Ethiopian Journal of Business and Social Science

DOI: https://doi.org/10.59122/194F5mto

Volume: 7 Number: 2, 2024, Pages: 104~133 ISSN: 2707-2770

Determinants of Livelihood Diversification among Rural Households in the Context of Climate Variability and Conflict-Affected Areas of East Wollega Zone, Southwest Ethiopia.

Dereje Chimdessa

Wallaga University, Email: derejechimdessa156@gmail.com

Article Info

Accepted on: October,2024

Published on: December, 2024

Abstract

This paper assesses the factors affecting livelihood diversification among rural households in the East Wollaga Zone, Southwest Ethiopia. These livelihoods are significantly affected by climate variability and conflict. A mixed-method approach was employed combining quantitative data from 400 households with qualitative insight gathered by interviews and focus group discussions. The findings reveal that most households experience low levels of livelihood diversification and are highly vulnerable to climate related risks and conflict induced challenges. Positive determinants of diversification included access to electricity, credit, water, irrigation, and higher household income, while barriers included marital status, agro-ecological disparities, and higher dependency ratios. Qualitative data also revealed that limited market access, inadequate institutional support, and sustained insecurity were some of the additional binding constraints. These results therefore call for targeted interventions that enhance resilience and food security. The main policy recommendations are investments in rural infrastructure, especially electricity and irrigation, expansion of access to financial services including credit, and improvement in water availability and agricultural extension services. Appropriate strategies addressing the structural barriers of high dependency ratios and agro-ecological disparities will be crucial for sustainable diversification. The identification of these determinants and the proffering of actionable solutions constitute the contribution of this study to a better understanding of rural livelihood strategies in climate variability and conflict-affected regions, hence providing salient guidance for policymakers and development practitioners who seek to promote economic stability and resilience.

Keywords: *Diversification, livelihood, Multinomial logit, probit, East Wollega Zone*

INTRODUCTION

In rural areas, households diversify their livelihoods to manage risks and stabilize income, particularly in developing nations where rain-fed agriculture predominates, making them vulnerable to weather fluctuations (Alemu, 2023). Climate change is projected to increase natural hazards, threatening food security by affecting its availability, access, utilization, and stability (FAO. IFAD, unicef, WFP, 2022; FAO, 2018). Livelihood diversification becomes essential for maintaining food security and adapting to climate change, aligning with Climate-Smart Agriculture (CSA) principles (FAO, 2018)

In sub-Saharan Africa (SSA), livelihood diversification is gaining attention for its potential to drive economic growth and reduce poverty (World Bank, 2024). It encompasses a sectoral shift from agriculture to non-agricultural activities and an increase in the variety of activities a household engages in (Ellis, 1998). Many rural farmers have diversified their income sources through migration and non-farm activities, supported by improved infrastructure and access to urban centers (Ellis, 1998; Loison, 2015). However, the impact of diversification on living standards remains debated, with some suggesting it leads to de-agrarianization (Hebinck, 2018)

In Ethiopia, rural households rely heavily on agriculture but also engage in non-farm activities to cope with climate-related challenges (Aboye, 2019). The agricultural sector faces significant risks due to climate change, affecting vulnerable populations disproportionately (IMF, 2022). Ethiopia's agricultural challenges include population growth, declining soil fertility, climate change, political instability, and natural resource degradation (World Bank, 2024). Given the unpredictable climate, diversification is crucial for managing agricultural risks (Israel, 2019).

Recent studies have explored rural livelihood strategies in Ethiopia (Abebe et al., 2021; Abera et al., 2021; Alamneh et al., 2023; Loison, 2019), yet the impacts of climate variability on these strategies, particularly in areas like East Wollega Zone, remain underexplored. Here, climate change exacerbates resource conflicts and ethnic tensions, necessitating deeper investigation.

This study aimed to identify the livelihood strategies of farm households and evaluate how climate change and conflict influence these strategies in East Wollaga Zone, Southwest Ethiopia.

With disruptions in agricultural production leading to food insecurity and income loss, households are diversifying into non-traditional activities, such as handicrafts and small-scale trade, aligning with Sustainable Development Goals (SDGs) 1 (No Poverty), 2 (Zero Hunger), and 13 (Climate Action) (Asfew et al., 2023).

Ethiopia's ten-year economic plan emphasizes supporting rural economies through capacity building, credit availability, and infrastructure development (FDRE Planning and Development Commission, 2021; Wazza, 2022). This strategy aims to help households build resilience against climate change and conflicts.

Conflicts undermine social cohesion and limit resource access, exacerbating vulnerability (Tolera, 2023). In this context, income diversification is a vital coping mechanism. Aligning livelihood diversification with SDG 16 (Peace, Justice, and Strong Institutions) can foster social stability and contribute to economic recovery. Ethiopia's economic strategy highlights the need for equitable resource distribution and inclusive growth to address the root causes of conflict.

Achieving sustainable development, food security, and resilience to climate change and conflict requires collaboration among government, local communities, and international partners (Donohue & Biggs, 2015). By supporting livelihood diversification and tackling climate change and conflict challenges, these efforts can enhance long-term stability and improve rural livelihoods in East Wollaga Zone.

METHODS AND MATERIALS

Research Design

Area of study

The study was conducted in the southwestern part of the Ethiopian region of East Wollega Zone. It is situated roughly 328 km west of Addis Ababa, with 8^0 31'20"N to 10^0 22'30"N latitude and 36º 06'00"E to 37º 12'00"E longitude (Fig 1). Three agro-ecological zones make up the zone: the Highlands make up 20.5% of the territory, the Midlands make up 50.9%, and the Lowlands make up 28.6%. East Wollega Zone has a total land area of 14,102.5 km^2 and a population of 1,585, 215 people. (CSA, 2022). East Wollega Zone was purposively selected due to its diverse

problems like resource conflict among various ethnic groups, agro-ecological differences and the dynamic nature of climate in recent periods

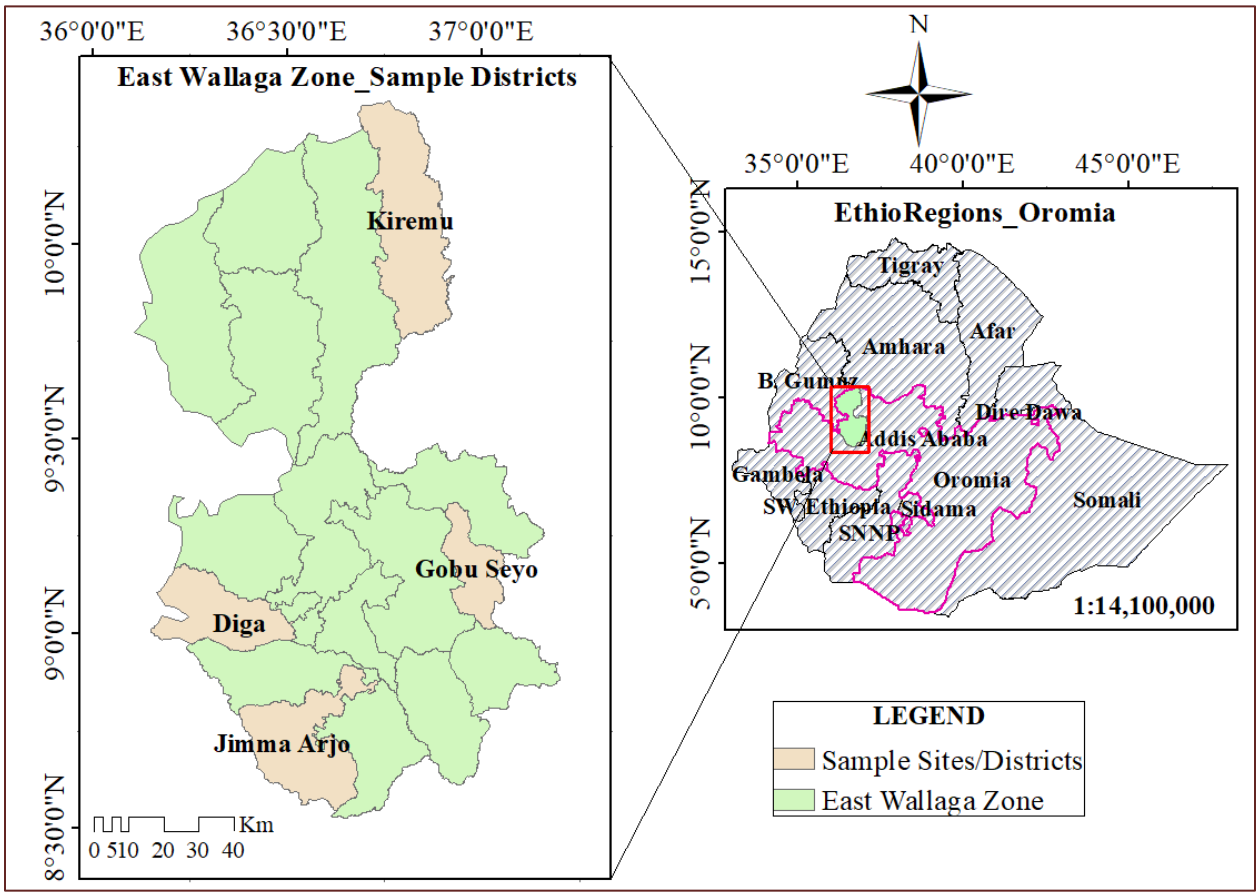

Fig1: Location map of East Wollega Zone and Study Districts

Socio-Economic and Cultural Background of East Wollega Zone

The East Wollega Zone maintains its socio-economic and cultural heritage, shaped by its geographical and historical characteristics, as well as its demographic factors. The zone primarily relies on an agrarian economy, with residents heavily dependent on subsistence farming. Key crops grown in the area include maize, sorghum, teff, and wheat, while coffee serves as the most significant cash crop. Besides this, the system of livestock farming comprises cattle, sheep, goats, and poultry rearing, which is also very important in household livelihoods. The farming households also involve themselves in several non-farming activities: petty trade, casual work, and traditional crafts like weaving and pottery. Most of them diversify as a response to economic challenges and variable climatic conditions. Despite certain infrastructural development, like the road conditions, schools, and healthcare facilities, these are mostly unequally accessible within

the rural regions, where markets and financial services in remote areas remain underdeveloped. While education has improved with the establishment of more schools and colleges, illiteracy—especially among older generations—remains high, particularly among rural women. As a result of these challenges and the lack of job opportunities outside agriculture, many individuals are migrating towards towns and urban centers in search of better prospects.

East Wollega is predominantly populated by the Oromo people, who have a rich cultural heritage rooted in their traditional practices and values. Afan Oromo is not only one of the most widely spoken languages in the region but also serves as a significant medium of instruction and administration. The Gada system, a socio-political institution of the Oromo, plays a crucial role in governance, conflict resolution, and the preservation of culture. It promotes values such as democracy, egalitarianism, and respect for elders. The religious landscape in the zone is diverse, with Christianity (including Protestant, Orthodox, and Catholic denominations) and Islam being the dominant faiths. Traditional beliefs also persist, particularly in rural areas, often blending seamlessly with mainstream religions. Social norms in East Wollega foster community cohesion and mutual assistance. The people have established institutions like idir (burial associations) and iqub (rotating savings groups), which are vital for building social and economic solidarity. Cultural festivals, such as Irreecha, along with religious holidays and other traditional Oromo life rituals, reflect the vibrant cultural identity of the region, reinforcing social bonds and providing opportunities for cultural expression.

Conflict and displacement within the recent period have spoiled livelihoods and raised vulnerability within the East Wollega Zone, despite its high economic potentials and rich cultural heritage. Ecological degradation with uncertain rainfalls is making agriculture progressively non-viable. Inequality along economic lines of differences in accessing resources and services constrains equitable development. These dynamics at the socio-economic and cultural levels give a holistic view of the opportunities and challenges that the people of the East Wollega Zone face and that shape their livelihoods and resilience.

Sampling and Data Collection

This study employed a multistage sampling technique to select respondents. East Wollega was chosen due to its exposure to climate variability and conflict-induced shocks. Four districts (Arjo, Diga, Gobu Sayo, and Kiremu) were selected for their agro-ecological diversity. From these, eight peasant associations were randomly chosen. Systematic sampling was used to select respondents. The sample size was calculated using Kothari's formula, suitable for stratified samples in finite populations(KOTHARI, 2004).

$$n = \frac{Z^2.p.q.N}{e^2\,(N-1)+Z^2.p.q} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [1]$$

Where q = 1 - p; p = 0.50 was presumed to supply the maximum sample size so that q = 0.5; and z = represented the value of the standard variation at a specified confidence level. Z-score (1.96); n = sample size; e = intended margin of error, which is 5% (0.05); N = total population. The margin of error utilized was 5%. From the total of 7,526 houses across all Kebeles (the lowest administrative unit in Ethiopia), 400 made up the necessary sample size. Based on the proportionality of each Kebele's household size, the sample size for each was chosen. Finally, household heads were selected for the questionnaire using a random sample procedure.

Data Collection

A stratified random sampling method was employed to ensure that the sample represents various socioeconomic and demographic groups within the selected region. To achieve this, the sample consisted of households from four different districts, covering eight peasant associations across three agro-ecological zones. This proportional allocation ensures that the diversity within the population is accurately reflected in the sample.

Data Sources

Primary data was collected via surveys and interviews; secondary data provided historical context and enriched the analysis.

Methods of Data Analysis

Both qualitative and quantitative analyses were conducted. Binary probit, multinomial logit models, and various statistical tests (ANOVA, chi-square) were used. Stata version 15 analyzed factors influencing households' income diversification strategies

The Binary Probit Regression Model- Econometric estimation for diversification of livelihood

The binary probit model was estimated to determine whether respondents diversified income beyond farming. It assumes over 30 observations, normality of data, and a linear relationship between response variables and predictors. This model fits binary outcomes: diversified, 1; not diversified, 0. For this study, respondents with additional activities beyond farming were coded as 1 and non-diversifiers were coded as 0. The functional form of the probit model is specified as follows:

$$\text{Pi} = F(Zi) = \frac{1}{1+e-(\propto + \sum BiXI)} = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..[\mathbf{2}]$$

where Pi denotes the likelihood that a respondent used diversification; The i^{th} explanatory variables are represented by *Xi*; the base of the natural logarithm is e; and the regression parameters that need to be calculated are α and *βi.*

To make the comprehension of the coefficients easier, a probit model can be described in terms of the odds and a log of odds. The probability (Pi) that a respondent varied their livelihood income divided by the probability (1 − Pi) that they did not is known as the odds ratio.

$$\frac{P}{1-P} = e^{ZI}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..[\mathbf{3}]$$

For easily understanding, the probit becomes a linear function of different independent variables:

$$li = ln\left[\frac{Pi}{1-Pi}\right] = e^{Zi} = Zi = \propto + \beta 1X1 + \beta 2X2 + \cdots \beta iXi\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots[\mathbf{4}]$$

where: Pi denotes probability of being participate in other activities, $1 - Pi$ denotes probability of being only engaged in agriculture, Li is the probit, *Xi* is vector of relevant household characteristics and βi is a vector of parameters to be estimated. It should be noted that the estimated coefficients do not directly indicate the effect of change in the corresponding explanatory variables on probability (P) of the outcome occurring (Mudzielwana et al., 2022). Thus, the study estimated marginal effects to indicate the effect of change in explanatory variables on probability (P) of the outcome occurring.

Multinomial logit model specification- Estimating the diversification of livelihood strategies

When the dependent variable has more than two outcomes, multinomial logistic (MNL) regression is commonly used for nominal outcomes(Wulff, 2015). The multinomial probit or multinomial logit regression models are appropriate when there is a dependent variable with more than two alternatives, such as unordered qualitative variables(Chan, 2005). However, multinomial probit is rarely employed due to its complexity and the need to solve multiple integrations associated with multivariate normal distributions the multinomial logit model was used in this study to examine factors influencing rural household livelihood diversification strategies.

This model was chosen based on its ability to capture differences in livelihood strategies and predict diversification (Abera et al., 2021). It also has computational advantages. The model assumes that a rational household head selects revenue sources that maximize utility based on time and available assets, promoting livelihood diversification. The utility for the i^{th} respondent choosing option j from J livelihood strategies can be expressed mathematically(Greene, 2003).

$$Uij = Zij\beta + \varepsilon ij \quad \ldots\ldots [\mathbf{5}]$$

In the event that the sample household selects option j, we presume that Uij is the highest utility among the J utilities. In order for the statistical model to be determined by the likelihood that choice j is selected, which is:

$$Prob(Uij > UiK) for\ all\ other\ K \neq j \quad \ldots\ldots [\mathbf{6}]$$

Where *Uij* represents the utility from livelihood strategy *j* to the i^{th} respondent. The i^{th} respondent's utility from livelihood strategy k is *Uik*. The household's decision is just an ideal distribution of its asset endowment to select a livelihood that maximizes its utility if it maximizes its utility as defined over income realizations. As a result, the decision made by the i^{th} household may be described as maximizing the expected utility by the selection of the j^{th} livelihood strategy out of *J* distinct livelihood strategies, that is,

$$\text{maxj} = E(Uij) = fj(Xi) + \varepsilon ij; j = 0 \ldots J \quad \ldots\ldots [\mathbf{7}]$$

In general, for an outcome variable with J categories, let the j[th] livelihood strategy that the i[th] household chooses to maximize its utility take the value 1 if the i[th] household chooses j[th] livelihood strategy and 0 otherwise. The probability that a household with characteristics "x" chooses livelihood strategy j, p_{ij} is modeled as:

$$Pij = \frac{\exp(XiBi)}{\sum_{j=o}^{J} \exp(XiBi)}, J = (0 \dots 3) \quad \ldots\ldots [8]$$

With the requirements that $\sum_{j=0}^{J} Pij = 1 \quad for\ any\ i\ where$

Pij =Probability representing the i[th] respondent's chance of falling in to category j;Xi= predictors of response probabilities and βj=covariant effects specific to j[th] response category with first category as the reference.

According to (Greene, 2003), the suitable normalization that cancels indeterminacy in the model is to assume that $\beta 1 = 0$ (this arise because probabilities sum to 1, so only J parameter vectors are needed to determine the $J + 1$ probabilities). Hence, $exp(Xi\beta 1) = 1$, implying that the generalized Eq. (8) above is equivalent to

$$\Pr\left(yi = \frac{j}{Xi}\right) = Pij = \frac{\exp(Xi\beta i)}{1+\sum_{j=1}^{J} \exp(Xi\beta i)}, for\ j = (0, \dots J) \quad \ldots\ldots [9]$$

and

$$\Pr\left(\gamma i = \frac{1}{xi}\right) = Pi1 = \frac{1}{1+\sum_{j=1}^{J} xp(Xi\beta}, \quad \ldots\ldots [10]$$

Where $\gamma = A$ polytomous outcome variable with categories coded from 0… J.

The probability of $\rho i1$ is derived from the constraint that the J probabilities sum to 1. That is, ρi1 = 1 – Σ ρij. Thus, similar to binary logit model, it implies that we can compute *J log-odds* ratios which are specified as:

$$\ln\left[\frac{Pij}{Pij}\right] = x'(\beta j - \beta J) = x'\beta j, if\ J = 0 \quad \ldots\ldots [11]$$

Multicollinearity diagnosis

Multicollinearity occurs when independent variables are highly correlated (Greene, 2003; Gujarati, D. & Porter, 2009). Variance inflation factor (VIF) tests multicollinearity in continuous variables, with VIF values above 10 indicating issues. For categorical variables, a contingency

coefficient close to 1 suggests strong association, with values above 0.75 indicating multicollinearity(Greene, 2003).

RESULTS

Descriptive Statistics

All the normality test was conducted for all explanatory variables. The majority of the 400 rural households in the sample (25%) were female, whereas 75% of the participants were male. Age-wise, 1.5% of the rural households were under 25, 10.75% were between 26 and 35, and 37.25% were between 35-42, 26.25% were between the age of 43-50, 13.75% were between the age of 51-58 , 14% of them were between the age of 51-58 and the senior households(>66years) were only 4%.

According to the survey data 83% of the households were married and 13% of the households were divorced and only 4% of the sample households were single. Among the sample respondents, 37% had attended up to grade six, while 30% were unable to read and write.

19% and 9% of the respondents had completed junior secondary and secondary school, respectively, while 5% had pursued tertiary education. In terms of land possession, 73% of the rural farming communities owned plots of land of varying sizes, while 27% did not own any land.

The households' access to livelihood assets varied significantly. Fifty-five percent of the households did not have access to irrigation, while 45% had the opportunity to cultivate crops using irrigation. Similarly, 78% of the rural households in the study districts did not have access to electricity and relied on alternative energy sources for cooking, lighting, and heating.

Livelihood strategies of the rural households in in East Wollega Zone

Economic status and livelihood diversification of Households

This study explored the strategies rural households use to cope with economic stresses. In East Wollega Zone, across four districts (Table 3), Arjo, Diga, Gobu Sayo, and Kiremu—32.5% of households relied solely on agriculture, while 36% combined agriculture with non-farm activities. Additionally, 14.3% pursued agriculture and off-farm activities, and 17.2% practiced a mix of agriculture, non-farm, and off-farm activities. Livelihood strategies were analyzed

through various approaches, with economists often grouping households by income shares from different rural sectors.

Table 3 Cross tabulation of sample households in livelihood strategies and economic status.

Livelihood Strategy	Economic Status of the Households							
	Better-off(N=75)		Medium (N=234)		Poor (N=91)		Total(N=400)	
	N	%	N	%	N	%	N	%
AG	30	40	60	25.6	40	43.9	130	32.5
AG+NF	24	32	97	41.5	23	25.3	144	36
AG+OF	11	14.7	35	15.0	11	12	57	14.3
AG+NF+OF	10	13.3	42	18.0	17	19	69	17.3
X^2								14.7650
P-value								0.022*

AG-Agriculture only, OF – Off farm, NF- Non-farm. N- Number, * significant at (95%), Chi square=14.7650 and p-value 0.022

Association between livelihood-diversification strategies and socioeconomic parameters.

Table 4 indicates a statistically significant correlation ($p < 0.05$) between the livelihood-diversification techniques and gender of rural households. The findings showed that, among female rural households, 23% engaged solely in on-farm activities, 37% engaged in both on-farm and non-farm activities, 10% in both on- and off-farm activities, and 19% in a combination of AG, OF and NF activities. The male counterpart engaged in AG, AG+NF, AG+OF and AG+OF+NF were 73%, 74%, 82% and 72%, respectively.

Table 4. Descriptive analytical results for dummy explanatory variables by choice of livelihood strategies.

Variable	Livelihood Diversification of the sample households						
	Response	AG	AG+NF	AG+OF	AG+NF+OF	Total	X^2
Sex	Male	95(73)	107(74)	47(82)	50(72)	299(75)	2.19** P=0.045
	Female	35(27)	37(26)	10(18)	19(28)	101(25)	
Loan	Yes	42(32)	65(45)	35(61)	34(49)	176(44)	15.075** Pr = 0.002
	No	88(67.7)	79(54.9)	22(38.6)	35(50.7)	224(56)	
Cooperative Membership	Yes	48(36.9)	38(26.4)	14(26.6)	24(34.8)	124(31)	5.1299
	No	82(63.1)	106(73.6)	43(75.4)	45(65.2)	276(71)	
Leadership	Yes	12(9.2)	21(14.6)	9(15.8)	8(11.6)	50(13)	2.4574
	No	118(90.8)	123(85.4)	48(84.2)	61(88.4)	350(88)	
Extension	Yes	110(84.6)	113(78.5)	52(91.2)	59(85.5)	334(84)	5.4321
	No	20(15.4)	31(21.5)	5(8.8)	10(14.5)	66(17)	
insurance	Yes	92(70.8)	115(79.9)	42(73.7)	59(86.8)	308(77)	9.1541
	No	37(28.5)	29(20.1)	15(26.3)	9(3.2)	90(23)	
Training	Yes	104(80)	121(84)	51(89.5)	58(84.1)	334(84)	2.6769
	No	26(20)	23(15.9)	61(10.5)	11(15.9)	66(17)	
Saving	Yes	35(26.9)	42(29.2)	15(26.3)	14(20.3)	106(27)	1.9049
	No	95(73.1)	102(70.8)	42(73.7)	55(79.7)	294(74)	
Land	Yes	105(80.8)	96(66.7)	37(64.9)	34(78.3)	292(73)	9.7722** P= 0.021
	No	25(19.2)	48(33.3)	20(35.1)	15(21.7)	108(27)	
Fertilizer	Yes	110(84.6)	136(94.4)	54(94.7)	65(94.2)	365(91)	10.628** P=0.014
	No	20(15.4)	8(5.6)	3(5.3)	4(5.8)	35(8.8)	
Improved seeds	Yes	72(55.4)	85(59.1)	30(52.7)	37(53.6)	224(56)	16.7061** Pr = 0.001
	No	58(44.6)	59(40.9)	27(47.4)	32(46.4)	176(44)	
Sufficient Food	Yes	47(36.2)	64(44.4)	18(31.60)	21(30.4)	150(37)	5.3857
	No	83(63.9)	80(55.6)	39(68.4)	48(69.6)	250(63)	

**Shows statistically significant at less than 5%

The analysis revealed a significant correlation ($p < 0.05$) between livelihood diversification strategies and farmers' access to credit. Of those receiving loans, 32% pursued agriculture only, 45% combined agriculture and non-farm activities, 61% engaged in agriculture and off-farm activities, and 49% combined all three strategies. Land ownership also significantly impacted livelihood choices, with 80.8% of landowners focusing solely on agriculture, 66.7% combining

agriculture with non-farm activities, 64.9% with off-farm activities, and 78.3% diversifying into all three.

Technological use, including fertilizers and improved seeds, was also important. Among fertilizer users, 84.6% engaged in agriculture alone, while over 94% diversified across multiple activities. Improved seed use had a significant impact ($p = 0.001$), with 72% focusing on agriculture and 85% diversifying into non-farm activities.

A one-way ANOVA test highlighted the influence of household characteristics. Age was significant ($p < 0.05$), with agricultural-only households averaging 45.28 years, while those engaging in off-farm activities averaged 44.3 years. Education was also significant ($p = 0.0108$), with more educated households diversifying more. The dependency ratio was higher among those diversifying, with agricultural-only households averaging 1.7, and those pursuing all activities averaging 2.2.

These findings emphasize the role of credit, land, technology, education, and household composition in shaping rural livelihood diversification strategies.

Table 5. Summary of statistics for continuous explanatory variables by choice of livelihood strategies.

Variables	**Livelihood strategies**					
	AG Mean	AG+NF Mean	AG+OF Mean	AG+NF+OF Mean	Total Mean	F-Value
Age	45.28	44.3	45.28	44.37	44.82	1.14**
Education(code 0=illitrate,	1.22	1.35	.95	1.13	1.16	3.32**
Family size (code 1=2-4)	1.76	1.75	1.71	1.68	1.72	0.36
TLU	7.4	8.9	7.7	7.4	7.85	1.11
Market distance	3.07	2.9	3.1	3.1	3.04	1.00
Farm size	2.0	2.04	2.2	2.02	2.065	0.04
Dependency ratio	1.7	2.3	1.7	2.2	1.97	1.99**

**Significant at 0.05 level of significance

Binary probit model analysis

A binary probit model was used to estimate the parameters responsible for livelihood diversification among the rural households in the study areas (Table 6). The results indicated that all of the estimated coefficients were statistically significant, as the LR X2 statistic was statistically significant ($p < 0.01$). The coefficients of the binary probit model did not represent the magnitude of the effects of the explanatory variables. Instead, the marginal effects were discussed. The marginal effects (ME) measured how a unit change in the average value of the independent variables influenced the probability of whether or not a respondent diversified his or her livelihood from farming activities.

Table 6. Parameter estimates of the binary Probit regression model's analysis on job diversification

Independent Variables	Coefficient	Std err	Marginal effects
Gender	-.0341983	.1592098	-.0148613
land	.0300317	.1569384	.0008302
Training	.1414583	.2048298	.0411577
Credit	.3235534	.1391855	.12763 **
Saving	-.0870287	.157209	-.0271
Coop	.2599847	.1457606	.099949
leader	-.246971	.2102667	-.0947697
Electricity |	.8005134	.205462	.222497***
Water	.2726529	.138159	.1074106 **
Inputs	.3238259	.311709	.7485108
Income	.8983831	.147247	.3513116 ***
marry	-.3537826	.1307374	-.0983314**
Irrigation	.2912655	.1367001	.1117667 **
Distance from the market|	.2394993	.076947	.0665671**
Agroecology	-.6533439	.145232	-.1815923***
Dependency ratio	-.1408016	.0568784	-.0391348**
Cons	-1.31236	.3708849	

***, ** and * shows statistically significant at 1%, 5% and 10% respectively.

The probit model results reveal key factors influencing rural households' likelihood of having a non-agricultural job. Access to credit significantly increases the probability of diversifying income beyond agriculture ($p < 0.05$). Electricity access also has a strong, highly significant positive effect, likely by facilitating small businesses and other economic activities. Access to water and higher income further enhance the likelihood of non-agricultural employment, supporting income-generating activities like small-scale irrigation or businesses.

Conversely, being married significantly reduces the probability of having a non-agricultural job, likely due to household responsibilities. The dependency ratio also negatively impacts non-agricultural employment, as households with more dependents may have fewer resources and flexibility. Additionally, the distance from markets increases the likelihood of non-agricultural employment, possibly due to limited agricultural market access.

Agro-ecological settings play a significant role, as living in certain zones reduces non-agricultural job opportunities, reflecting environmental constraints. Overall, access to resources like credit, electricity, and water encourages livelihood diversification, while socio-demographic factors such as marital status and dependency ratio limit non-agricultural employment opportunities.

Determinants of livelihood diversification strategies: the econometric model results

The multinomial logistic regression analysis aims to identify factors influencing different livelihood diversification strategies among rural households. The model compares three categories of livelihood diversification: agricultural only (AG), agricultural with non-farm activities (AG+NF), and agricultural with off-farm activities (AG+OF), with "AG+NF" as the base outcome.

Table 8 Multinomial logit model result on determinants of livelihood diversification strategies.

Variables	**Households' livelihood diversification strategies**								
	AG+NF			**AG+OF**			**AG+NF+OF**		
	Coef	St.Err	Odds ratio	Coef	St.Err	Odds rati	Coef	St.Err	Odds ratio
Intercep	2.4633	2.1514	12,18	0.481	3.030	1.62	-2.01	2.694	0.1334
Age	-0.058	0.1217	0.94	-0.149	0.175	0.862	0.04**	0.156	1.044
Sex	0.0181	0.835	1.02	1.01**	0.495	2.73	0.417	0.433	1.517
Educ	-0.27*	0.1432	0.758	-0.4**	0.190	0.616	-0.08*	0.173	0.923
Marriag	-0.0196	0.2142	0.981	-0.300	0.330	0.741	0.157	0.251	1.169
Fam.siz	0.544	0.2596	1.72	0.163	0.354	1.177	-0.09*	0.311	0.913

Variables	Households' livelihood diversification strategies								
	AG+NF			AG+OF			AG+NF+OF		
	Coef	St.Err	Odds ratio	Coef	St.Err	Odds rati	Coef	St.Err	Odds ratio
Agroeco	-0.391	0.2465	1.48	-0.9**	0.357	0.386	-0.15	0.300	0.861
Land	0.81**	0.3396	2.25	-0.076	0.409	0.926	0.489	0.397	1.631
Irrigatio	-0.0600	0.2973	0.942	0.156	0.376	1.168	0.050*	0.3455	1.051
Phone	-0.61**	0.3096	0.545	0.124	0.389	1.132	0.164	0.349	1.178
Water	0.523*	0.2794	1.69	0.240	0.366	1.271	0.02**	0.3424	1.023
Food	-0.1440	0.3044	1.866	-0.8**	0.407	0.439	-0.77	0.3710	0.463
Coop	0.523*	0.3012	1.69	-0.231	0.415	0.793	0.322	0.360	1.379
saving	0.1049	0.3248	1.11	0.018	0.415	1.018	-0.58*	0.399	0.5598
Credit	-0.63**	0.2940	0.53	0.65*	0.373	1.915	0.415	0.341	1.514
Income	-0.2766	0.3056	0.76	-0.107	0.414	0.898	0.101	0.360	1.106
Electric	-0.4188	0.4278	0.66	1.01**	0.466	2745	0.996	0.436	2.707
Depend	-0.37**	0.1065	0.69	-0.3**	0.136	0.708	0.073*	0.118	1.075
Inputs	-1.173*	0.6577	0.31	1.197	1.121	3.310	1.66	1.09	5.259
Extensi	0.79**	0.3849	2.22	0.611	0.562	1.842	0.515	0.451	1.673
leader	-0.1583	0.4519	0.853	0.265	0.508	1.303	-0.28	0.505	0.7557
Train	-0.0615	0.4685	0.94	0.817	0.637	2.263	0.110	0.528	1.116
House	0.0634	0.3158	1.065	-0.101	0.422	0.903	-0.39	0.367	0.6771
TLU	-0.0637	0.0453	094	-0.102	0.059	0.903	-0.12	0.053	0.8869
Wealth	-0.3642	0.4000	0.695	-0.378	0.534	0.685	-0.32	0.480	0.7261
Distanc	0.1013	0.1410	1.12	0.228	0.188	1.256	0.296	0.168	1.3444
landsize	0.0840	0.1833	1.09	0.380	.229	1,462	0.079*	0.209	1.0822
Insuranc	-0.2461	0.3908	0.782	-0.469	0.514	0.625	1.104	0.523	3.016
Fertilez	-0.5433	0.6939	0.581	-0.391	0.953	0.676	-1.02	2.69	0.361

Variables	Households' livelihood diversification strategies								
	AG+NF			AG+OF			AG+NF+OF		
	Coef	St.Err	Odds ratio	Coef	St.Err	Odds rati	Coef	St.Err	Odds ratio

Reference category: Dependent variable: **Agriculture alone**

Number of observations: **399**

Log likelihood model fitting: Intercept only **-523.78257**, Final **-439.06232**

LR chi-square test: **169.44**

Degrees of freedom: **84**

Significance: **0.000** ***

Pseudo R2: **0.1617**

***, **,* indicates significant at < 1%, 5% and 10% probability levels, respectively

The results of the multinomial logistic regression indicate that several factors significantly influence livelihood diversification strategies among rural households. The Wald chi-square statistic (169.44, p = 0.0000) confirms that the model is statistically significant, explaining 16.17% of the variation in livelihood strategies (pseudo R-squared = 0.1617).

DISCUSSION

The positive and significant impact of access to credit on job diversification leads to the sustainable livelihoods frame, which stresses that access to financial capital should make more livelihood options available to people. Access to credit avails the household with resources for investment in non-agricultural activities, such as small businesses or acquisition of skills, which diversify income streams. Researches have shown that rural households with access to credit are more likely to engage in livelihood diversification since it frees them from financial constraints, enabling them to invest in higher-return activities (Ellis, 2000).

This is strong evidence of the positive effect of electricity access on job diversification and hence indicates that basic infrastructure plays an important role in supporting rural development. According to the modernization theory, infrastructural development enables economic

transformation by allowing people to move into modern livelihoods. In general, electricity is the backbone for small-scale industries, value addition in agriculture, and entrepreneurship. Indeed, several empirical studies have shown that electrification significantly increases the proportion of non-farm employment, especially in rural areas(Diyammi, 2022).

Reliable access to water is another critical enabler of job diversification. According to the capabilities approach(Sen, 1999) , access to basic resources like water expands individuals' freedom to pursue diversified livelihoods. Improved water availability reduces the time and labor required for water collection, particularly for women, thereby freeing up time for engagement in non-agricultural jobs. Literature supports this, showing that water accessibility enhances household productivity and facilitates economic diversification(Visser et al., 2024).

The strong positive correlation between income and job diversification indicates that financial capability is an enabling factor for households to diversify their jobs. The asset-based approach of suggests that a household with a higher income can afford to invest in diversified activities, thereby reducing vulnerability to shocks(Israel, 2019). Empirical evidence on this comes from a study by, in which they find that wealthier households can enter non-farm employment due to their enabling ability to overcome entry barriers related to start-up capital costs and skill acquisition, for example(Dawid et al., 2023).

The hypothesized negative relationship between marital status and employment diversification can thus best be understood within the perspectives related to household responsibility. This is because married individuals experience higher family responsibilities, therefore limiting their mobility and even potential to diversify other employments. For example, literature indicates how one's family obligations can pressurize livelihood diversifications, especially in patriarchal societies where married individuals should ensure household stability(Haggblade et al., 2015).

Irrigation access has a positive influence on job diversification because irrigation stabilizes agricultural incomes and, simultaneously, frees household labor to pursue non-agricultural jobs. This result agrees with the agricultural intensification theory, where increasing agricultural productivity through irrigation reduces dependency on subsistence farming and allows for alternative livelihoods(Assefa et al., 2022). In fact, many researches showed that irrigation

infrastructure facilitates rural diversification by increasing agricultural returns and enabling shifts in rural employment(Diyammi, 2022).

The market access hypothesis indicates that job diversification occurs by reason of proximity to markets. It offers better opportunities to sell their products, obtain all forms of inputs, and also gain access to information related to alternative livelihoods(Usman, 2021). Market access indeed ensures low transaction costs and leads to more participation in non-farm employment among those household members who live closer to the market.

The negative relationship between lowland or mid-altitude agro-ecologies and job diversification reflects structural and environmental constraints faced by households in these regions. Geographical and climatic conditions, according to the theory of environmental determinism, have a strong impact on economic opportunities. Lowland areas, which are often associated with more unfavorable climates and resources, limit alternative employment opportunities. This is in line with the work of (Deressa et al., 2009), who identified the challenge of livelihood diversification in less favorable agro-ecological zones.

A higher dependency ratio reduces the likelihood of job diversification, as outlined in household labor allocation model. When a household has more dependents, fewer labor resources remain available for pursuing alternative livelihoods since a significant portion of time and income is dedicated to caregiving responsibilities. This observation aligns with Ellis, who noted that a greater dependency burden diminishes the mobility and diversification opportunities of rural households(Ellis, 1998, 2000).

The findings underline the need for investment in infrastructure, such as electricity and irrigation, financial services, such as credit, and market development in order to promote job diversification among rural households. Furthermore, targeted interventions in areas with high dependency ratios and challenging agroecological conditions are necessary to reduce the constraints to diversification.

Based on MNL analysis (Table 6), households pursuing agriculture-only (AG) strategies were more likely to have larger landholdings, suggesting that sufficient land enabled reliance on

agriculture. Access to loans, however, was negatively associated with this strategy, indicating that credit facilitates diversification. Telecommunication access was marginally significant and negatively associated with agricultural-only strategies, while household size was positively correlated, implying larger families relied more on agriculture. Education level and dependency ratio showed negative associations with agricultural-only strategies, suggesting that better-educated households and those with more dependents diversified more readily. Participation in extension programs also decreased the likelihood of solely pursuing agriculture, pointing to the influence of these programs in promoting diversification.

For households combining agriculture and off-farm activities (AG_OF), access to electricity emerged as a significant positive factor, highlighting its role in fostering non-agricultural opportunities. Agro-ecological settings negatively influenced this strategy, showing environmental constraints. Gender and dependency ratio had marginal effects, with gender positively and dependency negatively influencing the likelihood of off-farm engagement.

Households engaged in a mix of agriculture, non-farm, and off-farm activities (AG_NF_OF) were also positively influenced by electricity access and agricultural insurance, which encouraged broader diversification. However, livestock ownership had a negative effect, as livestock represented a primary livelihood, reducing the need to diversify. Distance from markets showed a marginally positive influence, suggesting that remote households diversified to cope with market access limitations.

The analysis has shown the significant effect of different explanatory variables on a household's choice of pursuing one or another livelihood diversification strategy. Age significantly positively relates to the category AG + NF + OF. This might be understood to mean that the diversified household heads are more likely to diversify, which might be anticipated, given their accumulated experience and better recognition of market dynamism as well as how to pool risks. This finding is consistent with human capital theory, which emphasizes that experience is one of the key factors in exploiting economic opportunities. Other literature supporting the fact that older individuals can handle complex livelihood strategies more effectively includes(Barrett et al., 2001; Ellis, 2000).

Sex was significant in determining the probability of adopting agriculture and off-farm activities, and male-headed households have a higher probability of diversification. This is in line with the gendered division of labor theory, which explains that, because of fewer household responsibilities and better mobility, men often have more opportunities for off-farm activities. Empirical studies, such as those by (Hegazi & Seyuba, 2024), reinforce this observation, highlighting the role of gender in shaping livelihood options in rural areas.

Education showed a negative relationship with livelihood diversification across all strategies, indicating that higher education levels decrease the likelihood of combining agriculture with non-farm or off-farm activities. This could reflect a preference among educated individuals for formal employment opportunities over mixed livelihood strategies. Human capital theory supports this finding, suggesting that education enhances skills and qualifications for specialized employment. Similarly, (Diyammi, 2022) find that educated rural populations tend to shift toward formal employment.

Family size negatively affected the likelihood of adopting agriculture combined with non-farm and off-farm activities (AG + NF + OF). Larger households may face labor constraints or high dependency ratios, therefore finding it difficult to adopt diversified strategies. The household labor allocation model also supports this argument, stating that larger families often focus on subsistence agriculture to meet immediate needs. Ellis further stresses that a high dependency ratio constrains diversification.

Agroecology was important for agriculture combined with off-farm activities, AG + OF, with households in less favorable agroecological zones, for example, lowlands, being less likely to diversify. Environmental determinism theory best explains this because of the relationship between geographical constraints and limited livelihood opportunities. Few Studies confirm that agroecological disadvantages hinder rural households' ability to access diverse income-generating activities(Deressa et al., 2009; Israel, 2019).

Agriculture and non-farm activities were positively related to land size, indicating that households with larger areas of land can diversify their livelihoods more. The asset-based approach leads to the same conclusion since physical assets are a prime factor in developing

surplus incomes to reinvest into non-agricultural activities. Similarly, Alemu argued that the diversification process is initially based on land resources.

Irrigation positively influenced the likelihood of pursuing agriculture combined with non-farm and off-farm activities (AG + NF + OF). This finding aligns with the agricultural intensification theory, which suggests that irrigation increases productivity and income stability, freeing up resources for diversification. Dawid et al. (2023) and Mudzielwana et al. (2022) highlight that irrigation enhances household resilience and supports alternative livelihoods.

This variable positively correlated with diversification into agriculture combined with non-farm and off-farm activities (AG + NF + OF). Improved access to water reduces the time spent in collecting water, thus allowing households, and especially women, to pursue other productive activities. From the capabilities approach perspective, Amartya Sen asserts that access to basic services enriches economic capabilities(Sen, 1999). The study also underscores that access to reliable water infrastructure can alleviate labor constraints and improve time allocation, especially for women and children who often bear the burden of water collection(Kojo et al., 2023).

Credit access had a stronger influence on AG + OF diversification. The access to financial capital, besides easing liquidity constraints, invests in off-farm ventures as seen from the sustainable livelihoods framework, in an effort to minimize vulnerability. Literatures provide further support that credit enables diversification as it promotes risk-taking and supports economic mobility(Ellis, 1998, 2000).

The dependency ratio had a negative influence on diversification into agriculture and non-farm activities because high dependency burdens constrain household labor resources and limit the diversification potential of a household. This finding supports the household life cycle theory, which suggests that households with more dependents often prioritize subsistence needs. There is also evidences as the roles of dependency ratios is that they reduce economic mobility in rural contexts and negatively affect livelihood diversification(Ellis, 2000).

Finally, extension services were positively related to the diversification into agriculture and non-farm activities. The diffusion of innovation theory explains that extension services introduce the household to new technologies and practices that raise productivity and provide opportunities for diversification. Literatures provide evidence that access to extension services increases resilience and supports diversified income sources(Ellis, 2000).

Qualitative interviews with local leaders revealed the devastating impact of ongoing conflicts on livelihoods. Insecurity in the region, particularly in Kiremu and Gobu Sayo districts, led to widespread displacement, loss of livelihood assets, and market disruptions. Rebel groups like the Oromo Liberation Army (OLA) – fighters in Oromia Regional State and FANO (rebel group based in Amhara Regional State) frequently harassed communities, resulting in the destruction of property, looting, and violence. Many residents were forced to flee, and the loss of agricultural inputs and market access severely affected their ability to sustain livelihoods. Interviewees emphasized that the persistent conflict, coupled with ineffective government interventions, had created a long-term social crisis, with no clear resolution in sight(Tolera, 2023).

In conclusion, access to electricity, credit, education, and agricultural insurance are key drivers of livelihood diversification. However, constraints such as livestock ownership, market access, and conflict-related instability hinder diversification efforts. The findings underscore the need for targeted interventions to promote livelihood resilience, particularly in conflict-affected areas.

CONCLUSIONS

Rural livelihood diversification is crucial in third-world countries, where households often rely heavily on agriculture. These regions face challenges such as limited access to education, infrastructure, and financial services, along with adverse environmental conditions and socio-political instability. Diversification helps mitigate risks associated with uncertainties by stabilizing income, reducing vulnerability to environmental shocks, and providing a buffer against conflict-induced disruptions in agriculture.

Rural households in many developing countries have adopted a variety of livelihood strategies as a way to cope with challenges. These strategies include small-scale trading, wage labor, and

more specialized ventures such as agro-processing and rural tourism. Research shows that households with diversified income sources tend to experience better food security, income stability, and overall well-being compared to those that depend solely on agriculture. For instance, in some regions, non-agricultural income sources account for 30-50% of total household income, highlighting the significance of diversification for sustainable livelihoods.

Climate change and conflict underscore the need for livelihood diversification. In regions such as sub-Saharan Africa and parts of Asia, households face unpredictable weather patterns, prolonged droughts, and floods, which directly affect crop yields and livestock production. At the same time, conflicts over natural resources and political instability exacerbate these vulnerabilities. These challenges make livelihood diversification essential for economic stability and resilience.

Recent research highlights key factors that enhance livelihood diversification, such as education, access to credit, infrastructure improvements, and market access. Studies in Ethiopia, Nigeria, and Bangladesh show that higher education levels, especially for women, significantly increase the likelihood of engaging in non-farm activities. Moreover, access to financial services enables households to invest in new ventures, while better infrastructure reduces transaction costs and increases profitability.

Efforts to enhance rural livelihood diversification require targeted interventions addressing the underlying barriers. This includes investing in education and vocational training programs, strengthening financial systems, and improving rural infrastructure. Policymakers and researchers must continue investigating what drives successful diversification to design effective policies that support rural communities in building resilience against climate change and conflict.

Policy Implications

The diversification of livelihoods is essential in building the resilience of rural households in East Wollega Zone, where climate variability and conflict significantly disrupt traditional agricultural livelihoods. Policies should be geared toward the development of other income-generating activities, such as small-scale enterprises, trade, and craft-making, to reduce

dependence on climate-sensitive agriculture. The setting up of vocational training centers will impart the necessary skills to households, especially the youth and women, for non-agricultural employment, thereby fostering economic diversification and stability.

Equally important would be the enhancement of the agricultural systems themselves. Climate-resilient practices such as introducing drought-resistant crops, conservation agriculture, and irrigation technologies would reduce the impacts on farming from environmental shock. Assuring access to reasonably priced agricultural inputs, such as seeds and fertilizers, may contribute to increasing productivity and adequately protecting livelihoods. Such actions are especially important in areas where agriculture represents the main source of livelihood for most households.

Addressing conflict and insecurity is important for creating an enabling environment for livelihood diversification. The establishment of community-based mechanisms for conflict resolution and collaboration among local leaders, government forces, and communities will go a long way in ensuring peace and stability. For the displaced or affected households, safety nets and rehabilitation programs can prevent further impoverishment and support recovery processes.

Better access to financial services can enhance investment by households in various sources of income. Scale-up of microfinance institutions and insurance mechanisms fitted for rural needs and those of crops and livestock will reduce vulnerability to climate and conflict-related risks. Along with this, infrastructure development is very important, especially transportation and communication systems, to better link rural producers with the markets and opportunities for agro-processing value addition.

Targeted interventions on vulnerable groups include women and youth. Empowerment for women can be enhanced through gender-inclusive policies that address barriers to credit and education, while unemployment and vulnerability to conflict should be handled through focused initiatives on the youth. These should be done with coordination across sectors and through the empowerment of local governance structures. Together, these policies enhance resilience to support sustainable livelihoods in the region.

REFERENCES

Abebe, T., Chalchisa, T., & Eneyew, A. (2021). The Impact of Rural Livelihood Diversification on Household Poverty: Evidence from Jimma Zone, Oromia National Regional State, Southwest Ethiopia. *Scientific World Journal*, *2021*. https://doi.org/10.1155/2021/3894610

Abera, A., Yirgu, T., & Uncha, A. (2021). Determinants of rural livelihood diversification strategies among Chewaka resettlers' communities of southwestern Ethiopia. *Agriculture and Food Security*, *10*(1), 1–19. https://doi.org/10.1186/s40066-021-00305-w

Aboye, A. (2019). *Assessment of Household Food Security and Coping Strategies in Wolaita Zone : The Case of Sodo Zuria Woreda Assessment of Household Food Security and Coping Strategies in Wolaita Zone : The Case of Sodo Zuria Woreda*. *January 2015*.

Alamneh, T., Mada, M., Abebe, T., & Rambaree, K. (2023). The Choices of Livelihood Diversification Strategies and Determinant Factors Among the Peri-Urban Households in Amhara Regional State , Ethiopia. *Cogent Social Sciences*, *9*(2), 1–20. https://doi.org/10.1080/23311886.2023.2281047

Alemu, F. M. (2023). Measuring the intensity of rural livelihood diversification strategies, and Its impacts on rural households' welfare: Evidence from South Gondar zone, Amahara Regional State, Ethiopia. *MethodsX*, *10*(April), 102191. https://doi.org/10.1016/j.mex.2023.102191

Asfew, M., Mitiku, F., Gemechu, A., Bekele, Y., & Lemma, T. (2023). Do climate change and political instability affect crop production in sub-Saharan Africa countries? *Journal of Agriculture and Food Research*, *12*(April), 100576. https://doi.org/10.1016/j.jafr.2023.100576

Assefa, E., Ayalew, Z., Mohammed, H., & Aye, G. (2022). Impact of small-scale irrigation schemes on farmers livelihood , the case of Mekdela Woreda ,. *Cogent Economics & Finance*, *10*(1), 1–20. https://doi.org/10.1080/23322039.2022.2041259

Barrett, C. B., Reardon, T., & Webb, P. (2001). *Nonfarm income diversification and household livelihood strategies in rural Africa : concepts , dynamics , and policy implications*. *26*, 315–331.

Beltrán-Tolosa, L. M., Cruz-Garcia, G. S., Ocampo, J., Pradhan, P., & Quintero, M. (2022). Rural livelihood diversification is associated with lower vulnerability to climate change in

the Andean-Amazon foothills. *PLOS Climate*, *1*(11), e0000051. https://doi.org/10.1371/journal.pclm.0000051

Chan, Y. H. (2005). Biostatistics 305. Multinomial logistic regression. *Singapore Medical Journal*, *46*(6), 259–269.

CSA. (2022). *Ethiopian 2022 Project Population Census*. *July*, 13.

Dawid, I., Haji, J., & Aman, M. (2023). Impact of small-scale irrigation on the livelihood and resilience of smallholder farmers against climate change stresses : Evidence from Kersa district , eastern Oromia , Ethiopia. *Heliyon*, *9*(8), e18976. https://doi.org/10.1016/j.heliyon.2023.e18976

Deressa, T. T., Hassan, R. M., Ringler, C., Alemu, T., & Yesuf, M. (2009). Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. *Global Environmental Change*, *19*(2), 248–255. https://doi.org/10.1016/j.gloenvcha.2009.01.002

Diyammi, M. P. (2022). *Contribution of Rural Electrification in Improving People ' s Liveliho od in Tanzania : A Case of Mpanda District , Tanzania*. *3*(6), 166–173.

Donohue, C., & Biggs, E. (2015). Monitoring socio-environmental change for sustainable development: Developing a Multidimensional Livelihoods Index (MLI). *Applied Geography*, *62*, 391–403. https://doi.org/10.1016/j.apgeog.2015.05.006

Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies*, *35*(1), 1–38. https://doi.org/10.1080/00220389808422553

Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. *Institute of Development Studie*, *51*(2), 289–302. https://doi.org/10.1111/j.1477-9552.2000.tb01229.x

FAO. IFAD, unicef, WFP, W. (2022). The State of Food Security and Nutrition in the World 2022. In *The State of Food Security and Nutrition in the World 2022*. https://doi.org/10.4060/cc0639en

FAO. (2018). Diversification Under Climate Variability as Part of a CSA Strategy in Rural Zambia. *Journal of Development Studies*, *54*(3), 457–480. https://doi.org/10.1080/00220388.2017.1293813

FDRE Planning and Development Commission. (2021). Ten Years Development Plan: A

Pathway to Prosperity. *Ten Years Development Plan: A Pathway to Prosperity*, *2*(ten years development plan.), 86. https://www.ircwash.org/sites/default/files/ten_year_development_plan_a_pathway_to_prosperity.2021-2030_version.pdf

Greene, W. H. (2003). *Econometric Analysis 4th Ed.* (Fifth ed). Prentice Hall.

Gujarati, D. & Porter, D. (2009). *Basic Econometrics* (5th ed.). Mcgraw-Hill Irwin.

Haggblade, S., Hazell, P. B. R., & Reardon, T. (2015). *TRANSFORMING THE RURAL NONFARM ECONOMY: Opportunities and Threats in the Developing World*. *January 2007*.

Hebinck, R. S. (2018). *De- / re-agrarianisation : Global perspectives*.

Hegazi, F., & Seyuba, K. (2024). Gender , livelihood diversification and food security : Insights from rural communities in Zambia. *Journal of Rural Studies*, *109*(June), 103321. https://doi.org/10.1016/j.jrurstud.2024.103321

IMF. (2022). *Climate Change and Chronic Food Insecurity in Sub-Saharan Africa*.

Israel, T. (2019). *Vulnerability analysis of smallholder farmers to climate variability and change : an agro- ecological system-based approach in the Fincha ' a sub-basin of the upper Blue Nile Basin of Ethiopia*. *7*. https://doi.org/https://doi.org/10.1186/s13717-019-0159-7 (2019)

Kojo, S., Ampadu, B., Adwoa, N., Ebo, E., & Amuah, Y. (2023). Impact of improved water supply on livelihood and health : Emphasis on Doba and Nayagnia , Ghana. *Innovation and Green Development*, *2*(1), 100033. https://doi.org/10.1016/j.igd.2023.100033

KOTHARI, C. R. (2004). *Research Methodology: Methods and Techniques*. NEW AGE INTERNATIONAL LIMITED.

Loison, S. A. (2015). *Rural Livelihood Diversification in Sub-Saharan Africa : A Literature Review The Journal of Development Studies Rural Livelihood Diversification in Sub-Saharan Africa : A Literature Review*. *August*. https://doi.org/10.1080/00220388.2015.1046445

Loison, S. A. (2019). Household livelihood diversification and gender: Panel evidence from rural Kenya. *Journal of Rural Studies*, *69*, 156–172.

Mudzielwana, R. V. A., Mafongoya, P., & Mudhara, M. (2022). An Analysis of Livelihood-

Diversification Strategies among Farmworker Households: A Case Study of the Tshiombo Irrigation Scheme, Vhembe District, South Africa †. *Agriculture (Switzerland)*, *12*(11). https://doi.org/10.3390/agriculture12111866

Sen, A. (1999). *COMMODITIES AND CAPABILITIES* (2nd ed.). Oxford University. http://journal.um-surabaya.ac.id/index.php/JKM/article/view/2203

Serrat, O. (2008). The Sustainable Livelihoods Approach. *Knowledge Solutions*, *November*, 21–26. https://doi.org/10.1007/978-981-10-0983-9_5

Tolera, Megersa. (2023). The Effects of Violent Civil Conflicts on Household Security and Government Responses in East Wollega Zone, Oromia Regional State. *World Journal of Education and Humanities*, *5*(3), p106. https://doi.org/10.22158/wjeh.v5n3p106

Usman, M. A. (2021). *Does market access improve dietary diversity and food security ? Evidence from Southwestern Ethiopian smallholder coffee producers*. *8*.

Visser, M. A., Kumetat, G., & Scott, G. (2024). Drought , water management , and agricultural livelihoods : Understanding human-ecological system management and livelihood strategies of farmer ' s in rural California ☆. *Journal of Rural Studies*, *109*(May), 103339. https://doi.org/10.1016/j.jrurstud.2024.103339

Wazza, M. T. (2022). *Ten Years Development Plan of Ethiopia (2021-2030): A Critical Review Ten Years Development Plan of Ethiopia (2021-2030): A Critical Review By Melkamu T . Wazza (Dr .) (Review and Personal Opinion) Email : melkamtw@gmail.com February 2022 Addis Aba*. *February*. https://doi.org/10.13140/RG.2.2.13412.86407

World Bank, G. (2024). ETHIOPIA COUNTRY CLIMATE AND DEVELOPMENT REPORT. *The World Bank Group*, 189a – 190. https://doi.org/10.1596/978-1-4648-0484-7_world_bank_group

Wulff, J. N. (2015). Interpreting Results From the Multinomial Logit Model: Demonstrated by Foreign Market Entry. *Organizational Research Methods*, *18*(2), 300–325. https://doi.org/10.1177/1094428114560024

Acknowledgement

I would like to express my sincere gratitude to Wollega University for their financial support during the course of my study and research. Their generous funding has been instrumental in

enabling me to complete this research. I am deeply appreciative of the resources and opportunities provided, which contributed significantly to the success of this work.

Declaration of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors except 45,000 ETH Birr for data collectors' per diem.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this research or its publication.

Authors' Contributions

Dereje Chimdessa, a PhD candidate, is the corresponding author and carried out all research activities, including the study design, data collection, analysis, and manuscript preparation. Dr. Admassu Tesso served as the major supervisor, providing guidance throughout the research process. Dr. Dereje Tolera acted as the co-advisor, offering additional support and critical insights to enhance the quality of the study.

Ethical Approval

This study was conducted in accordance with ethical standards and approved by Wollega University Gimbi Campus with Ref. letter of PADM 11/2024. Prior to data collection, informed consent was obtained from all participants, and their confidentiality and anonymity were ensured throughout the research process. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

Data Availability Statement

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author, Dereje Chimdessa, upon reasonable request.