

## Factors Affecting Choice of Livelihood Strategies in Peri-Urban Communities of Hossana Town, Southern Ethiopia

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### Abstract

**Background:** In Ethiopia, the land allocated for urban expansion is taken from farming communities residing in the peripheries of towns and cities. Therefore, this decision strongly affects the livelihood of local communities living at peri-urban areas.

**Objective:** The purpose of this study was to identify the livelihood strategy choices in peri-urban communities of Hossana town, Hadiya Zone, Southern Ethiopia and factors affecting them.

**Materials and Methods:** A household survey research design was conducted using a semi-structured questionnaire by interviewing 369 households. Qualitative and quantitative data were collected from primary and secondary sources. In addition to household interview, focus group discussion, key informant interview, transect walk and personal observation were used as data collection tools. The study employed multivariate probit model to identify factors affecting choice of livelihood strategies in peri-urban local communities.

**Results:** Model results showed that dependency ratio, active labor force in the family, sex of household head, educational levels of household heads, annual total income, market distance, household asset ownership, mass media exposure, achievement motivation, information seeking behavior, distance to public transport, total cultivated land, livestock (other than ox) and extension contact significantly affected choice of livelihood strategies.

**Conclusion:** From the results we can conclude that agriculture, cottage/small scale industries, service, migration and other livelihood strategies are used as sources of income in peri-urban communities of Hossana town and are affected by different socio-economic, demographic, institutional, information and psychological factors. Therefore, it is necessary to give attention to those factors which positively affect agriculture, cottage/small scale industries and service and negatively affect migration and other livelihood strategies.

**Keywords:** Cottage/small scale industry; Migration; Multivariate Probit; Other livelihood strategies; Service

## 1. Introduction

Urban regions worldwide are increasingly facing the challenge of dealing with highly dynamic metropolitan growth and, at the same time, institutional changes like decentralization and globalization. These kinds of changes express themselves most evidently in peri-urban areas, where urban and rural lives meet. These peri-urban areas in particular have been the stage for rapid physical, social and economic transformations, both in developed and developing countries (Woltjer, 2014). Theoretically a peri-urban interface has been highlighted as lying midway between the urban and the rural areas, practically it is difficult to designate the areas. It is a complex region in itself, being transitional in nature and characterized by neglect, especially in the developing countries. Being neither urban nor completely rural, it falls beyond the purview of planners on either side, but continues to host

the spill-over population from the urban vicinity, albeit without necessary infrastructural support. Land in the peri-urban interface is critically important as the region is impacted by a lack of clarity in land use planning and policies, while being a part of the city's hinterland, which has its typical economic as well as ecological role in the sustenance of both the urban and rural zones (Sarkar and Bandyopadhyay, 2013).

Peri-urban areas in Ethiopia, like that of other African countries, are places where much of urban growth is taking place and new urban built-up properties have been formed rapidly. They are geographic places where the competition for land between agriculture and non-agriculture (urban built-up property) is intense leading to the vanishing of rural agricultural land rights. Formal and informal actors play a significant role in the process of converting peri-urban agricultural lands into urban built-



up non-agricultural properties. Therefore, urban built-up properties in the peri-urban areas are the results of land use conversion through the informal and formal channels (Achamyeleh Gashu, 2020).

As demand for land for residential, commercial and manufacturing expansions increased over time, urban centers have been physically expanding their boundaries to surrounding rural and peri-urban areas by including additional land where people did base their lives in agriculture (SDC, 2017). Therefore, peri-urban areas located adjacent to the municipal boundaries have become the most dynamic areas in Ethiopia. They are places where all forms of lively competitions for land are fierce. Due to the rural-urban dichotomy of land holding systems in Ethiopia, urbanization and urban development in peri-urban areas involves land holding right acquisition and transfer issues. In the process of urban expansion and development in Ethiopia, peri-urban landholders or farmers' land rights are forcibly taken by the state and thereafter reallocated to urban residents and private developers through lease agreement. At the same time, the informal acquisition and development of land is a commonly observed phenomenon in the transitional peri-urban areas of Ethiopia (Achamyeleh Gashu, 2020).

On the other hand, Ethiopia's urban expansion and development strategy has been based on the acquisition of land by government from adjacent peri-urban areas. The land in the peri-urban areas is predominantly agricultural in nature. Thus, in the process of urbanization, local peri-urban landholders or indigenous small farmers are largely vulnerable to loss of their land wherein their livelihood is based (Achamyeleh Gashu, 2014b). The peri-urban farming community used to extract resource from their environment and meet their livelihood requirement. This livelihood is totally dependent on the land, which is the main source of livelihood of the peri-urban farming community. However, if the land is alienated to urban built-up activities, the livelihood of the peri-urban farming community may be disturbed (Efa Tadesse and Gutema Imana, 2017).

Unfortunately, peri-urban livelihood issues are hardly addressed in urban development policy making and planning, which rather commonly focus on physical issues such as land use for residential and commercial, housing supply to the urbanities, and infrastructure development to the area and so on (Achamyeleh Gashu, 2014). Moreover, most empirical research concerned with livelihood issues focus on rural farming community and urban areas, i.e., most of the researchers have not addressed peri-urban communities. Thus, it is necessary to answer questions like '*what livelihood strategy choices of peri-urban communities are and what factors do affect them*' and '*whether there are correlations between the strategy choices or not*' in order to generate insights which may help the concerned agencies to design and implement effective urban

development programs and strategies that include peri-urban communities. Therefore, the objective of this study was to identify the livelihood strategy choices of peri-urban communities of Hossana town and factors affecting them.

## 2. Research Methodology

### 2.1. Study Area

The study was carried out at Hossana town administration, the administrative center of Hadiya Zone, Southern Ethiopia. The town is located in Lemo woreda (district) of the Zone located at the distance of 232 km to the South of Addis Ababa and 168 km from Hawassa, the capital of the region (Hossana City Administration, 2017). Total area of Hossana is 40.5 km<sup>2</sup>. The mean annual temperature is 15.1 to 20 °C, mean annual rainfall is 1001 to 1200 mm and the elevation ranges from 2000 to 2500 meters above sea level. It has a latitude and a longitude of 7°30' to 7°35'N and 37°48' to 37°52'E (BoFED, 2018). The administrative division of the town was reformed in 2018/2019 and it is divided into 3 sub towns, 6 urban *kebeles*, 16 *ketenas*, 51 *sefers* and 253 *tabiyas* (HTFEDO, 2019). *Kebele* is the smallest administrative unit, followed by *ketena*, *sefer*, and *tabiya* in an increasing order of size, respectively.

Since the time of its establishment, the population of Hossana town has been increasing rapidly. It is now one of the most populated towns in Ethiopia. For instance, its total population was 13,467 in 1984; 31,701 in 1994 and 69,957 in 2007 (HTFEDO, 2019). In 2017/2018 the total population of the town reached 117,231 with a population density 2,859 person per km<sup>2</sup>. The average family size of the town is 4.0 whereas total number of households is 29,308 (BoFED, 2019). According to a census conducted by the town's administration in 2017/18, the total population of Hossana town is 177,954 (HTFEDO, 2019).

Hossana is one of the oldest towns in southern Ethiopia, which was established in 1906, and undergoes through different administrative and economic systems: feudal, social and capitalist system. Each system had its own impact on growth of the town. Growth of Hossana town was stagnant during the regimes of Emperor Haile Selassie and *Derg*. The change in economic and administrative system in the 1990s resulted in a remarkable growth (Addisyihun Abayneh, 2019). A horizontal growth of the town is mainly in the eastern and north western part with a small expansion towards the southwestern parts relative to other directions because of the landscape of the town. The trend and extent of changes in built-up areas is likely to continue with the rapid increments in the development of infrastructure and population (Tagesse Eromo, 2019).

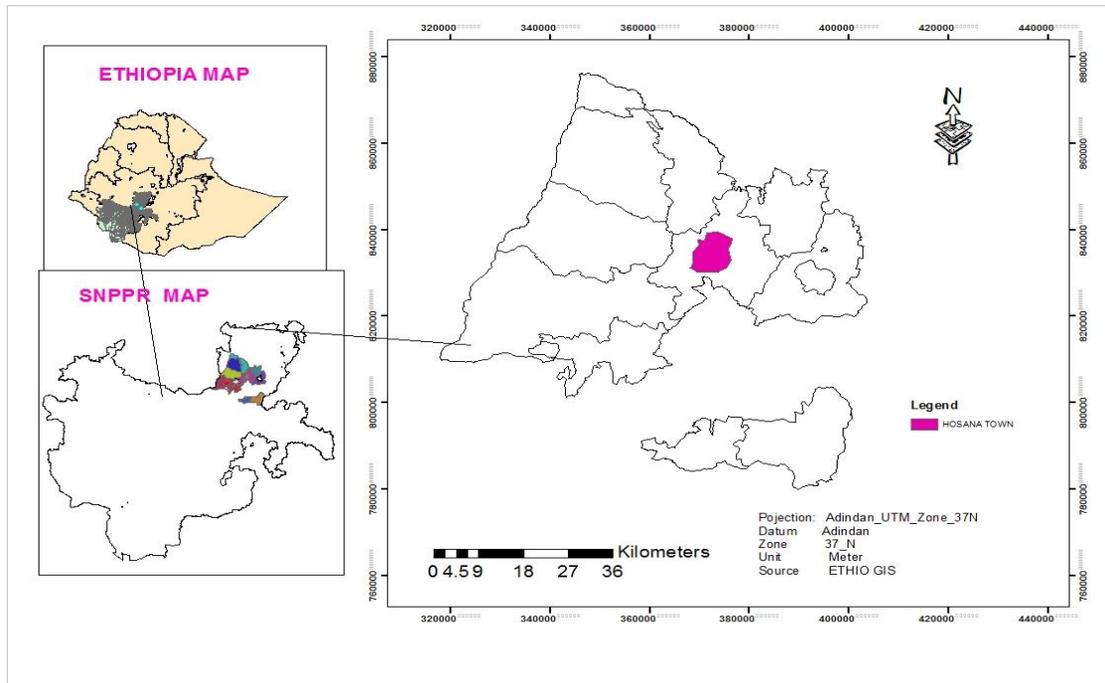


Figure 1. Geographic map of the study area.

## 2.2. Sampling Techniques

Members of the sample population were drawn from expropriated and non-expropriated households in the peripheries of Hossana town. It was hypothesized that the two groups had income and expenditure differences and thus, stratified sampling technique was applied. The study used multi-stage sampling method to select the sample respondents. In the first stage, Hossana town was selected purposively, because of its drastic horizontal urban expansion. Next, seven sample *kebeles* with higher urban expansion towards the peri-urban areas were selected purposively from the town. Additionally, seven sample rural *kebeles* around of the town were also purposively selected. Then households were stratified into expropriated and non-expropriated groups.

Lists of expropriated households in the last five years (2013/14–2017/18) were obtained from the three sub-town municipality offices, and lists of non-expropriated farmers were obtained from kebele offices. Finally, the study selected sample households using a systematic random sampling technique from the respective list of households using probability proportional to sample size (PPS) to both expropriated and non-expropriated households. The sample size was obtained using Cochran (1963) formula to produce a yield of a proportionate sample size.

$$n = \frac{Z^2 pq}{(e)^2}; \quad (1)$$

Where, n = desired sample size;

$Z^2$  = the abscissa of the normal curve that cuts off an area  $\alpha$  at the tails;

e = the desired level of precision;

p = the estimated proportion of an attribute that is present in the population; and

q = 1-p.

In this case, p was the proportion of expropriated households and q was the proportion of non-expropriated households which took 40% and 60% share of the total population respectively.

Therefore, the sample size was:

$$n = \frac{(1.96)^2(0.4)(0.6)}{(0.05)^2} = 369$$

Per the proportion, sample of expropriated and non-expropriated households were 148 and 221 respectively. Prior to conducting the interview, the researcher carried out a pre-test of the interview schedule out of sample *kebeles* in 18 expropriated and 18 non-expropriated households and accordingly made revision and finalized the questionnaire. The researcher also collected primary qualitative and quantitative data through the combination of a household survey, personal observations, key informant interviews, focus group discussions; case story and transect-walk and secondary data using note taking, reviewing and library methods from government reports and publication, books, articles, and reports of related institutions.

### 2.3. Method of Data Analysis

Primary data were collected from sample households and analyzed qualitatively and quantitatively. The quantitative data were analyzed using both descriptive statistics and econometric methods.

#### 2.3.1. Multivariate probit (MVP) model

Social studies often yield binary or dichotomous data due to the lack of adequate and direct continuous measurements. Indeed, correlated dichotomous data arise in many settings, ranging from measurements of random cross-section subjects to repeated measurements in longitudinal studies. The MVP model is a popular method in econometrics for analyzing this kind of data. This model is described in terms of a correlated multivariate normal distribution of the underlying latent variables that are manifested as discrete variables through a threshold specification, and hence allows the flexible modeling of the correlation structure and easy interpretation of the parameters (Song and Lee, 2005).

Multinomial choices of individuals are likely to be correlated. Nonetheless, econometric models for this phenomenon are scarce (Bel and Paap, 2014). And multinomial models do not show multicollinearity between multinomial choices of individuals. Moreover, individuals cannot choose more than one option. Thus, it was necessary to use a model appropriate for analyzing dichotomous data. Therefore, MVP model was used to identify determinants of livelihood strategy choice of peri-urban communities. The other alternatives for MVP are conditional logit, mixed and multivariate tobit models. Conditional logit employs choice specific data whereas mixed logit is used when the data are mixed (both choice specific and chooser specific). Since the data used in this study were chooser specific (vary across individuals), these models were not appropriate. On the other hand, multivariate tobit model is appropriate to show not only the probability but also the intensity of choices. But the concern of this study was to show the probability of different livelihood strategy choices.

#### 2.3.2. Model specification- according to Greene (2012)

Consider the M-equation multivariate probit model: The model is characterized, for each observation, by  $M$  pairs of equations, one describing each latent dependent variable and the other describing the corresponding binary observed outcome.

$$\begin{aligned} y_m^* &= x_m' \beta_m + \varepsilon_m, y_m = \text{lify}_m^* > 0, \text{otherwise}, m = 1, \dots, M, \\ E[\varepsilon_m | x_1, \dots, x_M] &= 0, \\ \text{Var}[\varepsilon_m | x_1, \dots, x_M] &= 1, \\ \text{Cov}[\varepsilon_j, \varepsilon_m | x_1, \dots, x_M] &= \rho_{jm}, \\ (\varepsilon_1, \dots, \varepsilon_M) &\sim NM[0, R] \end{aligned} \quad (2)$$

$\varepsilon_m, m = 1, \dots, M$ , are error terms distributed as multivariate normal, each with a mean of zero, and variance-covariance matrix  $V$ , where  $V$  has values of 1 on the leading diagonal and correlations  $\rho_{jm} = \rho_{mj}$  as off-diagonal elements for  $j, m = 1, \dots, M$  and  $j \neq m$ .

The joint probabilities of the observed events,  $[y_{i1}, y_{i2}, \dots, y_{iM} | x_{i1}, x_{i2}, \dots, x_{iM}] = 1, \dots, n$  that form the basis for the log-likelihood function, are the M-variate normal probabilities,

$$L_i = \Phi_M(q_{i1} x_{i1}' \beta_1, \dots, q_{iM} x_{iM}' \beta_M, R^*), \quad (3)$$

Where,  $q_{im} = 2y_{im} - 1$ ,

$$R_{jm}^* = q_{ij} q_{im} \rho_{jm}.$$

**Testing for multicollinearity:** Prior to conducting econometric analysis, it was imperative to check whether there was multicollinearity among the continuous explanatory variables and verify the degree of associations among dummy explanatory variables. Therefore, in order to see the degree of association between dummy or discrete variables contingency coefficient was computed and VIF was done whether there was multicollinearity between continuous explanatory variables or not.

**Dependent variable of the model:** The household livelihood strategy choices, which was the dependent variable for multivariate probit analysis, was a polychotomous variable. It was represented in the model as:

**Agriculture:** Income from agriculture = 1, 0 otherwise.

**Cottage or small scale industry:** Income from cottage or small scale industry = 1, 0 otherwise.

**Service:** Income from service = 1, 0 otherwise.

**Other livelihood strategies:** Income from remittance from other relatives, selling household asset and compensation = 1, 0 otherwise.

Table 1. The independent variables of the model.

Variable	Expected sign				
	Agri.	Indus.	Serv.	Migr.	Other
Age (years) is a continuous variable peculiar to the household head.	+	-	-	-	+
Dependency ratio (%) is a continuous variable and refers to the ratio of children under age 15 and old age of above 64 to the family member between age of 15 and 64.	+	-	-	-	+
Active labor force in the family (no.) is a continuous variable and refers to the number of family members between age of 15 and 64.	+	+	+	+	-
Sex is a dummy variable that takes the value 0 for female and 1 otherwise.	+	+	+	+	-
Educational level of the household head (years) is a continuous variable taking value of years of schooling.	+	+	+	-	-
Credit use: is a dummy variable taking a value of 1 if the household uses credit, 0 otherwise.	+	+	+	-	-
Total income (birr) is a continuous variable and refers income earned from on farm, off farm and nonfarm activities.	+	+	+	-	-
Health of the household head is a dummy variable taking a value of 1 if the household head is healthy, 0 otherwise.	+	+	+	-	-
Cosmopolitanism is a dummy variable taking a value of 1 if the household head is cosmopolite, 0 otherwise.	+	+	+	-	-
Market distance (kms) is a continuous variable, which refers to the distance that the household's home is away from the surrounding area local market.	+	-	-	+	+
Job opportunity is a dummy variable taking a value of 1 if the household has formal and informal job opportunity, 0 otherwise.	-	+	+	-	-
Household asset ownership is a continuous variable and refers the assets of the household, other than livestock and cultivated land, such as house, vehicles, bicycle, cart, tree plants, <i>enset</i> , <i>chat</i> and other durable goods valued in birr.	+	+	+	-	-
Mass media exposure is a dummy variable taking a value of 1 if the household head has exposure to different media like radio, television, newspaper, magazine, brochure, and social electronic media, 0 otherwise.	+	+	+	-	-
Achievement motivation is a dummy variable taking a value of 1 if the household head has achievement motivation, 0 otherwise.	+	+	+	-	-
Information seeking behavior is a dummy variable taking a value of 1 if the household head has information seeking behavior, 0 otherwise.	+	+	+	-	-
Distance to public transport (km) is a continuous variable, which refers to the amount of kilometer that the household's home is away from the surrounding area public transport.	+	-	-	+	+
Cash saving practice is a dummy variable taking a value of 1 if the household practices saving, 0 otherwise.	+	+	+	-	-
Membership to cooperatives is a dummy variable of which the value is 1 if the household head is member of cooperative and 0, otherwise.	+	+	+	-	-
Road access is a dummy variable taking a value of 1 if the household has access to road in its locality, 0 otherwise.	+	+	+	-	-
Total cultivated land (ha) is a continuous variable.	+	+	+	-	-
Livestock owned other than ox (TLU) is a continuous variable and indicates the livestock size excluding ox.	+	+	+	-	-
Oxen ownership (no.) is a continuous variable.	+	+	+	-	-
Input use is a dummy variable and takes a value of 1 if they are users and 0, otherwise. This refers to use of different agricultural inputs by the farming households.	+	+	+	-	-
Extension contact (no.) is a continuous variable and is the number of times the household head contact with the extension personnel during the immediate last crop year.	+	+	+	-	-

Notes: *Agri.* = Agriculture; *Indus.* = Cottage/small scale industry; *Serv.* = Service; and *Migr.* = Migration.

### 3. Results and Discussion

**Testing for multicollinearity:** Before fitting the model, the problem of multicollinearity among explanatory variables was checked by using variance inflation factor (VIF) and Pearson correlation matrix. The problem of multicollinearity was not serious among variables because of VIF value less than 10 and tolerance less than 1. Similarly, multicollinearity was not a serious problem between dummy variables as the value of contingency coefficient less than 0.5 assumes weak association between variables. Therefore, all of the variables were included in the model.

#### 3.1. Livelihood Strategy Choices of Peri-urban Communities

The livelihood strategies pursued by peri-urban communities of the study area were identified as agriculture, cottage/small scale industries, service, migration and others. These livelihood strategies were used in the MVP model and are presented in Table 2. According to the table, the  $\chi^2$ -value for the distribution of cottage/small scale industry shows that there was no significant difference between expropriated and non-expropriated households. But the  $\chi^2$ -values between the two groups for the rest four livelihood strategies show significant differences.

Table 2. Descriptive statistics of livelihood strategies used in the MVP model (N = 369).

Livelihood strategy	Description	Total sample	Expropriated	Non-expropriated	$\chi^2$ value
		(N = 369)	(N = 148)	(N = 221)	
		Frequency (%)	Frequency (%)	Frequency (%)	
Agriculture	Yes	354(95.90)	133(89.90)	221(100.0)	23.348***
	No	15(4.10)	15(10.10)	0(0.0)	
Cottage/small scale industry	Yes	20(5.40)	10(6.80)	10(4.52)	0.8613
	No	349(94.60)	138(93.20)	211(95.48)	
Service	Yes	212(57.50)	98(66.20)	114(51.60)	7.764***
	No	157(42.50)	50(33.80)	107(48.40)	
Migration	Yes	59(16.0)	31(20.90)	28(12.70)	4.52**
	No	310(84.0)	117(79.10)	193(87.30)	
Other livelihood strategies	Yes	77(20.90)	51(34.50)	26(11.80)	27.648***
	No	292(79.10)	97(65.50)	195(88.20)	

#### 3.2. Econometric Results of MVP Model

The MVP model results showing the marginal effects of explanatory variables are presented in Table 3 below. The Wald test ( $\chi^2$  (115) = 210.41,  $P > \chi^2 = 0.000$ ) was significant at 1% significant level. This indicates that the subset of coefficients of the model was jointly significant and that the explanatory power of the factors included in the model were satisfactory; thus, the MVP model fitted the data reasonably well. The null hypothesis for test of independence was rejected for all livelihood choices, as the likelihood ratio test ( $\chi^2$  (10) = 32.656,  $P > \chi^2 = 0.000$ ) of independence of error terms was significant at 1% significant level. Thus, use of MVP was justified indicating that the model was capturing wider effects than the single equation-probit model. Thus, the equations were inter-dependent. This verifies that separate estimation of choice decision of the livelihood strategies was biased, and the decisions to choose the five livelihood strategies were interdependent decisions.

Similarly, most of pair wise correlation coefficients (Rho) were significant. Rho21 (the correlation between cottage/small scale industry and agriculture) and rho54 (the correlation between other livelihood strategy and migration) were positively correlated and significant at less than 10% and 1% probability levels, respectively.

Rho41 (the correlation between migration and agriculture), rho51 (the correlation between other livelihood strategy and agriculture), rho52 (the correlation between other livelihood strategy and cottage/small scale industry), and rho53 (the correlation between other livelihood strategy and service) were negatively interdependent and significant at less than 1%, 5%, 1% and 1% probability levels, respectively. It indicates that households using cottage/small scale industry as a livelihood strategy were more likely to use agriculture as a livelihood strategy (rho21). Likewise, households choosing other livelihood strategies were more likely to diversify it with migration (rho54). However, households using migration as their income source were less likely to pursue agriculture (rho41); and households using other livelihood strategy were less likely to diversify it with agriculture (rho51), cottage/small scale industry (rho52) and service (rho53). It also indicates that two sets of livelihood options (cottage/small scale industry with agriculture and other livelihood strategy with migration) were complimentary to each other; while migration with agriculture and other livelihood strategy with agriculture, cottage/small scale industry and service were competitive to each other. This implies that households use migration as a substitute to agriculture and use other livelihood strategies as a substitute to agriculture, cottage/small scale

industry and service. The possible justification for competitive relation of other livelihood strategies with agriculture, cottage/small scale industry and service is that most of the time households use other livelihood strategies like selling household asset and remittance from other relatives when they do not have income from other sources.

The probability that households choose agriculture, cottage/small scale industry, service, migration and other as a livelihood strategy is 95.87%, 5.36%, 56.87%, 15.46% and 20.96%, respectively. This indicates that the probability of choosing agriculture was the highest (95.87%) and contrary to that the likelihood to choose cottage/small scale industry was the least of all (5.36%). This is obvious that agriculture is common in peri-urban and rural areas, and thus it takes the highest share. Cottage/small scale industries including construction, mining and handicraft were insignificant in the study area. Service (56.87% probability to be chosen) is common for peri-urban and rural residents. As in the study area migration to Republic of South Africa is common, migration took 15.46% probability to be chosen while other livelihood strategies including remittance (mostly from migrated) relatives and selling household asset took the probability of 20.96% to be chosen.

The joint probabilities of success or failure of choosing five livelihood strategies suggests that the likelihood of households to jointly choose the five strategies was low which was 0.056% and the failure to jointly choose them was 0.268%, i.e., they were less likely to succeed and fail to jointly choose the five strategies. The result in Table 3 reveals that out of 24 explanatory variables which can affect livelihood strategy choice, 14 of them namely dependency ratio, active labor force in the family, sex of household head, educational level of household head, annual total income, market distance, household asset ownership, mass media exposure, achievement motivation, information seeking behavior, distance to public transport, total cultivated land, livestock (other than ox) and extension contact had significant effect. Five explanatory variables were significant at one livelihood strategy choice; six explanatory variables were significant at two livelihood strategy choices; and three explanatory variables were significant at three livelihood strategy choices. Agriculture, cottage/small scale industry, service, migration and other livelihood strategies were significantly affected by four, seven, six, four and five explanatory variables at different probability levels, respectively. Three variables (credit use, job opportunity and road access) were dropped since they predict success on agriculture perfectly.

**Dependency ratio (DepRatio):** The MVP regression output shows that dependency ratio was found as one of the influential factors of livelihood strategy choice which affected the probability of choosing agriculture and cottage/small scale industry positively at less than 5% and

1% probability levels, respectively. Other factors kept constant, for a one unit increase in dependency ratio, there were a 0.1% and a 0.02% increases in the predicted value of households' livelihood strategy choice of agriculture and cottage/small scale industry, respectively. The positive association of dependency ratio with agriculture could be due to the fact that households with more dependent members do not have extra labor to share for other livelihood strategies. A similar finding by Adugna Eneyew and Wegayehu Bekele (2012) revealed that dependency ratio found to have a significant positive correlation with choice of agriculture and nonfarm strategy. Misganaw Teshager *et al.* (2019) revealed opposite finding that households with more dependents were less likely to choose on-farm activities and also Gebrehiwot Woldegebrial *et al.* (2018) found that households with high dependency ratio had low probability level to participate in off-farm and non-farm income-generating livelihood diversification strategies.

On the other side, positive association between dependency ratio and cottage/small scale industry could be due to households with dependent members above 64 tend to practice cottage industry like traditional handicraft, household utensils etc. at their pension age. This finding is in line with Misganaw Teshager *et al.* (2019) that households with more dependents tended to choose non-farm livelihood activities.

**Active labor force in the family (ActLab):** The model result indicates that active labor force in the family had been found as one among the most influential factors of livelihood strategy choice. It had a positive relationship with a probability of choosing agriculture and cottage/small scale industry and significant at less than 5% and 10% probability levels, respectively. *Ceteris paribus*, for a one unit increase in active labor force, there were a 4.7% and a 0.6% increases in choosing agriculture and cottage/small scale industry, respectively. This result implies that households with more active labor forces had extra labor force to share for agriculture and cottage/small scale industry like mining and construction. On contrary, the result by Xu *et al.* (2015) suggests that dependence on agriculture is negatively associated with the number of laborers.

**Sex of household head (SexHHH):** This variable had a negative relationship with the probability of choosing cottage/small scale industry and significant at less than 10% probability level. Males were taken as the reference category and the negative coefficient of the analysis indicates the relationship with males. Therefore, other factors being constant, for the male headed household, the choice for cottage/small scale industry was decreased by 3.8% as compared to female headed households. This implies that female headed households were more likely to practice cottage/small scale industry than their male counterparts. An empirical study conducted in Sululta

district by Dereje Tesema (2018) revealed that females participate in non-farm livelihood activities 28 times more than males. Where there is male labor constraint, females share cropped their land and more engage in non-farm living. In addition to this, traditional brewing and handcraft absorbs large labor of females in the study area.

**Educational level of household head (EduLev):** It was found that educational level of the household head had a negative and significant effect on the probability of choosing migration at less than 1% probability level. A one year increase in level of education was associated with a 1.2% decrease in the predicted value of choosing migration, holding other variables constant. This finding confirms the assumption that more educated household heads do not let their family members to migrate to other places in the country as well as to abroad. Paulos Lukas and Thomas Dana (2017) also found that more educated farmers can better access better means of livelihood than illiterate in urban expansion.

**Annual total income (TotIncome):** From Table 3, the result of the econometric analysis shows that annual total income positively influenced both the probabilities of choosing service and migration at less than 1% probability level each. For a 1 birr increase in annual total income, there were a 51.2% and a 10.2% increases in the choice of service and migration, respectively, *ceteris paribus*. From the result, it is indicative that households with better income could have initial capital to be engaged in different service providing activities like trade, transport, hotel, etc. Likewise, households with better income could invest to send their family member abroad to better economic prospects. This result is not in line with Misganaw Teshager *et al.* (2019) that household income had a significant negative influence on non-farm livelihood activities.

**Market distance (MarkDist):** It was found that market distance was among the most influential factors that affected the livelihood strategy choice. It affected the likelihood of choosing cottage/small scale industry negatively at less than 5% probability level while it affected the probability of choosing migration and other livelihood strategies positively at less than 10% probability level each. Keeping other things in the model constant, for a 1km increase in market distance, there were a 1.5% decrease in choosing cottage/small scale industry, a 3.1% and a 3.4% increase in choice of migration and other livelihood strategies, respectively. As cottage industry is based on market access, it shows a negative association whereas households with not liaison to market access prefer migration and other livelihood strategies like remittance and selling household assets.

From the result, we could suggest that the livelihood strategy choices of the households farther from market are limited to the choices like migration, remittance and selling household assets as they do not have incentive to choose different service giving activities and cottage industry due to distance from market. Previous studies, for example Geremew Worku *et al.* (2017), Bereket Tufo *et al.* (2018), Dereje Tesema (2018), Gebrehiwot Woldegebrail *et al.* (2018) and Tariku Lorato (2019) show similar results that a household residing in far distance to market are less likely to diversify the livelihood strategies into different combination of income sources.

**Household asset ownership (HHAsset):** The result shows that household asset ownership positively affected the likelihood of choosing service and other livelihood strategies at less than 10% and 1% levels, respectively. Accordingly, a one unit increase in household asset ownership was associated with a 5.8% and a 5.0% increases in the choices for service and other livelihood strategies, *ceteris paribus*. This finding confirms the assumption that asset was necessary and complementary to service and other livelihood strategies like selling household assets.

**Mass media exposure (MassMed):** It was found that mass media exposure had a negative and significant effect on the probability of choosing other livelihood strategies at less than 5% probability level. The negative coefficient implies that a predicted value of choice for other livelihood strategies was decreased by 19.1% in households having mass media exposure than those not having, keeping other factors constant. In other words, households which hadn't exposure to mass media preferred other livelihood strategies, i.e, remittance and selling household assets.

**Achievement motivation (AchievMot):** In table 3, the model result shows that achievement motivation was one of the most influential factors of livelihood strategy choice that affected the probability of choosing agriculture negatively at less than 10% probability level whereas it affected the likelihood of choosing cottage/small scale industry and service positively at less than 10% and 1% probability levels, respectively. Keeping other things in the model constant, for household heads having achievement motivation, there were a 9.0% decrease, a 2.1% increase and also a 32.6% increase in choice of agriculture, cottage/small scale industry and service, respectively as compared to those household heads not having achievement motivation. The possible justification for this finding could be that achievement motivation might be the reason to prefer cottage/small scale industry and service to agriculture.

Table 3. Multivariate probit model result.

Variable	Livelihood strategy choice				
	Agriculture (dF/dx)	Cottage industry (dF/dx)	Service (dF/dx)	Migration (dF/dx)	Other (dF/dx)
AgeHHH	-0.0003 (0.002)	-0.001(0.001)	0.001(0.003)	-0.002(0.002)	-0.001(0.002)
DepRatio	0.001(0.0005)**	0.0002(0.0001)***	-0.001(0.001)	-0.0004(0.0004)	-0.0001(0.0004)
ActLab	0.047(0.018)**	0.006(0.004)*	-0.022(0.021)	-0.020(0.013)	-0.010(0.014)
SexHHH	-0.017(0.041)	-0.038(0.033)*	-0.102(0.079)	0.030(0.043)	-0.038(0.063)
EduLev	-0.002(0.004)	0.0002(0.001)	0.010(0.008)	-0.012(0.004)***	0.002(0.005)
CredUse	Variable dropped	0.025(0.028)	-0.099(0.095)	-0.026(0.059)	0.036(0.072)
TotIncome	-0.004(0.037)	0.017(0.013)	0.512(0.078)***	0.102(0.038)***	-0.057(0.044)
HealthHHH	-0.024(0.050)	0.005(0.014)	-0.181(0.097)	-0.026(0.070)	-0.039(0.075)
Cosmoplite	-0.038(0.039)	0.009(0.011)	0.074(0.089)	0.055(0.043)	-0.101(0.069)
MarkDist	-0.022(0.024)	-0.015(0.007)**	0.034(0.028)	0.031(0.018)*	0.034(0.020)*
JobOppo	Variable dropped	-0.021(0.013)	0.084(0.075)	-0.039(0.046)	-0.071(0.050)
HHAsset	-0.020(0.020)	-0.009(0.006)	0.058(0.030)*	0.023(0.017)	0.050(0.019)***
MassMed	-0.045(0.040)	0.013(0.010)	0.119(0.127)	0.053(0.058)	-0.191(0.108)**
AchievMot	-0.090(0.040)*	0.021(0.011)*	0.326(0.113)***	-0.007(0.070)	-0.062(0.087)
InfoSeek	0.122(0.083)*	-0.017(0.019)	-0.185(0.085)**	0.038(0.048)	0.102(0.051)*
DistPubTran	0.033(0.033)	0.014(0.007)**	0.008(0.035)	0.001(0.023)	0.005(0.025)
CashSaving	0.024(0.036)	-0.018(0.013)	0.124(0.076)	-0.014(0.044)	0.019(0.053)
MembCoop	-0.028(0.051)	0.004(0.015)	-0.108(0.079)	0.032(0.049)	0.039(0.057)
RoadAcc	Variable dropped	0.003(0.013)	0.043(0.079)	0.036(0.047)	0.005(0.055)
TotCult	-	0.003(0.008)	-0.287(0.058)***	-0.058(0.033)*	-0.029(0.040)
LivOtherOx	-	0.001(0.004)	0.072(0.026)***	0.009(0.014)	-0.002(0.018)
OxenOwn	-	-0.007(0.007)	-0.041(0.041)	-0.003(0.027)	-0.035(0.036)
InputUse	-	-0.013(0.022)	0.058(0.125)	-0.042(0.068)	-0.120(0.083)
ExtensCont	-	-0.007(0.003)**	-0.009(0.010)	0.002(0.006)	0.017(0.007)**
Predicted probability	95.87%	5.36%	56.87%	15.46%	20.96%
Joint probability of success	0.056%	Joint probability of failure	0.268%	Log likelihood	-552.144
Number of draws (#)	5	Number of observation	366	Wald chi2(115)	210.41
Prob> $\chi^2$	0.000				
	Rho1	Rho2	Rrho3	Rho4	Rho5
Rho1	1				
Rho2	0.386(0.202)*	1			
Rho3	-	-	1		
Rho4	-0.449(0.134)***	-	-	1	
Rho5	-0.386(0.149)**	-0.353(0.165)***	-0.317(0.100)***	0.345(0.106)***	1
Likelihood ratio test of rho21 = rho31 = rho41 = rho51 = rho32 = rho42 = rho52 = rho43 = rho53 = rho54 = 0:					
$\chi^2$ (10)	32.656	Prob> $\chi^2$	0.000		

Note: \*\*\*, \*\*, and \* represent 1%, 5% and 10% level of significance. The figures in the parentheses refer to the standard error. The variables which predict success perfectly are dropped.

**Information seeking behavior (InfoSeek):** This was the other most influential factor in the choice of livelihood strategy in the study area. The model output shows that a negative and significant association between information seeking behavior and the probability of choosing service, and a negative and significant associations between information seeking behavior and the likelihood of choosing agriculture and other livelihood strategies. The results were significant at less than 5% probability level for service and significant at less than 10% probability level for agriculture and other livelihood strategies each. A predicted value of choosing service was 18.5% lower and choosing agriculture and other livelihood strategies were 12.2% and 10.2% higher, respectively, for household heads having information seeking behavior than those not having, holding other factors constant. This finding implies that household heads with information seeking behavior preferred agriculture and other livelihood strategy (remittance and selling household asset) to service.

**Distance to public transport (DistPubTran):** This variable had a positive relationship with the likelihood of choosing cottage/small scale industry and it was significant at less than 5% probability level. For a 1km increase in distance to public transport, there was a 1.4% increase in the choice of cottage industry, keeping other factors constant. This could be due to the farther households from public transport might choose small scale industry like quarrying.

**Total cultivated land (TotCult):** The multivariate probit regression result indicates that total cultivated land was among the influential factors of livelihood strategy choice that affected the probability of choosing service and migration negatively at less than 1% and 10% probability levels, respectively. Holding other factors in the model constant, for a 1ha increase in total cultivated land, there were a 28.7% and a 5.8% decreases in choosing service and migration, respectively. This result is in line with the assumption that households with larger cultivated do not tend to diversify their livelihood with non-farm activities. This finding is consistent with Mathewos Mentamo and Negatu Regassa (2016), Agidew Abebe (2018) and Bereket Tufo *et al.* (2018) that found an inverse relationship between land ownership and livelihood diversification. Dereje Tufo (2018) and Kassahun Tassie (2018) also found that an increase in size of landholdings decreases the likelihood of engaging in multiple livelihood activities. Contrary to these, Gebrehiwot Woldegebrail *et al.* (2018) and Tagesse Abo (2018) found that households with larger area of land for cultivation tend to diversify their livelihood more.

**Livestock owned (other than ox) (LivOtherOx):** Livestock owned (other than ox) was found to affect the

likelihood of choosing service positively at less than 1% probability level. A 1-TLU increase in livestock ownership (other than ox) was associated with a 7.2% increase in the predicted value of choosing service, holding other variables constant. The positive relationship implies that livestock holding excluding oxen for draft purpose help households to diversify their income portfolios with service. Households with no oxen could not be engaged in farming, thus they might tend to diversify their income sources with non-farm activities. Misganaw Teshager *et al.* (2019) reported a similar result that livestock holding had a significant positive effect on the choice of non-farm livelihood activities. This result is not in line with Tagesse Abo (2018) that number of livestock (excluding oxen) owned by a household influenced the probability of diversifying livelihood strategies negatively. Agidew Abebe (2018), Bereket Tufo *et al.* (2018), Gebrehiwot Woldegebrail *et al.* (2018) and Tariku Lorato (2019) also found that a household having larger size of livestock are less likely to diversify the livelihood strategies.

**Extension contact (ExtensCont):** This variable was found among the influential determinants of livelihood strategy choices that affected the probability of choosing cottage/small scale industry negatively at less than 5% probability level and affected the likelihood of choosing other livelihood strategies positively at 5% probability level. Holding other variables in the model constant, for a one unit increase in the frequency of extension contact, there were a 0.7% decrease and 1.7% increase in choosing cottage/small scale industry and other livelihood strategies, respectively. In other words, households with more frequency of extension contact did not diversify their livelihood strategy with industry, but pursue other livelihood strategies to increase their income.

#### 4. Conclusion and Recommendation

The results of the study have demonstrated that peri-urban households with more dependent members, active labor forces and information seeking behavior tended to choose agriculture as a source of income. Cottage/small scale industry was likely to be chosen by households having more dependent members, active labor forces, achievement motivation and which were far from public transport. Service as source of income was chosen by those households with higher income, household asset, achievement motivation and livestock ownership. Households which had higher income and those were far from market were likely to choose migration as livelihood strategy. Other livelihood strategies like remittance and selling household asset were income sources for those households far from market, had more household asset, had information seeking behavior and had higher frequency of extension contact. On the other hand, households with more achievement motivation did not

choose agriculture as income source; and households headed by male, far from market and higher frequency of extension contact were not likely to choose cottage/small scale industry as livelihood strategy. Households which had information seeking behavior and large cultivated land were unlikely to choose service as their income source. Migration as source of income was not preferred by households with educated head and having large cultivated land. Households having mass media exposure did not choose other livelihood strategies like remittance and selling household assets. The results of this study imply that peri-urban communities need strong attention of urban policy makers. Therefore, it is recommended for peri-urban community that awareness for appropriate and effective use of human and financial resources should be created; participation of women in all sectors, development of industry and service sectors integrated with market access and other social facilities should be achieved; and the importance of agricultural production should be considered and thus shrinkage of cultivation land should be reduced. Further studies with other peri-urban issues should be conducted to address peri-urban problems well.

## 5. Acknowledgements

The authors thank Wachemo and Wolaita Sodo Universities for funding the research.

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