km away from the nearest market while those sold for wholesalers and retailers market outlet are located on average 3.06 and 2.3 km away from home respectively. The finding (Table 1) indicates that distance from nearest urban market statistically influence choice of market outlet at 5% level. The average lagged onion market price offered by retailer market outlet was ETB 602.5 per quintal which is higher than price offered by other market outlets. On average 179, 122 and 205.5 quintal of onion yield per hectare was accessed by assembler, wholesaler and retailers market outlets, respectively. The finding indicates that onion yield or productivity statistically influence choice of market channels at 5%.

Proportion of household characteristics by onion market outlets is given in Table 2. The proportion of the respondents who sold to assembler (55%), wholesaler (53%), and retailer (62.5%) market outlets had attending formal and informal education. The results in Table 2 on transport ownership indicate that 16.67, 32 and 18.75% of market participants used assembler, wholesaler and retailer, respectively as the choice of marketing outlets. Observed difference in ownership of transport influence the choice of market outlet and was found to be statistically significant at 10% level. This implies that the majorities of who sold to wholesaler owned transport. The results on ownership of communication device indicate that 70, 52 and 78.12% of market participants used assembler, wholesaler and retailer market outlet, respectively. The observed difference in ownership of communication device influence the choice of market outlet and it was found to be statistically significant at 1% level. This means, the majorities of who sold their onion to assembler and retailer owned communication device. In terms of Non/off-farm activities only 26% onion producers sell their product to wholesaler market outlet which involved in non/off farm activities, whereas 51.67 and 56.25% of respondents sell their product to assemblers and retailers market outlet were participated in non/off-farm activities, respectively. The finding indicates that non/off farm statistical influence market outlet choice at 1% significant level.

Table 1. Mean household characteristics by onion market outlets.

Variables	Mean (Std) of market outlets			F- value
	Assemblers	Wholesalers'	Retailers	
Age of household head	43.8 (9.91)	43.28(10.76)	44.87(9.75)	0.29
Distance to the nearest urban market	2.03(1.62)	3.06(2.47)	2.30(1.56)	5.05**
Number of livestock owned in TLU	4.75(2.45)	4.80(2.50)	4.87(2.71)	0.02
Production cost	13514(11839)	13388(11883)	10989(6299)	0.64
Onion lagged price	551(139)	602(241)	602.5(252)	1.56
Onion yield(productivity)	179(208.5)	122(137.5)	205.5(233)	3.53**

Note: *** significant at 1%, ** at 5% and * at 10%. Results in parenthesis are standard deviations.

Table 2. Proportion of household characteristics by onion market outlets.

Variables	Category	Assemblers (%)	Wholesalers (%)	Retailers (%)	Chi-square value
Literacy status of household head	Literate	55	53	62.5	0.89
	Illiterate	45	47	37.5	
Ownership of transport asset	Yes	16.67	32	18.75	5.50*
	No	83.33	68	81.25	
Ownership of communication device	Yes	70	52	78.12	9.40***
	No	30	48	21.88	
Access to credit	Yes	38.33	22	31.25	
	No	61.67	78	68.75	5.02*
	No	15	22	15.62	
Participation in non/off farm income	Yes	51.67	26	56.25	15.14***
	No	48.33	74	43.75	
Agro ecology	Upland	56.67	64	53.13	1.57
	Lowland	43.33	36	46.88	
Access to extension service	Yes	90	89	96.68	1.80
	No	10	11	3.32	

Note: *** significant at 1%, ** at 5% and * at 10%.

Finally about 38.33, 31.25 and 22% of respondents sell their product to assemblers, retailers and wholesalers, market outlet had taken credit for onion production and marketing respectively. The chi-square result showed that access to credit was statistically significance with market outlet choice at 10% significance level.

Determinants of market channel choice

The expected multivariate interdependence of selection of particular market channel of assembler, wholesaler and retailers was accounted for by employing the multivariate Probit model (Table 3).The Wald test was used to test the model fits, the data is statistically significant at 1% significance level, which implied that the subsets of coefficient are jointly significant and the independent variable include in the model is acceptable.

Moreover the likelihood ratio test in the model $(\rho21 = \rho31 = \rho32 = 0)$ is significant at 1%. Therefore, the null hypothesis that all the ρ (Rho) values are jointly equal to 0 is rejected, indicating the goodness-of-fit of the model or implying that the decisions to choose these market channels are interdependent. Hence, the use of multivariate probit model is justified to determine factors influencing choice of market channels. Further, there are

Table 3. Multivariate probit Simulation results of market channel choice.

Variables	Coefficients (channel choice equations)		
	Assemblers (1)	Wholesalers (2)	Retailers (3)
Agro ecology (Lowland)	0.77**	-0.18	0.17
Distance to nearest urban market	-0.29***	0.30***	-0.18*
Literacy status of household head(literacy)	-0.45*	-0.23	0.19
Ownership of transport assets(yes)	-0.80**	-0.90***	0.54*
Ownership communication devices(yes)	0.72**	-0.37	1.03***
Non/off farm income (yes)	0.98***	-0.83***	0.75**
Productivity(onion yield)	0.001*	0.001	0.001
Log-Lagged onion market price	-1.82**	1.78*	-2.31**
Access to credit (yes)	0.72**	-0.80***	0.33
Log of production cost	-0.41	0.88**	-1.27**
Tropical livestock unit	0.01	-0.08*	0.07
Access to extension service (yes)	0.20	-0.21	1.52**
Age of household head	0.01	-0.001	0.02*
Constant	5.42*	-7.34**	6.80*
Predicted probability	0.390	0.693	0.205
ρ 21		- 0.92***	
ρ 31		0.67***	
ρ 32		-0.73***	
Number of simulations (draws)		5	
Wald chi2(39)		80.10***	
Likelihood ratio test of independence		*P21 = ρ31 = ρ32 =0, chi2(3) = 78.44***	
Joint probability (success)		0.033	
Joint probability (failure)		0.035	

Note: ***, **, and * significant at 1%, ** at 5% and * at 10% probability level respectively.

differences in market channel choice behavior among farmers, which are reflected in the likelihood ratio statistics.

The ρ values (ρ_{ij}) indicate the degree of correlation between market channel choices. The $\rho 21$ (correlation between the choice for assembler and wholesaler market outlet) and $\rho 32$ (correlation between the choice for retailer and wholesaler market outlet) are both negative and statistically significant at the 1% significance level (Table 3). The study revealed that farmers delivering to the assembler are less likely to deliver to wholesaler ($\rho 21$). Equally, farmers who involved in retailer market outlet are less likely to send their onion to the wholesaler ($\rho 32$). Moreover the Simulated maximum likelihood estimation results suggested that there was positive and significant interdependence between farmers selection of market outlet of retailer and assembler which implied that the $\rho 31$ (correlation between choice for assembler and retailer) are positively and statistically significant at 1% level. Finally the study reveals that assembler market outlet with wholesaler outlet and retailer and wholesaler market outlet are competitive to each other in the study areas. However correlation between assembler and retailer market outlet indicates complementary relationship (Table 3).

The marginal success probability for each equation (market channel decision) is reported below. The likelihood of choosing retailer is relatively low (20.5%) as compared to the probability of selecting assembler market channel (39.0%) and selecting wholesaler market channel (69.3%). This is good evidence because farmers were not interested in selling their products to retailer market channel even if they get good price than other market channel due to marketing cost.

If onion farmers chose all three market channels, their joint probabilities of choosing these market channels would be only 3.3%. It was unlikely for farmers to choose all three market channels simultaneously. This was justified either by the fact that simultaneous chose of all market channels was unaffordable for the smallholders onion farmers, or that all three market channels were not simultaneously accessible in the study areas. However, their joint probability of not choosing all three market channels was 3.5%, implying that the households were more unlikely to fail. This evidence suggests that choosing the right mix of market channels is determined by different factors for each market channels. The finding was also consistent with Degye et al. (2013) in their study on food security and agricultural technologies interaction study in Ethiopia.

Distance to nearest urban market: The coefficient of distance to nearest urban market was found to have a direct relationship with wholesaler onion market outlets and significant at 1% probability level. Whereas the likelihood of choosing retailer and assemblers market outlet statistically and negatively influenced by distance to nearest urban market at 10 and 1% probability level, respectively. This indicated that farmers whose residences are far from nearest urban market are more access to sell their product to wholesaler market outlet and less to sell to retailer and assembler outlet.

Agro ecology: Agro ecology was found to be positively and significantly affected in assembler onion market outlet at 5% significance level. As the agro ecology becomes lowland the likelihood of onion producers to sell their produce to assembler outlet would be decrease as compared to upland. The reason may be is the most of rural assemblers live either rural lowland Kebeles namely Woreta Zuria, Awa, or Woreta. This forced onion producers to sell to assemblers in the market.

Literacy status of household head: Literacy status of households was affected by assembler channel choice significantly at 10% and was negatively and not expected. It was expected that the literacy status of household would positively influence the market channel choice. This implied that the probability of selling onions to assembler's market channel would be decrease than the probability of selling to retailer market channel choice. This result consistent with Bongiwe and Micah (2013), Mutura et al. (2015), were found that education affect vegetable and diary market channel choice negatively, respectively.

Ownership of transport assets: ownership of transport influenced the choice of assembler and wholesaler outlet negatively and significantly at 5 and 1%, respectively; and choice of retailer outlet positively and significantly at 10% significance level. This might be farmers who have transport facility that could supply their product to local market center and sell to retailers directly by getting better price. The result concurs with argument of Chalwe (2011) who stated that the availability of on-farm transport increases the probability of transporting goods to private traders and retailers in the market.

Ownership communication devices: Another market characteristic is ownership of communication device which had a positive and significant influence on the choice of assembler and retailer outlet at 5 and 1% probability level, respectively. The positive sign show that farmers who have own communication device are more likely to sell onion to assembler and retailer outlet compared to those farmers who had not. This might be due to the reason that communication device is used to access information and knowledge to strengthen onion production and marketing. This result is consistent with Key et al. (2000).

Productivity (onion yield): Onion yield produced by farmers was associated with a positive effect on farmer's choices among alternative onion market channels. An increase in farmer's onion yield results in an increase in the probability of choosing assembler market channel at 10% level of significance. The implication is that if the quantity of onion to be produce is large farmers' search, a market outlet buys large volume with high price. But, if the quantity to be produce is low; farmers are not forced to search price and market information. This result is consistent with Maryam (2015) which showed that yield was associated with a positive effect on farmer's choices among alternative rice output market.

Non/off farm income: Non/off farm income affect the probability of choosing assembler and retailer market outlet positively at 1 and 5% levels of significance, respectively; and choice of wholesaler outlet negatively and significantly at 1% significance level. This indicates that onion farmers who are involved in non/off farm activities are more participated to sold their product to retailer and assembler market outlet as compared to onion farmers who didn't participated in off/non farm income activates. Moreover farmers who are involved in off/non-farm activities are less likely to send their onion to wholesaler outlet as compared to farmers who not. The possible explanation is that as the farmer involved in non/off farm activities the time he/she has to spare for marketing of agricultural activities and to produce marketable surplus is less, hence this decreases the probability of participating in wholesaler market channel which is a larger market compared to retailer and assembler market outlet. This result is consistent with Tewedrows (2014) who found that farmers involved in non/off farm activities affect retailer market participation negatively.

Access to credit: The probability of choosing assembler and wholesaler was also positively and negatively affected by access to credit at 10 and 5% levels of significance, respectively. As the farmers have access to credit, onion producer are more likely to sell onion to assembler outlet as compared to producers who not. In addition as the farmers have access to credit, the probability of participating in wholesaler market channel will decreases. The possible reason that farmers who choose assembler market outlet have better access to formal credit than wholesalers market outlet. The result is consistent with the findings by Mussei et al. (2001).

Lagged onion market price: The coefficient of onion lagged price variable was found to have an inverse relationship with the probability supplied to assembler and retailer's market outlets and significant at 5% probability level but positively and a significant influence on the choice of wholesaler's market outlet. The coefficient indicates that farmers are less likely to sell onion to assemblers and retailers outlet as lagged onion market price increase. The possible reason could be that the average onion lagged market price of wholesaler was high as compared to other market outlet among sample households. This result is consistent with the result obtained by Berhanu et al. (2013) who found that access to milk market outlet price negatively affect accessing cooperative milk market outlet as compared to individual consumer milk market outlet.

Production costs: production costs significantly affects the probability of choosing wholesaler market outlet positively at 5% significance level. This implied that an increase in production cost incurred by onion producers increases the probability of choosing wholesaler market outlet over retailer and decreases the probability of choosing retailer market outlet. The possible reason that the longer the distance, the higher the production costs, hence the channel which is associated with higher production costs reduces farmer's gross margins. This research finding is consistent with the results of Mutura et al. (2015).

Tropical livestock unit: Livestock holding affects the likelihood of choosing wholesaler market outlet negatively and significantly at 10% significance level. This implies that the likelihood of choosing wholesalers market outlet decreases, if ownership of livestock TLU increase. The possible reason is that livestock production and onion production compete for the scarce land and water resources, necessitating that farmers often have to make choices. This leads to reduced onion production and market channel choices.

Access to extension service: Access to extension service had positive sign and significantly affects the choice of retailer market outlet at 5% significance level. Farmers who have an access to extension service would be sold their product to retailer market outlet than farmers who did not have access to extension service. This implies that extension service increased ability of farmers to improve production and market information, thereby increasing output and ability to choose the best market outlet which gives high price. This result is consistent with Abraham (2013) who found that extension service affect choice of collector and retailer market outlet negatively.

Age of household: Age of household head was to be statistically significant at 10% significance level and positively influenced choice of retailer market outlet by smallholder farmers. The results implied that, as age of household head increases the probability of choosing retailer market outlet increase. This implies that, older farmers may take their decision to choose better market outlet which gives higher price more easily than the young farmers, because older people might have marketing experience, accumulated capital or a long term relationship with their clients or might have preferential access to credit due to their age, availability of land, or family size.

CONCLUSION AND RECOMMENDATIONS

Market outlet choice decision of onion is the most important elements. The main objective of the study is to analyze the determinant of market outlet choice by smallholder onion farmers in Fogera district. Therefore, Multivariate Probit Model (MVP) was employed to analyze factors determine choice of onion market outlet in the study areas. Onion producers in the study area sold their product through alternative market outlets. Farmers were classified into three categories according to their outlet choice decision but are correlated: those farmers who sold their product to wholesalers (66.7%); those who have supplied most of their produce to assemblers (40%); and those farmers who have supplied most of their produce to retailers (21.33%). Multivariate probit model results confirm that agro ecology, distance to nearest urban market literacy status, ownership of communication device and transport asset, onion yield, off/non-farm income, access to credit, access to extension service, production cost, age of household, lagged price of onion were an important factor that affects the probability of choosing market outlet choices.

From these findings, the following policy implications of the variable are extension interventions that should train old aged households to produce high quality products and choice market channels. Appropriate policies should strengthen the existing provision of formal and informal education through facilitating all necessary materials to the rural farming households in general and to the study area in particular, policies that would improve the existing onion production and productivity system. This district should establish the vegetable market centre nearest to the farmer's residence or production area. Moreover policies and strategies should place more emphasis on strengthening the existing communication device (ownership of radio, TV, mobile), rural telecom and rural-urban infrastructure development of the study areas, by the regional and Local Government. Finally, the study suggested strengthening the existing crop-livestock production system through providing improved health services, better livestock feed (forage), targeted credit

and adopting agro-ecologically based high-yielding breeds and disseminating through artificial insemination in the area.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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