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Livelihood diversification in the Boricha district of Sidama Region, Ethiopia: Strategies and determinants

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Abstract

Livelihood diversification is essential to reduce risks as well as supplement the unstable scanty agricultural-based livelihood activities. This study aimed to examine farmer's main livelihood diversification strategies and their determinants in Boricha district of Sidama Region, Ethiopia. To collect primary data a multi-stage sampling procedure were applied and 286 sample households were selected through randomly sampling techniques. Data were collected through surveys, interviews, focus groups, observations, and reports. The collected data were analyzed by using descriptive statistics and multinomial logit model. The descriptive findings reveal that more than half of sampled households (50%) combine on-farm with off-farm and non-farm livelihood activities. The result further showed that households involved in off-farm and non-farm activities were not taken as the primary sources of livelihoods, but taken as an alternative means of income generation in additional to on-farm livelihood activities. The result from the multinomial logit regression showed that younger household heads, larger family sizes, smaller land sizes, and better credit access were positively associated with diversification, whereas livestock ownership, market distance, and extension services reduced the likelihood of diversification. The study suggests that Policies should enhance training, credit access, rural education, vocational training, extension services, infrastructure, and smallholder support to promote sustainable livelihood diversification.

Keywords: *Determinants, Household, Livelihood diversification, Multinomial Logit Model, Boricha.*

1. INTRODUCTION

Livelihood diversification is pivotal for poverty reduction, food security, and global welfare of rural rain-fed communities (Abebe et al., 2021; Asfaw et al., 2017; Barrett et al., 2001a; Jabbar et al., 2023; Kassie et al., 2017). The increasing global population poses challenges, with approximately 124 million people facing a food security crisis in 2017 (Food Security Information Network (FSIN); 2018 cited in Kassie et al., 2017). Despite a growing awareness of these challenges, 805 million people still experience food insecurity crisis (Huseynov, 2019).

In Africa, where 65% of the labor force engages in the agricultural sector(Li & Wang, 2016), the impact of climate change and population growth on traditional production systems has been significant(Alobo Loison, 2015; Chauvin et al., 2012; CLOVER, 2003). Livelihood diversification emerges as a key strategy for poverty reduction, incorporating various economic activities, including off-farm pursuits (Idowu, 2014). Despite its crucial role, the agricultural sector in Sub-Saharan Africa faces challenges, including small farm size, loss of soil fertility, climate change, unable to feed growing population and uncertain policy environment (Iiyama et al., 2018; M. Kassie et al., 2015).

Ethiopia's agricultural sector, contributing 46% to GDP and employing 85% of the population, grapples with food security risks due to rain-fed subsistence production (FAO, 2019; WFP, 2019). Moreover, rural households in Ethiopia face substantial income shocks due to climate change (Endris & Kassegn, 2021). Over three million people require humanitarian assistance annually (SIDA, 2015). To reverse the existing rural shocks, the Ethiopian government has implemented various agricultural development strategies (Asfaw et al., 2017; Endiris et al., 2021; Kassie et al., 2017). However, low agricultural productivity persists due to insufficient focus on non-agricultural livelihoods (Kassie et al., 2017).

Rural households in Ethiopia have had only limited economic opportunities, so they employ various coping mechanisms, including diversifying their livelihoods, seeking food aid, and liquidating assets (Asfaw et al., 2017; Barrett et al., 2001b; Bezu et al., 2012). Similarly, in Sidama region, environmental degradation and soil erosion intensify challenges, leading households to adopt various livelihood diversification strategies (Matewos, 20192019; WFP, 2019; Boricha Woreda Rural and Development Office, 2023).

Several empirical studies have examined the factors influencing farm households to diversify their livelihoods and highlight the interplay of demographic, educational, and resource-based factors in shaping household livelihood strategies. Age has been identified as a negative determinant, with older households less likely to diversify their income sources (Adeoye et al., 2019; Admasu et al., 2022a; Khatiwada et al., 2017). In contrast, larger family sizes encourage diversification, particularly a shift from on-farm to off-farm activities(Admasu et al., 2022; Khatiwada et al., 2017). Education plays a nuanced role, where higher levels reduce overall diversification but increase engagement in off-farm livelihoods(Admasu et al., 2022; Asfaw et al., 2017; Dufera et al., 2023; Khatiwada et al., 2017; Musumba et al., 2022; Rahman & Akter, 2014; Seng, 2015; Tsiboe et al., 2016). Livestock ownership has positively supported diversification by fulfilling household needs and contributing to income (Admasu et al., 2022a; Brüssow et al., 2017; Khatiwada et al., 2017; Rahman & Akter, 2014). Land size also influences livelihood choices, with smaller holdings driving diversification while larger holdings encourage specialization in farming(Asfaw et al., 2017; Bezu et al., 2012; Dufera et al., 2023; Khatiwada et al., 2017; Meena et al., 2017; Owusu et al., 2011; Rahman & Akter, 2014; Romeo et al., 2016; Scharf & Rahut, 2014; Seng, 2015; Tran et al., 2016; Tsiboe et al., 2016; Wu et al., 2024). Additionally, access to extension services enhances agricultural productivity but can reduce off-farm diversification(Endiris et al., 2021). Empirical studies further noted that market proximity, credit access, and income levels influence livelihood diversification (Admasu et al., 2022a; Akaakohol & Aye, 2014; Dufera et al., 2023).

While recognizing the importance of livelihood diversification as a copying strategy in developing countries including Ethiopia, a critical research gap exists in understanding specific factors that determine household engagement in the Sidama region, especially in

Boricha Woreda. This study, therefore addresses this gap by identifying and evaluating existing livelihood diversification activities and the factors that determine them.

This study's rationale lies in addressing the identified research gap and offering insights into the factors determining livelihood diversification activities in Boricha Woreda of the Sidama region in Ethiopia. Understanding these factors is crucial for policymakers and development practitioners to formulate effective strategies. Thus, this study aims to address this gap by exploring the following research questions:

- What are the existing farmers' livelihood diversification strategies in Boricha Woreda? and
- What factors determine rural livelihood diversification strategies in the study area?

So as to address the above research questions the study employed a mixed research design, using survey method and in-depth interviews and focus group discussions with farm household from rural Districts of Boricha of Sidama Region. Data was analyzed using quantitative analysis, and findings were presented using descriptive statistics and multinominal logistic regression.

This article is structured as follows. The second section describe the methods. The third section discusses the main empirical results, and the fourth section concludes and discusses policy implications.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

Boricha Woreda is one of the administrative unit of Sidama National Regional State in the country. It is located at about 337 km from Addis Abeba and Hawassa City, respectively. Geographically, located at 6°49'21" to 6°28'12"N Latitude and 38°35'24" to 38°50'24"E Longitude. Relatively, Boricha Woreda the border of South by Darara, North by Hawassa Zuria, West by Bilate Zuria and East by Shebedino Woreda, (Boricha Woreda Road and Transport Office, 2023).

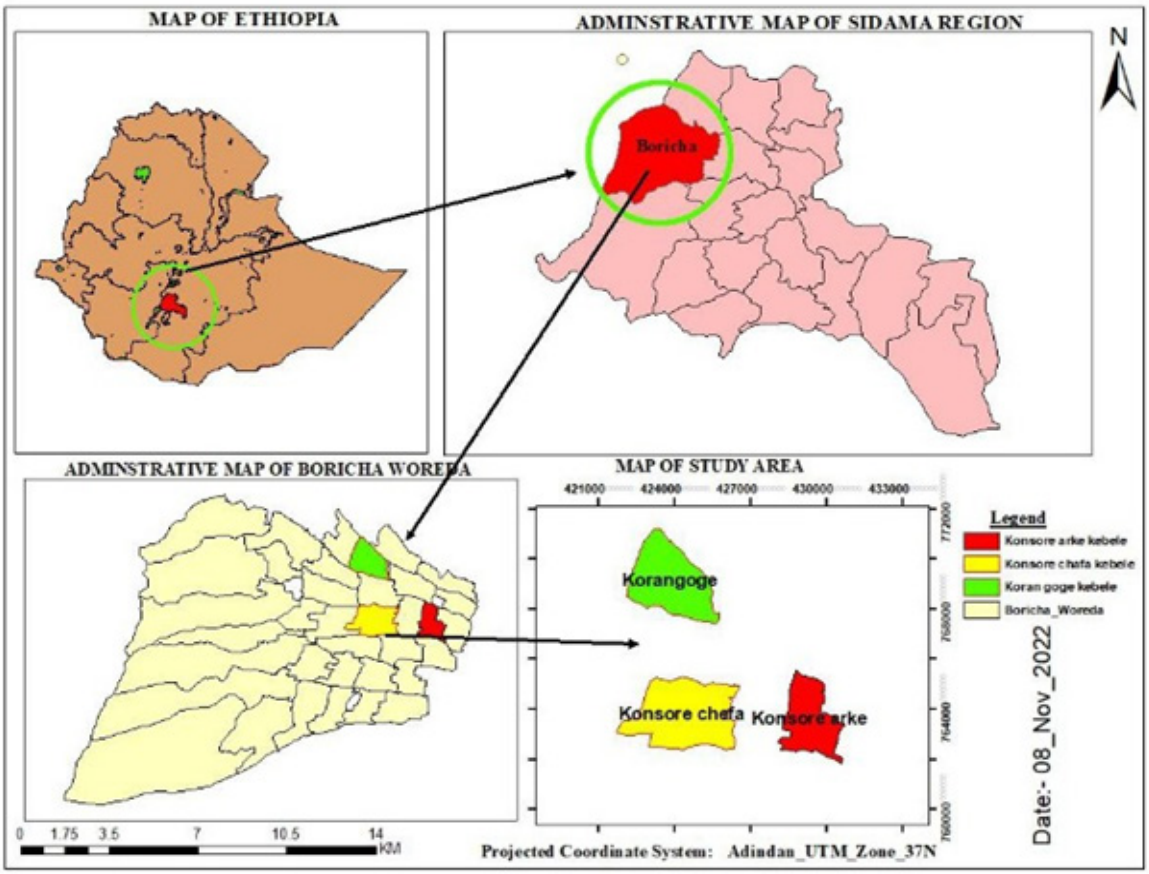

Figure 1. Map of the study area, Boricha, Sidama Region, Ethiopia

Source: Ethio-GIS

The geographic characteristics of the study area have significant implications for physical infrastructure, human livelihoods, and local biodiversity. The elevation of the study area ranges from 1,000 to 2,000 meters above sea level. The topography is generally gently undulating but is heavily dissected by a network of seasonal streams. As a result, rill and sheet erosion significantly impact the environment (Boricha Woreda Agricultural and Rural Development Office, 2023).

According to the Central Statistical Agency (CSA, 2017), the total population of Boricha Woreda is estimated at 130,715, comprising 65,106 males and 65,609 females. Approximately 88% of the population resides in rural areas, while the remaining 12% live in urban centers (Boricha Woreda Vital Events and Registration Agency, 2023).

2.2. Sources and Methods of Data Collection

The study used data generated from both primary and secondary sources. A structured questionnaire, translated into Sidamu Afoo for better comprehension, was distributed to collect primary data from 286 sampled households. The data collected included household demographics, livelihood activities, livestock holdings, market distance, land size, credit access, and extension services. Secondary data were collected from journals and published and unpublished office reports. Prior to the actual survey, a pilot study involving 10% of the sample was conducted to ensure its reliability, with adjustments made for a 10% non-response rate.

Moreover, three focus group discussions (FGDs) were conducted to complement the questionnaire data, each comprising 8–10 purposively selected participants of both sexes from the study Kebeles. The discussions used semi-structured questions to generate deeper insights into household livelihoods. Key informant interviews were also held with Woreda officials, development agents, and Kebele administrators. These interviews leveraged the informants' expertise and experience in managing and monitoring livelihood strategies. Field observations were conducted throughout the research process to validate the collected data and comprehensively understand the sampled households' socio-economic activities and real-life conditions.

The College of Social Sciences and Humanities Ethical Review Committee approved the study, and informed consent was obtained from all participants.

2.3. Sample and Sampling Procedure

A multi-stage sampling procedure was employed to select sample households and Kebeles for the study. Boricha Woreda was purposively chosen due to its vulnerability to drought, reliance on rain-fed agriculture, prevalence of off-farm activities such as weaving and pottery, and smaller landholdings compared to other areas. These factors made it a suitable focus for investigating rural livelihoods.

Three Kebeles—Konsore Chaffa, Konsore Arke, and Korangoge—were randomly selected from the Woreda. These Kebeles were chosen for their higher proportions of off-farm and non-farm livelihood activities, better transport and market access, and significant agricultural production (Table 1). Using Yemane (1967) formula, the sample size was determined at a 95% confidence level with a 5% margin of error, yielding a total of 286 households from a population of 1,000:

$$\text{To get the Sample size } n = \frac{N}{1+N(e)^2}$$

$$n = \frac{1000}{1+1000(0.05)^2} = 286$$

A proportional stratified sampling formula was used to distribute the sample size among the three Kebeles, ensuring fair representation. Simple random sampling was then applied to avoid selection bias and give all households an equal chance of being included in the study.

Table 1. Sampled Kebeles and Households

Name of Kebele	Agro-climate zone	Total number of household	Sample of household	Percentage
Konsore Chafa	Woina dega	342	98	34.26
Konsore Arke	Woina dega	323	92	32.17
Korangoge	Kola	335	96	33.57
Total		1000	286	100

Source: Field Survey, 2023

2.4. Method of Data Analysis

2.4.1. Measurement of Livelihood Diversification

Based on the study conducted by Admassu(2022), this study identifies four categories of household livelihood strategies: on-farm only, on-farm combined with off-farm activities, on-farm combined with non-farm activities, and on-farm combined with both off-farm and non-farm activities. To assess the level of income diversification, the Herfindahl-Hirschman Index (HHI) was utilized. The HHI measures the concentration of income sources and is calculated based on the proportion of income from each source, with values ranging from 1/N to 1, where N represents the total number of income sources. A higher value indicates lower diversification, while a lower value reflects greater diversification(Admasu et al., 2022).

To address the specific objectives, the study employed a comprehensive approach to analyze the data, utilizing both descriptive and inferential statistical methods, including econometric models. Descriptive statistics such as frequency counts, percentages, means, standard deviations, minimums, and maximums were used to summarize and describe the data.

Building on this foundation, the study applied a multinomial logit model to examine the determinants of household livelihood choices. Following Abdulhafedh (2017), the model was used to evaluate the probability of households engaging in one of three mutually exclusive strategies—on-farm only, on-farm plus off-farm, or on-farm plus non-farm—based on various household and contextual characteristics. Probabilities for each strategy were calculated relative to a reference category, and the effects of explanatory variables were analyzed through estimated coefficients. Marginal effects were further examined to understand how variations in both continuous and categorical variables impact the likelihood of adopting specific strategies.

Data were analyzed using STATA version 14, with the significance of coefficients categorized at 1%, 5%, and 10% levels. The model's fit was assessed using Pseudo R-squared values and the Hosmer-Lemeshow test, which compares observed and predicted probabilities within subgroups(Abdulhafedh, 2017). This framework ensures a robust understanding of the factors influencing household decisions regarding livelihood diversification.

2.4.2. Dependent Variables

Following methodology from Admasu et al. (2022) this study classified livelihood strategies into four main categories: on-farm only, on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm. These categories were used as dependent variables to analyze the diversification strategies adopted by households. Net on-farm activities were calculated as the sum of farm income (cash from farm and livestock sales) and the value of food produced for consumption or exchange, minus the costs of inputs and hired labor, excluding household labor. Net off-farm activities included income earned from wage labor on other farms, reciprocal labor arrangements (such as food or harvest shares and oxen rentals), and income from environmental resources, with in-kind earnings converted to cash using local market prices. Net non-farm activities encompassed wages or salaries from non-agricultural employment, income from land rentals, sales of non-agricultural products, petty trade, self-employment, handicrafts, and business enterprises, as well as remittances, pensions, welfare assistance, and other transfers. Transportation costs for semi-processed tools were subtracted from this total.

Livelihood diversification strategies: is a polytomous dependent variable rural households choice of livelihood strategies helps to broaden their income sources and reduce risk, which takes the value Y = 0 if the livelihood strategies is on-farm only, Y = 1 if the households livelihood strategies are on-farm plus off-farm Y = 2 if the livelihood strategies is on-farm plus non-farm, Y = 3 if the households livelihood strategies is on-farm plus off-farm plus non-farm livelihood strategies.

Building on earlier studies on non-farm income diversifications, such as those by Adeoye et al. (2019), Admasu et al. (2022), Khatiwada et al. (2017), Asfaw et al. (2017), Dufera et al. (2023), Musumba et al. (2022), Rahman and Akter (2014), Seng (2015), Tsiboe et al. (2016), Brüssow et al. (2017), Bezu et al. (2012), Meena et al. (2017), Owusu et al. (2011), Romeo et al. (2016), Scharf and Rahut (2014), Tran et al. (2016), Wu et al. (2024), Endiris et al. (2021), and Akaakohol and Aye (2014), and personal experience, the following variables were selected as explanatory variables: Age of household head, sex, family size, marital status, education status land size, income, livestock holding market distance access to extension, use of cooperatives, access to credit, exposure to shock, crop and livestock production risks serves as explanatory variables. The description and hypothesized effects of the selected independent variables on the dependent variable are given in Table 2.

Table 2. Definition of Variables used in the Multinomial Logit Model

Independent Variables	Type of Variables	Measurements	Expected Sign
AGEH	Continuous	Age of household in years	-ve
SEXH	Dummy	Sex of household head 1 = male, 0 = female	-ve
FAMS	Continuous	Family size in adult equivalent ratio	+ve
MASH	Categorical	Marital status of household head 1=Married, 0=non-married	+ve
EDUH	Continuous	Years of education	-ve/+ve
LDSH	Continuous	Land size in hectares (ha)	-ve
INCOME	Continuous	Income in Ethiopian Birr (ETB)	-ve
TLUH	Continuous	Livestock holding inTLU	-ve
MKTDH	Continuous	In kilometers (Km)	+ve
TOMH	Dummy	1 = polygamous, 0 = monogamous	+ve
COOPH	Dummy	1 = cooperative, 0 = otherwise	+ve
EXTCH	Dummy	Household access extension services 1 = Yes, 0 = otherwise	+ve
CREDIT	Dummy	access to credit 1=yes, 0 = otherwise	+ve
CPRH	Dummy	Household faced crop risk, 1= yes 0 = otherwise	+ve
LPRH	Dummy	Household faced livestock risk 1 =yes, 0 = otherwise	+ve

3. RESULTS AND DISCUSSIONS

3.1. Descriptive Results

Table 2 below shows that the average age of households surveyed is 42.9 years (SD = 10.02). The descriptive result showed that the average age of households was 42.9 years, with the minimum and maximum ages being 21 and 70 years, respectively. The overall importance of

the presence of older households suggests that some households live at an active, productive age. These 286 households were also found in different family sizes. From the average family size of the households, a family had 5.78 members (SD = 1.973). Accordingly, the minimum and maximum number of members in a family were 2 and 12, respectively. The result shows that the minimum and maximum land size is less than 0.5 and 2 hectares, respectively, with (SD = .922). The result for farm size shows that a household with a larger farm size or a household with a large agricultural area is obliged to work and at least combine work and agricultural subsistence activities. The average distance to market is 2 km with (SD =.1.3). The minimum distance to any local market is 1 km and the maximum is 5 km from the residence. Finally, the result from the survey showed that the average livestock mean is 4.133 and (SD = 2.972) the minimum and maximum are 1 and 10, respectively. Variations in land size and livestock population may influence households' choice of livelihood strategies.

Table 2. Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Age	42.923	10.026	21	70
Family size	5.78	1.973	2	12
Income (ETB)	2.301	0.944	1	3
Land size(ha)	2.057	0.922	0.5	2
Market distance (Km)	2.189	1.276	1	5
Livestock holdings	4.133	2.972	1	10

Source: Own Survey, 2024

3.2. Household Livelihood Diversification Strategies

Figure 1 illustrates the distribution of household livelihood strategies. Approximately 50% of households were engaged exclusively in on-farm activities, 14.7% combined on-farm with off-farm activities, 18.9% combined on-farm with non-farm activities, and 16.4% engaged in on-farm, off-farm, and non-farm livelihood strategies simultaneously. These results highlight that while agriculture remains the dominant livelihood activity, integrating off-farm and non-farm activities serves as a crucial adaptive strategy for households to enhance their resilience and sustain agricultural production.

Key informant interviews revealed that agriculture alone is insufficient, prompting households to adopt off-farm and non-farm activities to cope with vulnerabilities and support agricultural production.

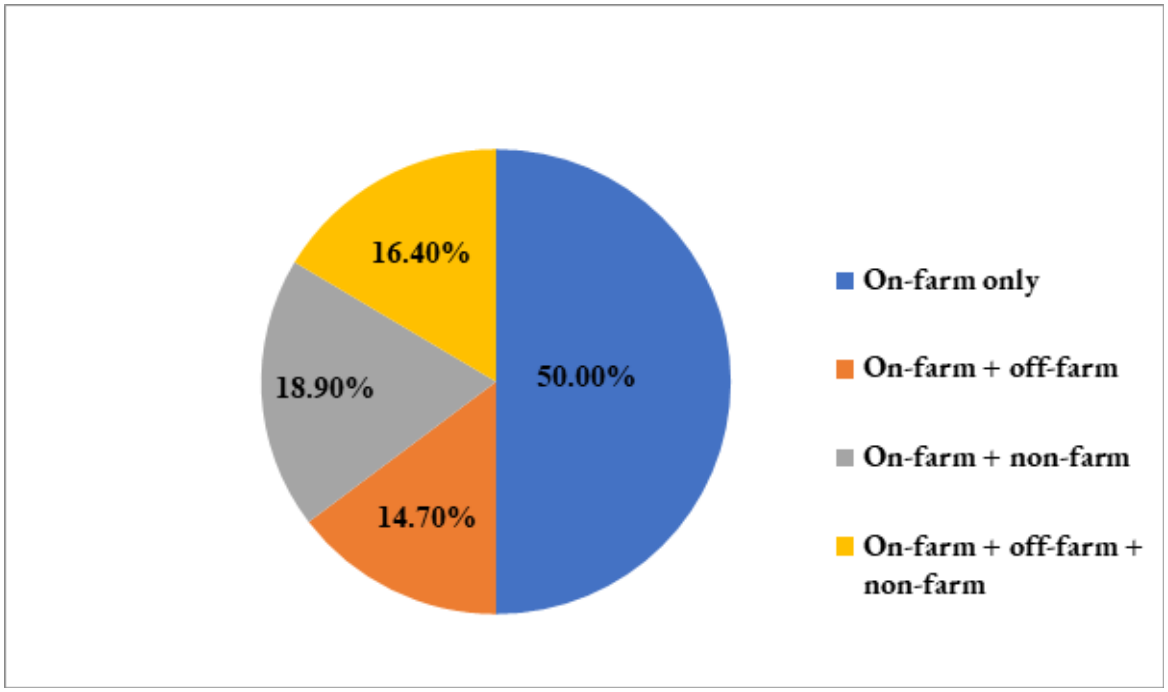

Figure 1. The Household Livelihood Diversification Strategies

Source: Field survey, 2023

3.3. Econometric Result: Determinants of Livelihood Strategies

The main objective of this study was to identify the main livelihood strategies and their determinants in the study area. The descriptive results highlighted the main livelihood practices, and to complement these findings, a multinomial logit model was used to identify the determinants of rural households' livelihood strategy choices. On-farm only activities served as the base outcome, and the results were interpreted in comparison to this category.

The results revealed no significant issues with multicollinearity among the categorical explanatory variables. The Chi-square test showed strong explanatory power for the model, with a significant effect at the 1% level (p-value = 0.0000) on the household's choice of livelihood strategies.

The multinomial logit model identified the determinant variables for each category compared to the base outcome, with on-farm only activities as the reference category. The maximum likelihood method was applied to estimate the effect of predictor variables on livelihood strategy choices. The parameter estimates indicate the direction of the effect of independent variables on the dependent variables.

The marginal effect measures the expected change in the probability of a given choice based on a unit change in the explanatory variables(Greene, 2008). Nine of twelve hypothesized explanatory variables were found to significantly determine livelihood strategies at the 1%, 5%, and 10% significance levels. These included age, sex, family size, marital status, type of marriage, educational level, livestock holding, land size, market distance, and income.

The magnitude of the effect for some variables varied across the three livelihood strategies, showing that multiple factors influenced the choice of livelihood strategies differently compared to the base outcome (on-farm only).

Age of the Household Head: As hypothesized, age was found to significantly and negatively affect the household's choice of on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies at the 10%, 10%, and 5% significance levels, respectively. Holding all other variables constant, a one-year increase in the age of the household head would decrease the choice of on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies by 4%, 1.2%, and 2%, respectively, compared to the base outcome of on-farm livelihood strategies. This result is consistent with the findings of (Admasu et al., 2022; Khatiwada et al., 2017) that younger household heads are more likely to embrace new and profitable livelihood strategies, both within and outside of agriculture. However, it contradicts Gecho et al.,(2014) who found that as age increases, farmers tend to have more children, which increases available labor for engaging in diverse activities. The increased number of children leads to higher demand for basic necessities.

Family Size: Family size positively influenced livelihood strategies at the 10% and 5% significance levels. Holding all other variables constant, as the family size increases by one person, the probability of engagement in on-farm plus off-farm and on-farm plus off-farm plus non-farm livelihood strategies increases by 1.4% and 333.3%, respectively, compared to the base outcome of on-farm livelihood strategies. The positive correlation between family size and livelihood strategies might be due to the relationship between larger family sizes and household labor availability. This finding is consistent with the results of (Admasu et al., 2022) and Ayantoye et al. (2017) that attest a correlation between family size and the need for income diversification. Moreover this finding align with Admasu et al. (2022) and Khatiwada et al (2017) finding that highlight that family size is a factor that increases the likelihood of livelihood diversification larger families may require more diverse income streams to meet the needs of their members.

Educational Level: The educational level was found to be negatively and significantly related to on-farm plus off-farm livelihood strategies, but positively and significantly related to on-farm plus non-farm livelihood strategies at the 10% and 5% significance levels, respectively. Holding all other variables constant, an additional year of schooling can reduce the likelihood of choosing on-farm plus off-farm livelihood strategies by 8%, and increase the likelihood of choosing on-farm plus non-farm livelihood strategies by 2.9%, relative to the reference category of on-farm livelihood strategies. This finding is consistent with literatures (Admasu et al., 2022; Asfaw et al., 2017; Dufera et al., 2023; Khatiwada et al., 2017; Musumba et al., 2022; Rahman & Akter, 2014; Seng, 2015; Tsiboe et al., 2016)unlike the rural areas, the situation is unexplored in the case of towns of developing economies. The objective of this study was to identify the determinants of households' livelihood diversification in a sub-Saharan town. Data were collected from 151 households and 4 key informants. In addition, secondary data were collected to supplement the primary data. Descriptive statistics were employed to identify the households' livelihood strategies. The level of households' livelihood diversification was estimated by the Herfindahl–Hirschman Index, whereas multinomial logistic regression was employed to investigate the determinants of the households' livelihood diversification. The result of the Herfindahl–Hirschman Index shows the presence of three levels of livelihood diversification among households: no diversification (11.26% that state education is widely recognized as a driver of diversification.

Livestock Ownership: Livestock ownership was found to negatively and significantly affect households' participation in on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood diversification strategies at the 5%, 5%, and 1% significance levels, respectively. Holding all other factors constant, the likelihood of rural households choosing on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies decreases by 1.0%, 5.0%, and 60.3%, respectively, as livestock holdings increase by one Tropical Livestock Unit (TLU) compared to the base category of on-farm livelihood strategies. A possible reason is that households with more livestock may earn more money by selling livestock, allowing them to strengthen their financial position and invest in on-farm income-generating activities. This finding contradicts the findings of (Admasu et al., 2022a; Rahman & Akter, 2014)unlike the rural areas, the situation is unexplored in the case of towns of developing economies. The objective of this study was to identify the determinants of households' livelihood diversification in a sub-Saharan town. Data were collected from 151 households and 4 key informants. In addition, secondary data were collected to supplement the primary data. Descriptive statistics were employed to identify the households' livelihood strategies. The level of households' livelihood diversification was estimated by the Herfindahl–Hirschman Index, whereas multinomial logistic regression was employed to investigate the determinants of the households' livelihood diversification. The result of the Herfindahl–Hirschman Index shows the presence of three levels of livelihood diversification among households: no diversification (11.26%, that households with substantial livestock assets may generate sufficient income from livestock, reducing their need to diversify.

Access to Extension Contact: Contrary to expectations, access to extension contact negatively and significantly influenced on-farm plus non-farm and on-farm plus off-farm plus non-farm livelihood strategies at the 1% and 5% significance levels, respectively. Holding all other factors constant, the likelihood of choosing on-farm plus non-farm and on-farm plus off-farm plus non-farm livelihood strategies decreased by 7.4% and 92.7%, respectively, for those who had access to extension services from development agents (DA) relative to the base on-farm only livelihood strategies. This result contradicts with findings of Endiris et.al(2021) who emphasized the role of extension services in promoting off-farm activities. Moreover, it contradicts with Lorato(2019), who found that households receiving extension services are more likely to engage in different combinations of livelihood strategies.

Land Size: As expected, land size was significantly and negatively related to on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies at the 5%, 10%, and 10% significance levels, respectively, compared to the on-farm only livelihood strategies. The negative coefficient indicates that households with larger land sizes are less likely to engage in off-farm and non-farm livelihood strategies, and more likely to focus on on-farm livelihood diversification. The likelihood of engaging in on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies decreased by 1.7%, 3.3%, and 5.0%, respectively, compared to the on-farm livelihood strategy. This finding corroborates the findings of Admasu(2022) that households with smaller landholdings are more likely to diversify their income sources as the agricultural output from their limited land may be insufficient to meet their needs and Kaakohol & Aye (2014), households with larger landholdings might have the resources and capacity to specialize in farming activities.

Market Distance: In line with expectations, market distance negatively and significantly affected households' participation in on-farm plus off-farm plus non-farm livelihood strategies at the 10% significance level. Holding all other variables constant, a one-kilometer increase in

market distance decreased the likelihood of households choosing on-farm plus off-farm plus non-farm livelihood strategies by 4.9%, compared to the base on-farm livelihood strategy. This result align with findings that proximity to markets is generally seen as a factor that facilitates diversification (Admasu et al., 2022b; Akaakohol & Aye, 2014; Dufera et al., 2023; Endris & Kassegn, 2021; Nguyen et al., 2022; Owusu et al., 2011; Romeo et al., 2016)

Access to Credit: Contrary to expectations, access to credit had a positive and statistically significant relation with the probability of participating in on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies at the 10%, 1%, and 10% significance levels, respectively. Holding all other factors constant, as access to credit increases by one unit, the probability of choosing on-farm plus off-farm, on-farm plus non-farm, and on-farm plus off-farm plus non-farm livelihood strategies increases by 12.4%, 9.8%, and 4.2%, respectively, compared to the base on-farm livelihood strategy. This result is consistent with those empirical findings who found that access to credit can provide the capital needed to invest in new income-generating activities, thereby supporting diversification efforts(Admasu et al., 2022b; Akaakohol & Aye, 2014; Asfaw et al., 2017; Dufera et al., 2023; Endiris et al., 2021; Imai et al., 2015; G. Kassie et al., 2017; Meena et al., 2017; Musumba et al., 2022; Owusu et al., 2011; Rahman & Akter, 2014; Shaheen et al., 2021; Tran et al., 2016; Tsiboe et al., 2016)unlike the rural areas, the situation is unexplored in the case of towns of developing economies. The objective of this study was to identify the determinants of households' livelihood diversification in a sub-Saharan town. Data were collected from 151 households and 4 key informants. In addition, secondary data were collected to supplement the primary data. Descriptive statistics were employed to identify the households' livelihood strategies. The level of households' livelihood diversification was estimated by the Herfindahl–Hirschman Index, whereas multinomial logistic regression was employed to investigate the determinants of the households' livelihood diversification. The result of the Herfindahl–Hirschman Index shows the presence of three levels of livelihood diversification among households: no diversification (11.26%.

Income: As expected, income had a positive and significant influence on the household's choice of on-farm plus non-farm livelihood strategies and a negative and significant influence on the choice of on-farm plus off-farm livelihood strategies at the 5% significance level. Holding all other factors constant, as income increases, the probability of choosing on-farm plus non-farm strategies increased by 2.0%, while the probability of diversifying into on-farm plus off-farm livelihood strategies decreased by 5.0%. This result suggests that farm households income levels are likely to influence diversification decisions(Duong et al., 2021; Khatiwada et al., 2017; Meena et al., 2017; Nguyen et al., 2022; Pfeiffer et al., 2009).

Table 3. Multinomial Logit Model Results

Household Livelihood Diversification Strategies									
	On-farm + off-farm			On-farm + non-farm			On-farm + off-farm + non-farm		
Vars	Coeff.	Std. Err	Dy/dx	Coeff.	Std.Err	Dy/dx	Coeff.	Std.Err	Dy/dx
AGE	-.036	.019	-.040*	-.005	.017	-.012*	-.005	.018	-.020**
SEX	-.611	.512	-.015	-1.49	.409	-.167	-.731	.456	-.041
MARS	.508	.23	.057**	.246	.242	.023	.167	.291	.039**
EDUC	-.125	.118	-.080*	.243	.116	.029**	-.005	.113	-.0800
FAMS	.047	.093	.014*	.048	.087	.500	-.006	.091	-.333**

TOM	-.264	.221	-.013	-.461	.218	-.049	-.257	.207	-.015
LADS	-.133	.202	-.017**	-.209	.184	-.033*	-.329	.204	-.050*
MKTD	-.087	.147	-.001	-.243	.16	-.045	-.348	.13	-.049*
INCO	-.056	.196	-.020**	.073	.185	.050**	.133	.193	.014
TLU	-.010	.061	-.010**	-.043	.057	-.05**	-.037	.06	-.603 ***
EXTC	.402	.097	.093	-.657	1.04	-.074***	-1.00	.733	-0.93**
CRED	6.151	.074	.124*	3.31	.001	.098***	9.7	2.513	.042*
CONS	-3.7	1.53		.139	1.33		-184	1.4	

Mean dependent vars	1.510	SD dependent vars	0.811
Pseudo r-squared	.140	Number of obs	286
Chi-square test	65.339	Prob > chi2	.000
Akaike crit. (AIC)	456.651	Bayesian crit. (BIC)	559.019

Source: Own survey

Note: Dy/dx is marginal effect for factor levels is the discrete change from the base level.
*, **, and *** indicates statistical significance of 10%, 5% and 1% levels respectively,
The reference (comparison group) base category is 1 (on-farm only).

4. CONCLUSION AND POLICY IMPLICATIONS

Agriculture is the main economic activity and key source of income for rural families. However, owing to small farm sizes and unregulated growth in population, agricultural productivity has dropped over time, forcing people to seek alternate work opportunities in order to stabilize livelihood, mitigate risks, achieve food security and reduce poverty in rural areas. This study investigates farmers' main livelihood diversification strategies in the Boricha district of the Sidama Region, Ethiopia, and examines the factors that influence these strategies.

The descriptive findings highlight that on-farm activities dominate household livelihoods, with half of the households relying exclusively on them, while others diversify into off-farm and non-farm activities. Findings from the regression indicate that the key factors influencing diversification include age, family size, education, livestock ownership, land size, market distance, income, access to credit, and extension services. Younger household heads, larger family sizes, smaller land sizes, and better credit access were positively associated with diversification. In contrast, livestock ownership, market distance, and extension services reduced the likelihood of diversification. Hence, policies should support younger households with training, improve access to credit, and invest in rural education and vocational training. Enhancing extension services, reducing market distance through better infrastructure, and supporting smallholders and livestock management can foster sustainable livelihood diversification.

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7. CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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