Determinants of market participation and intensity of marketed surplus of smallholder chickpea producers in Este woreda

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Abstract
In Ethiopia, chickpea is an important legume crop, particularly in Este district. It is a source of food and provides cash income for majority of smallholder farmers. To commercialize chickpea producers, selecting an appropriate market channel is important for participation. Hence, this study aimed to identifying factors affecting chickpea market participation and volume of marketed surplus of chickpea. Both primary and secondary sources of data were used. Moreover, both qualitative and quantitative data were collected from primary and secondary data sources. Primary data were collected directly from chickpea farmers through semistructured questionnaire. Focus group discussion and field observations were undertaken during primary data collection in the study area. Combination of data analysis methods like descriptive analysis and econometric models were employed. Heckman model result indicated that market participation decision was significantly affected by age, family size, lagged price, and distance to the market and market supply by frequency of extension contacts, quantity produced, transport ownership, and distance to the market. Based on the findings, government and concerned stakeholders need to focus more on enhancing accessibility of infrastructures facilities to promote marketing of chickpea and increase marketed surplus as well as expanding market access and improving yield through strengthening extension service in order to accelerate market chain development.

KEYWORDS
chickpea, Heckman two stages, market participation, market surplus

1 | INTRODUCTION

In the rural areas of Ethiopia, farmers do not have the opportunity to sell their crop at competitive prices. Important inputs, such as improved seed, fertilizer, and chemical, are either unavailable or their prices are usually high making them very costly and unbenefficial to farmers to use. Limited resources, low levels of adoption of new variety, lack of use of enhanced technologies, lack of adequate road and rail network, and institutions that support agricultural development are the major reasons behind low productivity of small-scale agriculture in Ethiopia that lead to production patterns dominated by the satisfaction of continuation requirements and food insecurity at both household and national levels (Jemberu, 2017).
Different types of legume are grown in Ethiopia with different intensities in terms of land and other input allocation, purpose of production, and marketability. Among which chickpea is an important food legume in Ethiopia that provides sources of livelihood for millions of smallholder farmers. Currently, it has become an important high-value crop that promotes commercialization. Current evidence showed that there has been a significant upswing in the trends of local chickpea prices both in nominal and real terms since the last 8 years. As a result, chickpea has become an important cash crop in high potential major chickpea growing areas where farmers dispose the largest proportion of their chickpea production (82%) for marketing purpose (Setotaw et al., 2018).

Ethiopia is the leading producer, consumer, and seller of chickpea among African countries and is the sixth most important producer in the world. Ethiopian chickpea production is shifting from traditional cultivars to improved varieties and from desi variety to the kabuli variety. Kabuli is high yield with relative to desi varieties. Other progressive shifts include the use of market-oriented cultivars and enhanced adoption of production packages recommended by research, among which pulling back planting time to late July to early August depending on soil drainage helped much in increasing productivity through provision of longer growing time (Mekasha, 2013).

Este woreda is endowed with diverse natural resources and has the capacity to grow different annual and perennial crops. Legume production in the woreda is mainly for consumption and market. The production is very fragmented and uncoordinated where all growers produce similar type of crop resulting in glut typically in harvest season mainly chickpea, bean, and Guaya. Chickpea production is increasing and is one of the sources of food in Este woreda (Este Woreda Office of Agriculture [EWOA], 2019). But producers are not selling their produce in an organized manner, and they are not benefited and need to be further investigated thoroughly, and alternative solution has to be recommended and implemented so as to benefit producers and other marketing agents involved in the chickpea market. Hence, this study was aimed at analyzing chickpea market chain in Este woreda so as to come up with important information to improve the livelihood and income level of farmers.

2 | Research Methodology

2.1 | Description of the study area

Este is one of the woredas in South Gondar Zone, Amhara region, which is found around 653 km northwest of Addis Ababa and approximately 114 km east of Bahir Dar. Este is bordered by the Abay Waterway on the south which isolates it from the East Gojjam Zone, on the west by Andabet and Dera, on the northwest by Fogera, on the northeast by Lay Gayint, on the east by Simada, and on the north by Farta. Within woreda, there are 46 kebele organizations (KAs) with four urban kebeles and 42 rural kebeles. From 42 KAs, 11 are potential chickpea producer kebele’s within the ponder woreda. Figure 1 shows the study area.

Farming system in study area is a mixed farming system centered primarily on crop production and livestock rearing activities. Agriculture relies on rain and uses only the bare minimum of irrigation. According to EWOA, (2019) report, 1587 ha of land was suitable for irrigated agriculture; the others were cultivated through rain-fed agriculture. This means that small-scale irrigation activities in the study region have not increased. Wheat, teff, barley, and maize are the most common and valuable crops, providing both food and income in addition to chickpea. Other crops filled in the investigation region incorporate pea, nouge, and beans. In the examination territory, various organic products are developed. These incorporate lemon, orange,
mango, banana, and avocado, which are significant organic products. Crop sales make the largest contribution to the household income together with sheep and goat for their cash earnings.

2.2 | Method of data collection and sampling techniques

Both quantitative and qualitative data were collected from primary and secondary data sources. The primary information was gathered on farmers (sampled households, collectors, district retailers and wholesalers) through semistructured questionnaires. Center gathering conversation and field perception were likewise attempted during essential information assortment in the examination territory. Farmers and extension agents were interviewed through focus group discussion using a checklist. Optional information was gathered from office of farming, woreda exchange office, review report, yearly report, and sites. Two-phase inspecting technique was utilized for the determination of test family heads. At the first stage, from a total of 11 chickpea-producing Kebles in the district, four chickpea-producing Kebles were selected randomly. In the second stage, from the four selected Kebles, about 122 sample households were selected by using a simple random sampling technique taking into account the probability proportional to size of each sample Keble. The example size of rustic families was dictated by utilizing the accompanying equation created by Yamane (1967).

\[ n = \frac{N}{1 + N\left(\epsilon/2\right)} \]

where \( n \) is the sample size 122, \( N \) is the total population 8690, and \( \epsilon \) is the error term 0.09.

Information from traders likewise was gathered. As indicated by the data acquired from the exchange office, there were just four authorized wholesalers. In this way, evaluation overview was lead for wholesalers. However, because of the absence of clear information in the locale about the number of retailers engaged with chickpea exchange, a market evaluation review was led to think of clear pictures of retailers occupied with chickpea exchanging action the investigation territory. Then, seven retailers from district market, five retailers from village market, and nine collectors were selected purposefully during the market day, constituting a total of 25 traders interviewed.

2.3 | Methods of data analysis

2.3.1 | Descriptive analysis

Expressive measurements like recurrence, rate, mean, and standard deviation were utilized to examine the qualities of the example families and merchants. Moreover, the limitations that influence chickpea creation and showcasing were investigated utilizing illustrative insights. Furthermore, inferential measurement of chi-square test (\( \chi^2 \) test) and T test was used to show the association between dummy (categorical) and continuous variables with the outcomes respectively.

2.3.2 | Econometric analysis

The main dependent variables that will be included in the model are described as follows;

Market participant (MARPART): It is a dummy-dependent variable measured in terms of the household market participation that represents 1 if farmers participate and 0 if farmers do not participate.

Amount (intensity) of chickpea marketed (MARSPLUS): It is a continuous variable measured in quintals (100 kg). It represents the actual quantity of chickpea marketed by farm households in 2019/2020 production year.

The appropriate econometric models for this study are Heckman two-step models, double-hurdle model, and tobit model (Komarek, 2019/2020). Tobit model is a statistical model proposed by Tobin (1958) to describe the relationship between nonnegative dependent variable and independent variable, and it assumes that the participation and sales volume decisions are made simultaneously, and hence, factors that affect the participation decision and the sales volume decision are the same. Hence, this model is not appropriate for this study. A Heckman two-step model relaxes the tobit model assumption by allowing different method to examine the discrete probability of participation and level of participation Heckman (1979). Double-hurdle model is not appropriate in this study because of sample selection problems, and more precisely, in the case of incidental truncation, some part of the dependent variable is not observed because of the outcome of another variable. To eliminate the problem of selectivity bias and to relax the assumptions in the tobit model, separate the effect of variables on the probability of market participation from the effect on the volume of chickpea that can be sold (Heckman, 1979). Therefore, the study used a Heckman two-step procedure.

The two equations for the two steps are specified in the following model specification: (1) likelihood of household’s heads to participating supplying of chickpea was given as

\[ Y_i = \beta_i X_i + \epsilon_i, \]

where \( \epsilon_i \sim N(0,1) \); \( i = 1,2,...,n \). \( Y_i \) is the dummy variable that represents 1 if the household heads participate and 0 if the household heads do not participate, \( \beta_i \) is the parameters in the model, \( x_i \) is the independent variable, \( \epsilon_i \) is the error term observed, and it is assumed to bivariate and normally distributed (in the correlation coefficient, \( \rho \)).

(2) The volume of chickpea including inverse Mills ratio (\( \lambda_i \)) is represented as

\[ Y_i = \beta_i X_i + \lambda_i \mu + \epsilon_i, \]

where \( \epsilon_i \sim N(0,\sigma^2) \). \( Y_i \) is the amount of chickpea marketed surplus when the household participated in the chickpea market; \( \beta_i \) is the
unknown parameters; \( X \) is the independent variable that affects the amount of chickpea surplus; \( \lambda \) is the correction factor for selection bias (inverse Mills ratio) \( \lambda = \frac{f(Y|i)}{1-f(Y|i)} \); and \( e_i \) is the error term, assumed to be bivariant, and normally distributed with correlation coefficient, \( \delta^2 \).

3 | RESULT AND DISCUSSION

3.1 | Descriptive statistical analysis

3.1.1 | Demographic and socioeconomic characteristics of chickpea producers

As Table 1 demonstrates, out of the 122 example respondents, 103 (84.5%) were male headed and the rest 19 (15.6%) were female headed. The dispersion of conjugal status 110 (90.2%), 8 (6.5%), and 4 (3.3%) were hitched, separated, and bereft individually. Regarding educational background of the household heads believed to be an important feature that determines the readiness of household heads to accept new ideas and innovations. Makers that are more instructed are probably going to acknowledge new advances to rise their property and work profitability. In view of order of training, the information showed that (62) 50.82% of the respondents do not peruse and compose, (42) 34.43% can peruse and compose, (10) 8.2% finished grade school, and the leftover (8) 6.56% accomplished optional instruction.

As per the study result, about 91 (74.6%) of families have their own vehicle office, and about 31 (25.4%) have no vehicle office. Also, the outcome shown that the principle method for transport was pack creature. Because of the absence of street access, the majority of the makers did not utilized vehicles to move chickpea either to the locale level or different business sectors. Thus, accessibility of well-working vehicle offices to the region is fundamental because it makes place utilities of the item. Explicitly, the outcomes show that 84.4% of market members own a vehicle whereas 15.6% did not possess. Then again, 38.5% of nonmarket members own a vehicle whereas 61.5% did not claim. The chi-square outcome shows that the vehicle proprietorship was measurably huge at 1% demonstrating that a greater amount of market members claimed transport than nonmarket members. The transport ownership greatly boosts the morale of the farmer to participate in the market because it convenient the farmers on the place of marketing and the time. An examination on market access by Sigei et al. (2014) shows that the responsibility for methods for transport, for example, vehicle, is decidedly identified with market investment.

In wording market data, about 73.1% of nonmarket member had no admittance to showcase data and 26.9% approached market data from various sources. The chi-square outcome shows that admittance to showcase data was measurably critical at 1% importance level, which demonstrate that a greater amount of market members get market data than nonmarket members. There is no satisfactory and coordinated progression of data about market to chickpea makers of the investigation territory. Admittance to horticultural advertising data is fundamental factor in empowering cutthroat business sectors. Solid market data assist ranchers with selling their chickpea produce openly by interfacing with dealers and can pick a beneficial method of

| Characteristics | Item | Market participant | Nonmarket participant | Overall | \( \chi^2 \) value |
|-----------------|------|---------------------|-----------------------|---------|-----------------|
|                  | Freq | %       | Freq | %   |               |               |
| Sex             |       |         |       |     |               |               |
| Male            | 83    | 86.5    | 20   | 76.9 | 103            | 1.415          |
| Female          | 13    | 13.5    | 6    | 23.1 | 19             |               |
| Educational status |     |         |       |     |               |               |
| Not read and write | 47    | 75.8    | 15   | 24.2 | 62             | 1.441          |
| Read and write  | 33    | 76.8    | 9    | 21.4 | 42             |               |
| Primary school  | 9     | 90      | 1    | 10   | 10             |               |
| Second school   | 7     | 87.5    | 1    | 12.5 | 8              |               |
| Off-farm income |       |         |       |     |               |               |
| Yes             | 22    | 24.6    | 8    | 30.8 | 30             | 0.680          |
| No              | 74    | 75.4    | 18   | 69.2 | 92             |               |
| Transport facility |     |         |       |     |               |               |
| Yes             | 81    | 74.6    | 10   | 38.5 | 91             | 22.755***      |
| No              | 15    | 25.4    | 16   | 61.5 | 31             |               |
| Market information |     |         |       |     |               |               |
| Yes             | 92    | 95.8    | 7    | 15.6 | 99             | 63.505***      |
| No              | 4     | 4.2     | 19   | 73.1 | 23             |               |
| Credit access   |       |         |       |     |               |               |
| Yes             | 73    | 73      | 16   | 61.5 | 89             | 2.181          |
| No              | 23    | 27      | 10   | 38.5 | 33             |               |
| Marital status  |       |         |       |     |               |               |
| Married         | 86    | 89.6    | 24   | 92.3 | 110            | 1.165          |
| Divorced        | 6     | 6.2     | 2    | 7.7  | 8              |               |
| Widowed         | 4     | 4.2     | 0    | 0    | 4              |               |

Source: Own survey result, 2019.
***Statically significant at 1% significance level.
exchange or channels to improve advantage. The result is similar with the finding of Mezgebu (2018) marketing activity depends on access to market information, willingness and ability of farmers to use the information.

Table 2 shows average period market members around 44 years old and nonmarket member around 38 years old. Generally average age chickpea producer ranchers discovered was 42.87 years old. The result of the chi-square showed that the age was statistically significant at 5% significance level, signifying that the mean age of nonmarket participants was less than that of market participants this is similar to Dessie et al. (2017) that indicate market participation increase with age because the older people are more experienced that they could acquire through time and to supply high volume.

Regarding chickpea amount, the methods for chickpea created for market members each year were discovered to be 4.85 quintal, and for nonparticipant, they were discovered to be 2.52 quintal. The mean of general chickpea amount was discovered to be 4.35 quintal. The aftereffect of the t test shows that measure of chickpea produced was genuinely huge at 1% demonstrating that the market members had more chickpea amount than nonmarket members. The result is similar with the findings of Takele (2010) who confirmed that increasing the volume of production increase market participation.

Regarding chickpea value, the outcomes uncover that the normal market cost per kilogram among members was discovered to be 16.95 ETB whereas in nonmarket member was 16.33 ETB in 2018/19 creation season. The normal mean of chickpea cost was discovered to be 16.82 ETB. The aftereffect of the two followed tests showed that the slacked cost of chickpea was genuinely huge at 10%. Value variable assumes a principal part in chickpea promoting on the grounds that it decides the measure of pay to be procured from chickpea deals. Better item cost is the critical inspiration for the dealers to supply extra to the market. Consequently, greater cost is seen to expand the degree of market cooperation.

Regarding the distance of the closest market, vast majority tested that chickpea maker ranchers need to walk a significant distance from home to the closest market to sell their chickpea and other farming items. Admittance to actual market transportation is genuinely low in the country local area; along these lines, ranchers move products into the closest market. The outcome demonstrates that the mean of distance to the closest market for market member was 74.17 min, whereas for nonmarket member, it was 92.5 min. The general mean of distance to the closest market for test respondents was 78.07 min. The consequence of t test shows that distance to the closest market was measurably huge at 5% importance level. This show the mean distance to the closest market for market members were not exactly nonmarket members. The distance to the market has been found to negatively affect market cooperation. The outcome is comparative with the finding of Sigei et al. (2014) who affirmed that the biggest distance to the market builds exchange expenses and promotes expenses and this obstructs the level of market support.

In terms frequency of extension contact that out of a total chickpea producers sample households, the mean extension contact frequency provided for chickpea producing farmers who are participate in market was found to be 3.18 day/month and Non-market participant was found 1.23 year. The general mean of recurrence of expansion contact for test respondents was 2.76. The consequence of t test shows that recurrence of expansion contact was measurably huge at 1% importance level. These demonstrate that expansion administrations gave about chickpea creation, input use (manure, fertilizer), item stockpiling, seedling raising, and item advertising.

### 3.2 | Econometrics analysis

#### 3.2.1 | Factors affecting market participation

To determine the factors influencing market participation of chickpea in Este district, probit model was estimated in the first step of the Heckman two-step procedure. The results presented in Table 3 shows that the variables (age, household family size, age square, distance to the market, and lagged price) significantly influence the farmers’ decision to participate in the chickpea market. The inverse Mills ratio

| Characteristics | Mean | Market participant | Nonmarket participant | Overall mean | t value |
|-----------------|------|---------------------|-----------------------|--------------|--------|
| Age (year)      |      |                     |                       |              |        |
| Total family size (number) | 5.92  | 5.19                | 5.76                  |              | –1.584 |
| Lagged price (ETB)    | 16.931 | 16.3269             | 16.8197               |              | –1.883*|
| Frequency of extension contact (number) | 3.1771 | 1.2308              | 2.7623               |              | –5.737***|
| Total number of livestock (number) | 3.5013 | 3.1987              | 3.4368               |              | –0.848 |
| Distance to the nearest market (min) | 74.1667 | 92.5000            | 78.0738              |              | 2.372**|
| Amount of chickpea produced (quintal) | 4.8505 | 2.5192             | 4.3537               |              | –4.104***|

Source: Own survey result, 2019.
*Statically significant at 10% significance level.
**Statically significant at 5% significance level.
***Statically significant at 1% significance level.
(IML/lambda) was significant and positive at (0.014), which implies that the error term in the selection and primary equation is positively correlated. This indicate that unobserved factors that make participation in chickpea marketing are more likely to be associated with high value on the dependent variable. The results interpret by using marginal effects value.

**Age of the household**

Age of the household head significantly and positively influenced market participation at 1% significance level. An increase in the age of household head by 1 year increases the probability of participating in the chickpea market by 2.2%; all other factors held constant. This implies that the older people are more enthusiastic to participate in the chickpea market than the younger people in the study area. This finding agree with that of Dessie et al. (2017) who found to have positive and significant influence on market supply of red pepper.

**Age squared**

As it was hypothesized, the variable is found to have nonlinear (parabolic) relationship in market participation of chickpea. Moreover, the negative sign of the variable indicates that up to some stage of the earlier period of the chickpea producers of household age, the relation was positive as it was shown by positive sign of the coefficient of age variable, but later on, as the household gets older, the participation of household in chickpea market declines as chickpea production is the function of active labor (Table 3).

**Family size**

Family size of the household head significantly and positively influenced market participation at 5% significance level. When the family size increases by one, the probability of participating in the chickpea market increases by 2.6%; all other factors held constant. This can be explained by the fact that a farmer who has more family size has more family labor which is the major source of labor force for better management of chickpea production and directly related to engagement in production and marketing activities of chickpea in the study area. Therefore, those farmers who have access to more family labor are likely to produce more quantity of chickpea, which in turn increases the probability of farmers to participate in chickpea marketing. This is in line with Mirie and Zemedu (2018) who illustrate that if teff producer had more family labour, provides a greater opportunity for the farmers to participate in the teff market.

**Distance to the nearest market**

This variable was significant at 10% and negatively associated with the probability of participating in the chickpea market. The Heckman two-step selection equation result indicated that as the distance of the producer residence from the nearest market increases by one walking minute, the participation of the household decreases by 0.034%. Since chickpea producer farmers reside far from the nearest market decrease market participation because of more costly and time consuming to move with output forcing smallholder producers to hold more output mostly which is common in rural areas where

### TABLE 3 The Heckman two-step selection equation result

| Variables                    | $\frac{dy}{dx}$ | SE  | Z    | $p > |z|$ |
|------------------------------|------------------|-----|------|-------|
| Sex                          | 0.0082591        | 0.01836 | 0.45 | 0.653 |
| Age                          | 0.0216432***     | 0.00318 | 6.81 | 0.000 |
| Age squared                  | -0.0002152***    | 0.00004 | -6.13 | 0.000 |
| Education level              |                  |       |      |       |
| Read and write (1)           | 0.00963          | 0.01319 | 0.73 | 0.465 |
| Primary school (2)           | -0.0100413       | 0.02136 | -0.47 | 0.638 |
| Secondary school (3)         | 0.0006192        | 0.02365 | 0.03 | 0.979 |
| Family size                  | 0.0262652**      | 0.0115 | 2.28 | 0.022 |
| Family size squared          | -0.0014279       | 0.0009 | -1.59 | 0.112 |
| Total livestock unit         | -0.0029584       | 0.00453 | -0.65 | 0.514 |
| Quantity of produced         | 0.0000256        | 0.00267 | 0.01 | 0.992 |
| Off-farm income              | 0.0140686        | 0.01485 | 0.95 | 0.343 |
| Frequency of extension       | 0.0047912        | 0.00414 | 1.16 | 0.247 |
| Transport facility           | 0.0130547        | 0.01705 | 0.77 | 0.444 |
| Market information           | 0.0195391        | 0.02881 | 0.68 | 0.498 |
| Lagged price                 | 0.018078***      | 0.0036 | 5.02 | 0.000 |
| Distance to the market       | -0.0003413*      | 0.00018 | -1.89 | 0.059 |
| Credit access                | 0.0035551        | 0.01379 | 0.26 | 0.797 |

Source: Own survey result, 2019.

*Statically significant at 10% significance level.

**Statically significant at 5% significance level.

***Statically significant at 1% significance level.
transportation facility is poorly developed and those producers near to the market can easily supply without incurring high cost. Therefore, due to increase transportation cost, producers discourage participation to the market. This result is similar with Geremewe (2019) who found that distance to the nearest market declines the probability of participation in the wheat market by 2.4%.

**Lagged price**
Lagged price (previous year price in that production year) significantly and positively influenced market participation at 1% probability level. An increased price of chickpea by one birr per kilogram increases the probability of participating in the chickpea market by 1.8%; all other factors held constant. This implies that as the lagged price increases, market participation also increases. This is in line with the findings of Mezgebu (2018) who illustrate that if one Birr increases in previous year market prices lead to 0.035 increases in the volume of marketed. This suggests that higher price provides a greater opportunity for the farmers to participate in the chickpea market.

**Factors affecting amount of chickpea marketed surplus**
To determine the factors affecting the extent of market participation in chickpea marketing, the OLS estimation was used to estimate in the second stage of the Heckman outcome equation. As the survey result shown in Table 4, four variables (frequency of extension contact, quantity of produced, transport ownership, and distance to the market) were significant to the extent of market participation positively and negatively at different significance level. In addition to this, the coefficient of inverse Mills ratio (lambda) in the Heckman two-step estimation is significant at less than 5% significance level and affects positively. This implies that sample selection bias, existence of some unobservable producer factors determine producer participation in chickpea market and affecting marketed surplus. As depicted in Table 4, the chi-square was statically significant at 1% probability level indicating the goodness of fit of the Heckman two-step model to explain the relationships of the chickpea market participation of the variable.

**Quantity of produced**
As the result show that the chickpea quantity produced was positively and significantly affecting farmer market supply of chickpea at 5% significance level. The positive and significant relationships between the two variables indicate that chickpea quantity produced was a very important variable affecting the household heads volume of chickpea supply. The coefficient for the quantity

| TABLE 4 | Heckman two-step outcome equation result |
|----------|----------------------------------------|
| Variables                       | Coef.  | SE       | Z      | p > |z|  |
| Sex                                | −0.5126721 | 0.7472797 | −0.69 | 0.493 |
| Age                                | −0.1326509 | 0.2053447 | −0.65 | 0.518 |
| Age square                         | 0.0018011 | 0.0023652 | 0.76  | 0.446 |
| Education level                   |         |          |       |     |
| Read and write                    | −0.1236788 | 0.5775816 | −0.21 | 0.830 |
| Primary school                    | −0.5081219 | 1.010005  | −0.50 | 0.615 |
| Secondary school                  | 0.5769701 | 1.329111  | 0.43  | 0.646 |
| Family size                       | 0.7386322 | 0.543944  | 1.36  | 0.174 |
| Family size square                | −0.040608 | 0.0415492 | −0.98 | 0.328 |
| Total land size                   | −0.1733098 | 0.4922631 | −0.35 | 0.725 |
| Total livestock unit              | −0.0807679 | 0.1681276 | −0.48 | 0.631 |
| Quantity of produced              | 0.3930365** | 0.2001833 | 1.96  | 0.050 |
| Off-farm income                   | 0.468473 | 0.5987702 | 0.78  | 0.434 |
| Frequency of extension            | 1.170527*** | 0.3780568 | 3.10  | 0.002 |
| Transport facility                | 2.412613*** | 0.6792464 | 3.55  | 0.000 |
| Distance to the market            | −0.0172025** | 0.0084661 | −2.03 | 0.042 |
| Credit                            | 0.2782263 | 0.5113723 | 0.54  | 0.586 |
| _Cons                             | −2.575309 | 4.480466 | −0.57 | 0.565 |
| Mills lambda                      | 0.0546025** | 0.0221866 | 2.46  | 0.014 |
| Number of observation             | = 122    |          |       |     |
| Censored observation              | = 26     |          |       |     |
| Uncensored observation            | = 96     |          |       |     |
| Prob > chi2                       | = 0.0000 |          |       |     |

Source: Own survey result, 2019.
*Statically significant at 10% significance level.
**Statically significant at 5% significance level.
***Statically significant at 1% significance level.
produced of chickpea indicates that an increase in quantity produced of chickpea by 1 quintal leads to an increase in farm level market supply of chickpea by 0.4 quintal; all other factors held constant. This is in line with the finding of Abay (2010) who found that the quantity produced influenced the amount of market supply of pepper positively and Hailu (2016) who revealed produced by the household significantly and positively affected the supply of commodities.

**Frequency of extension contact**
As it was hypothesized, the result of the finding indicated that frequency of extension contact was positively and significantly related to the volume of chickpea supplied at 1% significance level. From the result, as other explanatory variable being constant, one more additional contact of extension agent with chickpea producers increases amount of chickpea supplied by 1.2 quintal. This implies that chickpea producers get extension service frequently through different means of awareness creation and demonstration techniques. This helps producers in availing up-to-date information regarding the technology that improves production and volume supply to the market. This result is in line with Urgessa (2011) and Melaku and Ashalatha (2016) who confirmed that teff producers have more number of extension contact increases the amount of teff supplied.

**Ownership of transport**
The transport ownership positively and significantly affects market supply at 1% significance level. The result revealed that producers get transport facility increases the proportion of chickpea sale by 2.4. Transport ownership plays crucial role in lowering the transport cost and boosting the volume of transport and this increases the proportion of chickpea sales to the market. The result is similar with the finding of Jegwe et al. (2010) on the impact of transaction cost on the participation of smallholder farmers and intermediaries in banana market who found ownership of transport to increase the banana sale.

**Distance to the nearest market**
This variable affected the quantity of chickpea supplied to the market negatively and significantly at 5% probability level. The Heckman two-step outcome equation result indicated that as the distance of the producer residence from the nearest market increase by one walking minute, the quantity of chickpea supplied decreases by 0.02 quintal. Since chickpea producer farmers reside far from the nearest market increase marketing cost because of increase transportation cost and those producers near to the market can easily supply without incurring high cost. Therefore, due to the increase transportation cost, producers discourage selling high quantity of chickpea product to the market. This result is similar with Ayalew (2015) and Mebratu (2014) who found that distance to the nearest market decline marketed surplus.

## 4 | CONCLUSION AND RECOMMENDATION

### 4.1 | Conclusion

The examination showed that 95.8% of market member of ranchers had market data before they deal yet casually. This implied that there is no formal system of market information dissemination that beneficiary the actors.

The aftereffect of the Heckman test determination model shows that marketing participation of farmers’ was altogether and emphatically influenced by age, family size, distance to showcase, and slacked cost in the chickpea market and promotes that excess of chickpea was essentially influenced by recurrence of augmentation contact, amount of created, transport proprietorship, and distance to advertise. All of these variables affect marketed surplus positively except distance to market. Accordingly, these factors need unique consideration to expand maker advantage.

Finally, the implication of the study is targeting the producers’ enhancement of education level, improving extension and credit services, establishing transport facility so as to increase the producers bargaining power and accessing better production methods are a means for better in market participation as well as chickpea market supply and would be accelerated chickpea market development.

### 4.2 | Recommendations

The result revealed that transport facility positively and significantly affect the amount of chickpea supply. Therefore, the government should also invest in rural infrastructure, especially on the road network to ease conveyance of the chickpea produced from the area of production to marketing point in order to lower transaction costs and to motivate market participation.

There is a need to build the capacity of producer to increase their knowledge and technical skill gap trough extension education in order to increase delivery of chickpea produce across chickpea market chain. Therefore, it is necessary to strengthen extension service in order to give continuous training and information to chickpea producers, to provide necessary agricultural inputs at a right time to improve production and marketing system of chickpea in the district.

Due to long distance for the woreda market and lack of market access in the district, special attention needs to be given to expand accessibility of infrastructures such as transportation facilities, road, and rural market accessibility to promote production and marketing of chickpea.

## AUTHOR CONTRIBUTIONS

All authors read and approved final manuscript.
CONFLICT OF INTEREST
The researcher declares that they have no conflict of interests.

DATA AVAILABILITY STATEMENT
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.

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REFERENCES
Abay, A. (2010). Market chain analysis of red pepper: The case of Bure woreda, west Gojam zone, Amhara National Regional State, Ethiopia. MSc thesis in Agricultural Economics. Haramaya University, Ethiopia.

Ayalew, Y. (2015). Factors affecting fruit supply in the market: The case of Habru Woreda Amhara Region, Ethiopia. Journal of Marketing and Consumer Research, 7, 1–40.

Dessie, M., Woldeamanuel, T., & Mekonnen, G. (2017). Value chain analysis of red pepper: The case of Abeshge District, Guragie Zone, South Ethiopia. International Journal of Environmental Science and Natural Resource, 2(3), 94–101.

Este Woreda Office of Agriculture. (2019). Este Woreda unpublished Report, August 20, 2019.

Geremewe, Y. T. (2019). Factors influencing the intensity of market participation among smallholder wheat (Triticum aestivum) farmers: A case study of Jabi Tehnan District, West Gojam zone, Ethiopia. International Journal of Horticulture, Agriculture and Food Science (IJHAF), 3, 2456–8635.

Hailu, A. (2016). Value chain analysis of vegetables: The case of Ejere Woreda Oromia Region, Ethiopia. MSc Thesis. Haramaya University, Ethiopia.

Heckman, J. (1979). Sample selection bias as a specification error. Econometrica, 47, 153–161. https://doi.org/10.2307/1912352

Jegwe, J., Machethe, C., & Ouma, E. (2010). Impact of transactions cost on the participation of smallholders farmers and intermediaries in banana market in Burundi, Congo and Rewanda. African Journal on Agriculture and Resource Economics, 6, 12–30.

Jemberu, T. (2017). Chickpea market chain analysis in Gondar Zuria woreda of North Gondar Zone, Amhara National Regional State, Ethiopia, Msc Thesis, Haramaya University.

Komarek, A. (2010). The determinants of banana market commercialisation in Western Uganda. African Journal of Agricultural Research, 5(9), 775–784.

Mebratu, T. (2014). Tomato value chain analysis in the Central Rift Valley: The case of Dugda Woreda, East Shoa Zone, Oromia National Regional State. MSc Thesis, Haramaya University, Haramaya, Ethiopia.

Mekasha, C. (2013). Report on chickpea postharvest loss assessment survey-Ethiopia. Ethiopian Institute Of Agricultural Research.

Melaku, T., & Ashalatha, D. (2016). Determinants of teff and wheat market supply in Dendi district, Oromia Region, Ethiopia. International Journal of Current Research, 8, 40716–40721.

Mezgebu, A. (2018). Market chain analysis of wheat: The case of Debre alias District, east Gojam zone, Amhara national Regional State. MSc Thesis, Bahirdar University, Ethiopia.

Mirie, T., & Zemedu, L. (2018). Determinants of market participation and intensity of marketed surplus among teff producers in Dera District of South Gondar Zone, Ethiopia. Journal of Development and Agricultural Economics, 10(10), 359–366.

Setotaw, F., Asnake, F., & Seid, A. (2018). Assessing the competitiveness of smallholders chickpea production in the central highlands of Ethiopia. Ethiopian Journal of Crop Science, 6(2), 51–65.

Sigeli, G., Bett, H., Kibet, L. (2014). Determinants of market participation among small-scale pineapple farmers in Kericho County, Kenya MSc Thesis. Egerton University.

Takele, A. (2010). Analysis of rice profitability and marketing chain in Fogera District, South Gondar Zone, Amhara national Regional State. MSc Thesis. Haramaya University, Ethiopia.

Tobin, J. (1958). Estimation of relationships for limited dependent variable. Econometrica, 46, 24–36. https://doi.org/10.3302/1907382

Urgessa, M. (2011). Market chain analysis of teff and wheat production: The case of halaba special district Southern, Ethiopia. MSc Thesis. Haramaya University, Ethiopia.

Yamane, T. (1967). Statistics: An introductory analysis (2nd ed.). Harper and Row.

How to cite this article: Worku, C., Adugna, M., & Mussa, E. C. (2022). Determinants of market participation and intensity of marketed surplus of smallholder chickpea producers in Este woreda. Legume Science, 4(3), e132. https://doi.org/10.1002/leg3.132