Minyiwab, Awoke Dejen; Mengistu, Yismaw Ayelign; Tefera, Tarekegn Dessalegn

Article

The effect of livelihood diversification on food security: evidence from Ethiopia

Cogent Economics & Finance

Provided in Cooperation with:
Taylor & Francis Group

Suggested Citation: Minyiwab, Awoke Dejen; Mengistu, Yismaw Ayelign; Tefera, Tarekegn Dessalegn (2024) : The effect of livelihood diversification on food security: evidence from Ethiopia, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 12, Iss. 1, pp. 1-12, https://doi.org/10.1080/23322039.2024.2345304

Cogent Economics & Finance

ISSN: 2332-2039 (Online) Journal homepage: www.tandfonline.com/journals/oaef20

The effect of livelihood diversification on food security: evidence from Ethiopia

Awoke Dejen Minyiwab, Yismaw Ayelign Mengistu & Tarekegn Dessalegn Tefera

To cite this article: Awoke Dejen Minyiwab, Yismaw Ayelign Mengistu & Tarekegn Dessalegn Tefera (2024) The effect of livelihood diversification on food security: evidence from Ethiopia, Cogent Economics & Finance, 12:1, 2345304, DOI: 10.1080/23322039.2024.2345304

To link to this article: https://doi.org/10.1080/23322039.2024.2345304

Published online: 02 May 2024.

COGENT ECONOMICS & FINANCE
2024, VOL. 12, NO. 1, 2345304
https://doi.org/10.1080/23322039.2024.2345304

DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

OPEN ACCESS Check for updates

The effect of livelihood diversification on food security: evidence from Ethiopia

Awoke Dejen Minyiwab, Yismaw Ayelign Mengistu and Tarekegn Dessalegn Tefera

Department of Economics, Debre Tabor University, Debre Tabor, Ethiopia;

ABSTRACT

Livelihood diversification is relevant in poverty reduction, improve food security and a means of coping mechanism and risk management for survival of households. The research intended to examine the dynamics of livelihood diversification and food security over time, investigate the determinant factors of participation rate among household heads on livelihood diversification and to examine its effect on food security of rural and town households of Ethiopia based on the secondary data of Ethiopia living standard measurement survey. Balanced panel data employed enclosing a total 3729 samples representing national level of Ethiopia. The study used the descriptive analysis, Simpson diversification index and random effect logit model. Dynamics of livelihood diversification and food security observed over time. The random logistic regression model revealed that, household size, gender (female) and distance to market affect the livelihood diversification positively & significantly. Whereas, Age of household head, location (rural), distance to main road, credit access, assistance and experience of shocks influenced the probability of livelihood diversification negatively and significantly. Households who experienced shock and engaged in diversified livelihood have lower food security than being a diversified alone. Policy makers and other stakeholders need to integrate on implementations of livelihood strategies to improve food security, building resilience and vibrant economy.

IMPACT STATEMENT

This study investigated the determinants of household participation to livelihood diversification and the nexus between livelihood diversification and household food security in Ethiopia focusing on rural and small town context. The study used survey dataset collected by the living standard measurement study of the World Bank group in Collaboration with the Ethiopian Central statistical Agency. the data collection covered a wide range of representative sample in the country (a total 3729 samples) and the authors analysed the dynamics in food security over three waves of the survey (i.e. 2011/12, 2012/13 and 2015/16) which is critical policy concern stage in the Ethiopian development planning period (Ethiopia's first growth and transformation plan). The dynamics is observed over the comparison of the survey waves in Ethiopia.

The result revealed that, compared with the first wave, 70.9% stayed driving income from one income source 15.9% and 13.2% of them moved to less and high-level diversifications in the second wave respectively. The transition level of food security increased by 10.7% and 3.6% in wave two and three compared with the first wave. Simpson Diversification Index suggested that the pattern and extent falls between 0.00 and 0.84. About 72.5% of respondents reported as relies only in one income source (i.e., agriculture). There was variability of trends of shocks over time which was observed highest score in wave three.

Household that experiences shock and engaged in less diversified livelihood have lower food security status than being a diversified alone. Policy makers and other stakeholders need to integrate on implementations of livelihood strategies to increase food security, building resilience and vibrant economy.

Thus, this study has the significance to policy makers, practitioners and academicians as it gives take ways to each depending on their respective interest.

ARTICLE HISTORY
Received 30 January 2024
Revised 29 March 2024
Accepted 13 April 2024

KEYWORDS
Livelihood diversification; food security; panel data; household food security

REVIEWING EDITOR
Professor Goodness Aye, University of Agriculture, Makurdi Benue State, Nigeria

SUBJECTS
Development studies; rural development; economics; agricultural economics; economics and development; microeconomics

CONTACT Yismaw Ayelign Mengistu yismaway@gmail.com Department of Economics, Debre Tabor University, Debre Tabor, Ethiopia

Introduction

Background of the study

Food security is an indicator of human welfare. The achievement of food security is a complex but important development priority and an international concern for every human being (Amevenku et al., 2019; Huseynov, 2019). Approximately 805 million people worldwide are suffering from crises of food insecurity situations (Huseynov, 2019). Food insecurity primarily comes from poverty, vulnerability to risk, and non-diversified income (Amevenku et al., 2019). However, a focus on livelihood diversification is relevant to poverty reduction and enhances food security (John Afodu et al., 2020). Diversification is associated with livelihood survival, improving food security, maximizing resilience capacity, and improving households' economic conditions of households. Achieving sustainable food security at the national level remains a great challenge for developing countries (Huseynov, 2019).

In Africa, smallholder farmers contribute approximately 80% of agricultural production (FAO, 2015). Agriculture is the primary livelihood strategy in developing countries. However, in sub-Saharan Africa, it is dependent on the climate and farmers in small hectares of land (John Afodu et al., 2020). On the other hand, non-farm income generating activities are provide an important source of income in developing countries with having potential role in reducing vulnerability of households to poverty (Kassie et al., 2017). Because of the persistence of low agricultural productivity and decline in farm size coupled with an increase in population in sub-Saharan Africa, structural and agricultural transformation appears to move very slowly, which leads to food insecurity (Loison, 2015).

Ethiopia agricultural productivity is found below the expected even though the country has implemented various agricultural development strategies and packages. The strategies formulated so far, do not incorporate an attention for non-agricultural livelihood strategies under the policy frame work (Kassie et al., 2017). Mixed farming, which encompasses crop and livestock production and animal husbandry, is a major source of livelihood in Ethiopia (Asfaw et al., 2017). The average farm size in Ethiopia is less than two hectare (Gebreegziabher et al., 2020). In Ethiopia between a period of 1977–2000 the average farm size declined from 1.43 to 1.03 ha (FAO, 2015). Ethiopian farmers harvest agricultural crops once a year during the summer. Therefore, there is an idle rural productive labor force in the remaining non-agricultural seasons (Kassie et al., 2017). In rural Ethiopia, where rain feeds substance agriculture, the existence of food insecurity and related vulnerability is high (Dewan Arif et al., 2006). Diversified livelihood activities improve household and community resilience to shocks, and enhance household food security, nutrition, and economic well-being (Gebru et al., 2018; Kassie et al., 2017).

According to Endalew and Sen (2020), the traditional rain feed agriculture in rural area of Ethiopia is highly vulnerable to climate change due to disadvantaged socio economic and demographic conditions. Climate change become reality and the dominant factor of food security in particular, for agriculture based livelihood household (Mekonnen et al., 2021). Farming as livelihood activity is associated with immense risk, climate, pest and price fluctuation which is severe in sub Saharan Africa countries including Ethiopia (John Afodu et al., 2020). Ethiopian framers also harvest agricultural crops once a year during the summer season. Therefore, there is an idle rural productive labor force in the remaining nonagricultural seasons (Kassie et al., 2017).

There is growing interest in research on farm and off-farm livelihood diversification in rural economies (John Afodu et al., 2020). Livelihood diversification is a key strategy that takes place at different levels of the economy and is considered a coping mechanism of risk management for farm households (Kassie et al., 2017). On the other hand, empirical evidence has revealed that income from non-farm sources has grown in importance, accounting for 35 percent in sub-Saharan Africa and 50 percent in Asia and Latin America (Alobo Loison, 2015). In Ethiopia, only 37.7 percent of rural household income, which is an insignificant level, comes from non-farm economic activities (Asfaw et al., 2017). Livelihood diversity is an important feature of household survival (ODI, 1999).

Many previous studies have been conducted based on cross-sectional data from individual and narrow areas of data sampling. The nature of cross-sectional data limits the ability to distinguish the distinctive characteristics of households, such as attitudes, from other observable characteristics. The concept of livelihood diversification, status of food security, and vulnerability context is thought to vary over time due to households' proneness to shocks and risks (Dewan Arif et al., 2006). Previous studies

have been conducted in separate disciplines of livelihood diversification and the food security of households. In addition, the studies did not include the expected pushing factor variables, such as shocks and risks, when considering their influence on the effect of food security. Typically, the use of large panel dimension data allows for the account of unobservable household-level heterogeneities (Dimova & Sen, 2010). Panel data contain more information, variability, and efficiency than pure time series or cross-sectional data. This makes it possible to minimize omitted variable bias.

This study examines the dynamics of livelihood diversification over time and investigates the determinants of household participation in livelihood diversification. In addition, it has a motive to examine the effect of livelihood diversification on food security in rural and small-town households of Ethiopia based on the secondary data of the Ethiopian living standard measurement survey of wave one, two and three.

Conceptual framework

Livelihood diversification

This comprises the range and combination of activities and choices that people undertake and make in order to achieve their livelihood outcomes and objectives for their standard of living, which is the ability of rural people to pursue one or a combination of strategies based on their access to assets.

Livelihood outcome is the achievement of livelihood strategies. According to the Department for International Development (DFID), a sustainable livelihood framework, there are five 'categories' of expected livelihood outcomes: more income, increased well-being, reduced vulnerability, improved food security, and more sustainable use of the natural resource base without exploitation for the next generation.

Household preference for livelihood strategy is determined by household preferences and priorities as well as trends (Chinangwa et al., 2016). Livelihood diversification centers on portfolios of diverse activities that enhance livelihood achievements and boost livelihood outcomes to increase the resilience capacity to shocks (Gani et al., 2019).

Livelihood diversification strategies contribute to the expected positive results. Livelihood strategies are characterized by the procedure by which household members build various arrangements of exercise and construct diverse portfolio activities on economic and social support capabilities in their struggle for survival and to improve their way of life and standard of living (Kassegn & Endris, 2021; Khatun & Roy, 2012). Livelihood strategies include how households combine their income-generating activities in proper way of using their assets (Alemayehu et al., 2018). Households can diversify their livelihood through three livelihood strategies and return dimensions, which are commonly known as farm, off-farm, and non-farm activities (Kassie et al., 2017) (Figure 1).

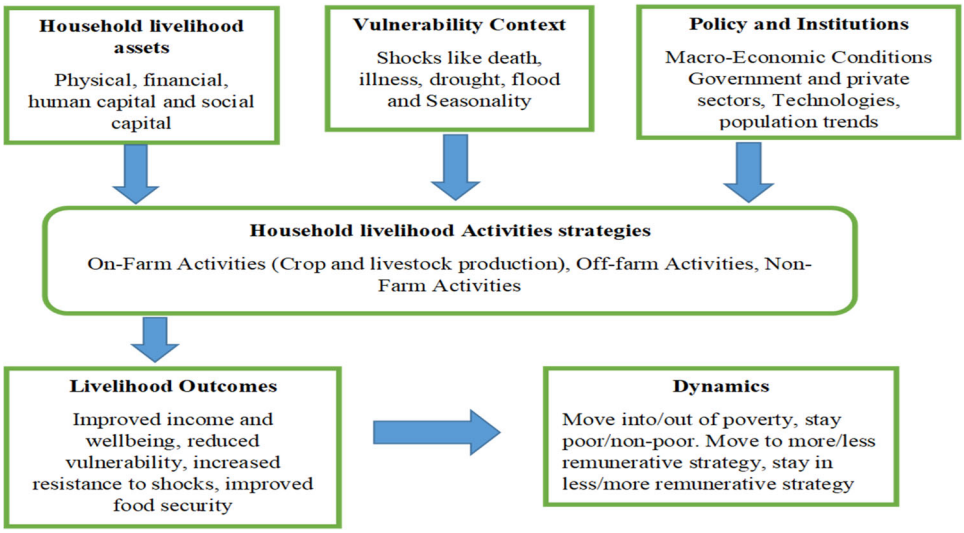

Figure 1. Sustainable livelihood framework (SLF). *Source*: Adopted from (Natarajan et al. (2022); DFID, 1999).

Vulnerability has different definitions in different circumstances. For instance, vulnerability is negatively associated with natural hazards and environmental changes, which negatively affect food security and economic welfare negatively (Eshetu & Guye, 2021). The aim is to identify the trends, shocks, and all aspects of seasonality that are particularly important to livelihoods, which enables the development of a full understanding of all dimensions of vulnerability contexts.

Food security can be ensured if three conditions are fulfilled: food stock at any level from family to nation, food stocks are stable for families, and affordable availability of food for families to have in all periods (Adrian, 1995). Conceptually, food insecurity is a lack of access to nutritional food in terms of nutritional diet in households or countries it exits in two forms: chronic and transitory food insecurity (Gani et al., 2019). Chronic food insecurity occurs when food supplies are persistently insufficient and cannot provide adequate nutrients for all individuals. However, transitory food insecurity occurs when there is a transitory shortfall in access due to distress, such as instability in food production, food price fluctuations, and declining income (Gautam & Andersen, 2016). The literature indicates that there are four pillars of food security dimensions that are critically believed to be sustainable approaches to food security (Kassegn & Endris, 2021). These four pillars are food availability, stability, access, and utilization.

Food security and livelihood-based approaches are complimentary, and it is important to recognize that they also have a high level of communality in terms of their cross-sectional content, people centered, measures dynamic and process-oriented, and macro- and micro-linkage contexts of specific actions (FAO, 2009). Many findings show that farm livelihood diversification activity helps reduce the adverse impact of both short- and long-term on farmers' food insecurity. Off-farm livelihood diversification also plays a significant role in reducing poverty and enhancing food security (Kassegn and Endris, 2021).

Data & methodolgy

Description of the study area

Ethiopia is sub-Sahara, located between 5 and 15 Northing latitude and 35 and 45 Easting longitudes geographically located in the horn of Africa (Komikouma et al., 2021) officially known as the Federal Democratic Republic of Ethiopia (FDRE). The federation is composed of ten regional states and two city administrations counsels comprising more than 500 districts (UNDP, 2019). Ethiopian topography is one of the most rugged areas in Africa, built on four geologic formations in five topographic features: western highlands, western lowlands, eastern highlands, eastern lowlands, eastern highlands, eastern lowlands, and the rift valley. The divers of the economy are mainly in the agriculture and service sectors, which account for 34 and 37% of gross domestic product, respectively.

Data type and source

For the study, secondary data were used in which information was obtained from 2011–12 to up to 2015–16 nationally representative panel data implemented by the Central Statistics Agency (CSA) of the Ethiopian socio-economic survey, which was conducted in collaboration with the World Bank as part of integrated surveys on agriculture programs. The survey included three instrumental questionnaires: household, agricultural, and community.

Sample size and sampling techniques

The sample size was determined by the World Bank and ESS survey. In the first wave (2011–12), 3776 households were interviewed in rural areas and small towns of the country, followed by this in the second wave (2013–14) a total of 5262 households were interviewed, including rural, small town, and urban enumeration areas. In the third wave (2015–16) a total of 4954 households re-interviewed with 5% of attrition level compared with the second wave. However, to generate panel data across three periods, 1293 from wave two and 985 from wave the sample size dropped to balance the data over time. The final sample data of 3729 households were selected for this analysis, which represents both rural and small-town residents that are appropriate for this specific study.

Analytical tools

Descriptive analysis

The analytical approach to livelihood diversification in this study is based on the combination of livelihood diversification indicators, categories of livelihood diversification strategies, and food security pillars and indicators. The descriptive analysis used a tool such as percentage, mean, and standard deviation, which describe the summary statistics of selected socio-economic characteristics derived from the dataset.

Econometric analysis

The objectives were analyzed in accordance with economic theory and empirical evidence. Based on the literature, there are three categories of livelihood activities: on-farm, off-farm, and non-farm activities (Ahmed & Sallam, 2020). The dependent variable was dichotomous, taking 1 for households that diversified their livelihood and 0 for those that did not diversify their livelihood. Therefore, for this study households who diversified their livelihood strategy more than one take value of '1' which represented diversified, on the other side, who didn't diversify and relies only in one livelihood strategy takes a value of '0' represented for non-diversified.

The explanatory variables are commonly used in livelihood diversification based on economic theory and literature, as well as observable covariates that might affect the decision of household livelihood diversification strategies. These include (demographic factors, human capital factors, financial factors, community factors, and shocks) including location dummies to account for rural and urban households (Barrett et al., 2000). The probability that the response is 1 in the logit model is

$$\Pr = y_{it} = 1|x_{it} = \text{Logit}^{1} = (\beta 1 + \beta 2 x_{it}) \frac{\exp(\beta 1 \ + \ \beta 2 xit)}{1 + \exp(\beta 1 \ + \ \beta 2 xit)} \tag{1}$$

To estimate the nature and extent of livelihood diversification, the researcher analyzed the indices of livelihood diversification using Simpson Diversification Index (SID) (John et al., 2020; Tashikalma et al., 2015; Tyenjana & Taruvinga, 2019a), which is the Simpson index of diversity is defined as;

$$\text{SID} = 1 - \sum_{i=1}^{n} p_i^2 \tag{2}$$

where n is the number of income sources, P_i is the proportion of income from source i and i is 1, 2, 3, … n. In this study, the SID model is expressed as

$$\text{SID} = 1 - \{\left(\frac{i1}{THi}\right)^2 + ^{+}\left(\frac{i2}{THi}\right)^2 + \ \left(\frac{i3}{THi}\right)^2 \ldots\ldots \ + \left(\frac{in}{THi}\right)^2\}$$

where *THi*, is total household income.

With this index, the SID value always falls between zero and one. Households with the most diversified incomes have the largest SID value, and less diversified incomes are associated with the smallest SID value. For the least-diversified households (i.e. those that depend on a single income source), SID takes on its minimum value of 0. The upper limit for SID is one, depending on the number of income sources available and their relative shares (Chuong et al., 2015; Saha & Bahal, 2014).

The researcher also examined the effect of livelihood diversification on household food security based on the pillars of food security outcome indicators with and without household experience in shocks. The study adopted the weighted mean of annual food expenditure per adult equivalent for the construction of a relative food poverty line for simplicity and ease of computation, as well as the data available in the survey dataset (Russell et al., 2018). The adult per equivalent (H_j) for each household was obtained by converting household size based on sex, age, and activity levels in the adult equivalent scale, and the total value of food consumed per adult equivalent (F_{*j}) was derived from the divided total value of food expenditure by household adult equivalent (Eneyew & Bekele, 2012).

$$F_{*j} = \frac{Fj}{Hj} \tag{3}$$

Where, $F*j$ = total value of the food consumed per adult equivalent Fj = total value of food consumed by k_{th} household Hj = adult equivalent for k_{th} household.

Random effects logistic regression was also applied to analyze the effect of livelihood diversification on the food security status of households. The effect of natural shocks on household food security status was also estimated, and the effect of livelihood diversification to overcome the shock effect on the food security of the households was analyzed using this model (John et al., 2020). The model is specified as follows.

$$Y_{it} = y_0 \sum y_{jt} x_{jt} + \varepsilon_{jt} \tag{4}$$

$$Y_{it} = yo + y_1 HH\_LHD + y_2 HHN\_shock + y_3 HH\_LHD * HH\_Nshock + Error\,term.$$

Where Y_{it} is the food security status of the HH (0, food insecure 1 food secure), HH_LHD = livelihood diversification of the HHs at time t, N_Shock = HHs experience for natural shocks at time t, and HH_LHD *N_shock = household interaction variable with natural shock at time t.

Result & discussion

Patterns and dynamics of livelihood diversification and food security in Ethiopia

The patterns and dynamics of livelihood diversification and food security can also be observed in the data over time for the three waves. Of the total households in the first wave, 70.9% stayed driving income from one income source 15.9 and 13.2% of them moved to less and high-level diversification, respectively, in the second wave. The Changes in food security level also observed over time at 1% level of significance. In the first wave, only 50.8% of households from the sample size were food secure, it was increased in to 61.5 and 65.1% in wave two and three respectively. Therefore, the transition level of food security changed and increased by 10.7 and 3.6% in wave two and three correspondingly compared with each consecutive period. Households were classified into two levels of food security using weighted food expenditure per adult equivalent as per the survey data of food expenditure. Accordingly, the majority (59.1%) of the households in the sample data were food secure (they were above the food expenditure indicator of relative food poverty line). Whereas, the 40.9% of the households had no experience in the food security. Town residents had relatively higher numbers of food secure households compared with the rural residents, which accounted 73.7% of respondents being food secure the remaining 26.3% were food insecure (Figure 2).

Extent and level of livelihood diversification

The calculated livelihood diversification index from the sample data ranged between 0 and 0.84. The result indicates minimum livelihood diversification indices of 0 (SID = 0.00) and maximum of 0.84 (SID = 0.84) and a mean of 0.16 (SID = 0.16). Based on the Simpson diversification index (SID), only 15.71, 11.79% of households less diversified and highly diversified their livelihood activities, respectively. Households tend to be relatively concentrated in single sources of income. Similar results were observed in previous studies in South Africa and Nigeria (Tyenjana & Taruvinga, 2019a; John et al., 2020).

Agriculture was the most dominant livelihood activity, accounting the share of 72.5% of the total economic activities in rural areas and 55.4% in small-town areas. On the other hand, collectively on-farm

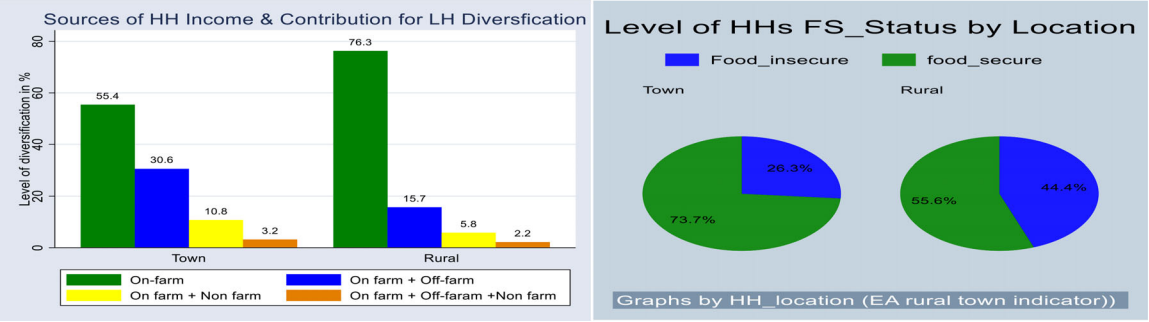

Figure 2. Source of income and status of food security. *Source*: Authors' sketch for the dataset using STATA software.

with off-farm, on-farm with non-farm, and diversified of all (on-farm + off-farm + non-farm) activities contributed 15.7, 5.8, and 2.2%, respectively, in rural areas. Whereas, collectively on-farm with off-farm, on-farm with non-farm, and diversified of all (on-farm + off-farm + non-farm) activities contributed 30.6, 10.8, and 3.2%, respectively, in the small-town area.

Determinants of livelihood diversification in Ethiopia

Random effect binary logistic regression was employed to analyze the determinant factors of the household level of livelihood diversification (Table 1) for the binary output of the dependent variable, classified as diversified and non-diversified.

Based on the estimation using random effect logistic regression for three periods of panel data, other factors are kept constant, as indicated in (Table 1), where household participation in livelihood diversification was determined by different socioeconomic, demographic, and geographic factors.

Age

Other variables remained constant; each year increase in age of household associated with 9.3% decreases the probability of the household participation livelihood diversification overtime statistically significant at 1%. It may be a natural factor that elder households cannot handle many livelihood activities, which leads to dependence on the subsistence of single-income generating activity, and young people are relatively better at looking for alternative livelihoods. This result is consistent with most previous studies (Asravor, 2018; Gebreyesus, 2016; Kassie et al., 2017; Neglo et al., 2021).

Gender

Female headed households have greater probabilities approximately by 3.5% compared with male headed households over time participating in livelihood diversification. A possible reason might be that female-headed households more diversified their income-generating activities because of their involvement in different IGA besides farming. This result is consistent with (Asravor, 2018). However, inconsistent with other studies, according to Kassie et al. (2017).

The size of household

The marginal effect in (Table 1) shows that as household size increases by one unit, the participation in livelihood diversification also increases over time with probability of 1.6% other independent variables kept constant. A possible reason for this could be that a higher number of people in the household creates an opportunity for additional labor force to more likely distribute the available labor force

Table 1. Determinants of livelihood diversification.

HH_LHD	Coef	Robust St.Err	*Z*	P > |z|	Av.marginal effet (dy/dx)
HH_educ (not educated)	0.004	0.05	0.07	0.944	0.001
Gender (female)	0.185***	0.068	2.69	0.007	0.035
AgeHH	−0.492***	0.149	−3.30	0.001	−0.093
HH_Size	0.083***	0.011	7.49	0	0.016
Marital_Stat (married)	0.054	0.073	0.73	0.463	0.010
HH_Location (rural)	−1.085***	0.06	−17.97	0	−0.205
dist_road	0.008***	0.007	1.17	0.241	0.002
dist_market	0.005***	0.001	5.48	0	0.001
HH_crdt_acc (yes, access crdt)	−0.371***	0.051	−7.34	0	−0.070
HH_get_Assit (yes, access to Asis)	−0.185***	0.061	−3.05	0.002	−0.035
HHs_Shock_Hist (yes, faced any of shock)	−0.102**	0.047	−2.16	0.03	−0.019
Constant	0.006	0.501	0.01	0.991	
Constant	−3.741	2.392	b	b	
Mean dependent var	0.276		SD dependent var		0.447
Number of obs	10219		Chi-square		430.188
Number of groups	3,728				
Prob > chi^2	0.000		Akaike crit. (AIC)		11596.008

***$p < .01$; **$p < .05$; * $p < .1$.

Source: Own computation from living standards measurement study. Integrated Surveys of Agriculture (LSMS-ISA (2022).

for additional income-generating activities. This result is consistent with those of other studies conducted in Ghana and Uganda (Abeje et al., 2019; State, 2017) and South Africa (Tyenjana & Taruvinga, 2019b).

Location dummy

The estimated result using average marginal effect indicated that households located in the rural areas were less likely to engage in livelihood diversification by 20.5% compared to households who located in the small-town area over the survey periods at 1% significance level. A possible justification may be the resource endowment differences between rural and town resident households that create a variation level of livelihood diversification activities, and rural households have a predisposing condition to specialization rather than diversification. This result was consistent with a previous study (Kassie et al., 2017) that households residing near towns around the highway that stretches from Addis Ababa to the regional cities probably diversified their livelihood.

Distance to market (dist_market)

Households far from the market center were positively affected at 1% level of significance. As the market distance increased by 1 km, the chance of livelihood diversification of the household declined by 0.1 percent over a time span. This result is in line with those of previous studies (Kassie et al., 2017, Asravor, 2018a). However, based on the study conducted by Demissie (2013) and Baharu, as the market distance decreases by one kilometer, the level of livelihood diversification increases.

Distance to the road (dist_road)

With an increase in distance by one kilometer from the main road, the probability of the livelihood diversification of households decreased by 0.2% at 1% level of significance. A possible reason might be that households far from the main roads might face a lack of access to input, and the output market linkages decline due to the detached social networks to establish business-to-business relationships and convincing platforms. This result is in line with previous studies that proximity to infrastructure and towns has a positive relationship with livelihood diversification (Khatun & Roy, 2012).

Access to credit

Households that access credit decrease probability of livelihood diversification by 7% compared with households that didn't receive a credit across over time. The results of this study showed that access to credit was negatively associated with livelihood diversification. The results suggest that households do not rely on financial services for livelihood diversification; rather, they are able to finance through directly available resources. Other negative factors may also exist.

Household get any assistance

The Households receiving any assistance during the survey period decrease the probability of diversifying their livelihood portfolio by 3.5% relative to households who didn't receive any assistance. This implies that it could promote the culture of dependent syndrome on the attitude of households rather than engaging in different livelihood activities.

Households experience to shock

Households who faced any shocks during the survey period have negative and significant at 2% level, affecting the chance of livelihood diversification by 1.9% compared with the households who didn't report any of shocks during the survey periods. This implies that different types of shocks have a negative impact on the sustainability of livelihood activities due to their adverse effects. The result was inconsistent with a former study conducted in rural Nigeria (Dedehouanou & McPeak, 2020), in which households facing shocks tended to diversify their livelihood to overcome the risk of shocks and climate change (Sime Kidane & Wale Zegeye, 2020).

Table 2. Effect of livelihood diversification on food security.

HH_Fs_Stat	Coef	Robust St.Err	*z*	P > |z|	Av.Mar.effect(dy/dx)
HH_LHD (diversified)	0.112**	0.05	2.25	0.025	0.027
N_shock_Occ(yes experienced)	−0.232***	0.056	−4.14	0	−0.056
LH_Nshcok(LH_Nshcok)	0.023	0.121	0.19	0.849	0.006
Constant	0.379***	0.027	13.84	0	
Constant	−3.053	0.94	.b	.b	
Mean dependent var	0.589		SD dependent var		0.492
Number of obs	10,425		Chi-square		29.688
Number of groups	3,728		Log likelihood		−7045.3839
Prob > chi^2	0.000		Akaike crit. (AIC)		14100.768

***$p < .01$; **$p < .05$; *$p < .1$.
Source: Own analysis from LSMS-ISA (2022).

Effect of livelihood diversification on food security status of households

The food security status of households was assessed using the Fooster-Greer-Thorbecke (FGT) poverty measures (John et al., 2020). To identify the food security level, the study adopted a weighted mean of annual food expenditure per adult equivalent relative food poverty line for simplicity and ease of computation, as well as the data available in the survey dataset.

Referring to Table 2 above, Being diversified has an average food security higher by about 0.112, with a shock experience having a lower average food security of about 0.232 and an average food security of 0.097 $(0.112 - 0.232 + 0.023)$. Therefore, being both or a household that experiences shock and engaged in diversified livelihood has lower food security than being diversified alone or a higher food security than the one who is experiencing shock alone. This indicates that increasing the number of livelihood diversifications engaged in by households leads to increased stable income and consequently leads to food security. The magnitude is positive, and the probability increased by 2.7% of food security status relative to the households that didn't diversify their livelihoods. This result parallels that of a previous study, in which income diversification contributed positively to food security (Etea et al., 2019). Diversified agriculture also has a positive effect on food security (Waha et al., 2018).

Conclusion & recommendations

Conclusion

The researcher took advantage of one of the large panel surveys carried out under the Living Standard Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA), conducted by the World Bank and Central Statistics Agency of Ethiopia. By enclosing three consecutive periods of wave one, two and three. According to the study, the dynamics of livelihood diversification and food security across wave periods were observed ($p<.05$). For instance, of the total households from first wave, 70.9% stayed driving income from one income source 15.9 and 13.2% of them moved to less and high-level diversification in the second wave, respectively. The transition level of change food security increased by 10.7 and 3.6% in wave two and three compared with each consecutive period at ($p<.05$).

Other things kept constant, the random logistic regression model revealed that household size, gender (female), and distance to market affect the livelihood diversification positively at 1% level of significance across the time span. On the other hand, the age of the household head, location (rural), distance to main road, access to credit and assistance, and experience of shocks are negatively and significantly influenced, respectively. Households located in the rural areas were less likely to engage in livelihood diversification by 20.5% compared with households who located in the town area over the survey period. A possible justification may be the resource endowment differences between rural and town resident households that create a variation level of livelihood diversification activities. In addition, rural households mainly depend on their livelihood only in the agriculture sector because of their access to land compared to town-resident households.

With regard to the effect of livelihood diversification on food security status have found positive at 2% level of significance and opposite results observed in households with experience of shocks.

Recommendations

Based on the findings, the researcher recommends the following:

- It is necessary to design appropriate credit access modalities and intensive training approaches, and capacitate households in financial literacy skills to become credit-worthy as intended.
- It would be better to given as attention and being focus on livelihood diversification in rural and town areas for the better achievement of the Food Security Office of Agriculture, as small and micro enterprises and TVET colleges should work intensively in layering and sequencing.
- The food security problem in rural areas remains a major problem, and is the main concern of the government and other international and local developmental organizations for cooping strategies and livelihood diversification approaches. Aid organizations should apply sustainable development operations to reduce vulnerability and enhance resilience and food security in rural areas.

In addition to the aforementioned recommendations, the researcher would like to recommend researcher to conduct detailed and further investigation on factors that improve the business and institutional enabling environment for livelihood diversification and food security.

Acknowledgment

No funding was received. There was no fund received from any organization to undertake this study. All expenses are covered by the study team.

Author contributions

All the three authors have contributed significantly to the writing of this article. Awoke Dejen Minyiwab and Yismaw Ayelign Mengistu were responsible for the study's conception, design, and development. Tarekegn Dessalegn has written literature review and guided the method of estimation selection. Awoke Dejen Minyiwab has made the first draft of the article which was reviewed by Yismaw Ayelign Mengistu with modification made by same. Access for the Dataset was made by Yismaw Ayelign Mengistu. All the three authors contributed fairly equally during the data analysis as well as reviewing and editing the article. The discussion was reviewed by Yismaw Ayelign Mengistu and edited by Awoke Dejen Minyiwab for final research report. Lastly, Yismaw Ayelign Mengistu prepared the article in line with the authors' guideline of the journal.

Disclosure statement

No potential conflict of interest was reported by the author(s). We all are aware and have agreed up on submission of the paper for the journal.

ORCID

Yismaw Ayelign Mengistu http://orcid.org/0000-0002-8777-0627

Data availability statement

The raw dataset is obtained from Ethiopian socio-economic survey from living standard measurement study (LSMS) which was collected by the Ethiopian central statistical agency in collaboration with the World Bank Group. It is available at https://microdata.worldbank.org/index.php/catalog/3823/get-microdata. The dataset extracted for this study and the do file will be made available on request.

References

Abeje, M. T., Tsunekawa, A., Adgo, E., Haregeweyn, N., Nigussie, Z., Ayalew, Z., Elias, A., Molla, D., & Berihun, D. (2019). Exploring drivers of livelihood diversification and its effect on adoption of sustainable land management practices in the upper Blue Nile basin, Ethiopia. *Sustainability*, *11*(10), 2991. https://doi.org/10.3390/su11102991

Adrian, F. (1995). *Dynamics of food security in recent decades* (pp. 192–196). Florea Adrian University of Oradea Faculty of Economics.

Ahmed, O., & Sallam, W. (2020). Assessing the potential of improving livelihoods and creating sustainable socio-economic circumstances for rural communities in upper Egypt. *Sustainability*, *12*(16), 6307. https://doi.org/10.3390/su12166307

Alemayehu, M., Beuving, J., & Ruben, R. (2018). Risk preferences and farmers' livelihood strategies: A case study from eastern Ethiopia. *Journal of International Development*, *30*(8), 1369–1391. https://doi.org/10.1002/jid.3341

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A Literature Review. *The Journal of Development Studies*, *51*(9), 1125–1138. https://doi.org/10.1080/00220388.2015.1046445

Amevenku, F. K. Y., Kuwornu, J. K. M., Seini, A. W., Osei-Asare, Y. B., & Anim-Somuah, H. (2019). Livelihood vulnerabilities and diversification of fishing households in Ghana. *Development in Practice*, *29*(7), 867–881. https://doi.org/10.1080/09614524.2019.1636933

Asfaw, A., Simane, B., Hassen, A., & Bantider, A. (2017). Determinants of non-farm livelihood diversification: Evidence from rainfed-dependent smallholder farmers in northcentral Ethiopia (Woleka sub-basin). *Development Studies Research*, *4*(1), 22–36. https://doi.org/10.1080/21665095.2017.1413411

Asravor, R. K. (2018). Livelihood diversification strategies to climate change among smallholder farmers in Northern Ghana. *Journal of International Development*, *30*(8), 1318–1338. https://doi.org/10.1002/jid.3330

Barrett, C. B. C., Reardon, T., Christopher, B., & Barrett, T. R. (2000). *Asset, activity, and income diversification among African agriculturalists: Some practical issues*. Project report to the USAID BASIS CRSP. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=257344.

Chinangwa, L., Pullin, A. S., & Hockley, N. (2016). Livelihoods and welfare impacts of forest comanagement. *International Journal of Forestry Research*, *2016*, 1–12. https://doi.org/10.1155/2016/5847068

Chuong, O. N., Thao, N. T. P., & Ha, T. L. Y. (2015). Rural livelihood diversification in the South Central Coast of Vietnam (pp. 1–25).

Dedehouanou, S. F. A., & McPeak, J. (2020). Diversify more or less? Household income generation strategies and food security in rural Nigeria. *The Journal of Development Studies*, *56*(3), 560–577. https://doi.org/10.1080/00220388.2019.1585814

Demissie, A. (2013). Determinants of income diversification among rural households: The case of smallholder farmers in Fedis district, Eastern Hararghe zone, Ethiopia. *Journal of Development and Agricultural Economics*, *5*(3), 120–128. https://doi.org/10.5897/JDAE12.104

Dewan Arif, R., Langworthy, M., & Aradhyula, S. (2006). *Livelihood shocks and coping strategies: An empirical study of Bangladesh households*. American Agricultural Economics Association.

Dimova, R., & Sen, K. (2010). Is household income diversification a means of survival or a means of accumulation? Panel data evidence from Tanzania. *BWPI Working Paper*, *April 2010*. www.manchester.ac.uk/bwpi.

DFID. (1999). Sustainable livelihoods guidance sheets: Framework introduction vulnerability transforming. Context, 26.

Endalew, H. A., & Sen, S. (2020). Effects of climate shocks on Ethiopian rural households: An integrated livelihood vulnerability approach. *Journal of Environmental Planning and Management*, *64*(3), 399–431. https://doi.org/10.1080/09640568.2020.1764840

Eneyew, A., & Bekele, W. (2012). Causes of household food insecurity in Wolayta. *Journal of Stored Products and Postharvest Research, 3*(3), 35–48. https://doi.org/10.5897/JSPPR11.069

Eshetu, F., & Guye, A. (2021). Determinants of households vulnerability to food insecurity: Evidence from southern Ethiopia. *Journal of Land and Rural Studies*, *9*(1), 35–61. https://doi.org/10.1177/2321024920967843

Etea, B. G., Zhou, D., Abebe, K. A., & Sedebo, D. A. (2019). Household income diversification and food security: Evidence from rural and semi-urban areas in Ethiopia. *Sustainability*, *11*(12), 3232. https://doi.org/10.3390/su11123232

FAO. (2009). *Declaration of the world summit on food security*. World Food Summit. www.fao.org

FAO. (2015). *The economic lives of smallholder farmers* (vol. 39). FAO Food and Agriculture Organization of the United Nations.

Gani, B. S., Olayemi, J. K., & Inoni, O. E. (2019). Livelihood diversification strategies and food. *Ekonomika Poljoprivrede*, *66*(1), 281–295. https://doi.org/10.5937/ekoPolj1901281G

Gautam, Y., & Andersen, P. (2016). Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *Journal of Rural Studies*, *44*, 239–249. https://doi.org/10.1016/j.jrurstud.2016.02.001

Gebreegziabher, Z., Van Kooten, G. C., Etea, B. G., Zhou, D., Abebe, K. A., Sedebo, D. A., Abeje, M. T., Tsunekawa, A., Adgo, E., Haregeweyn, N., Nigussie, Z., Ayalew, Z., Elias, A., Molla, D., Berihun, D., Gautam, Y., Andersen, P., Sisha, T. A., Etana, D., … Wale Zegeye, E. (2020). Analysis of households food insecurity and its coping mechanisms in Western Ethiopia. *Sustainability*, *12*(1), 1–10. https://doi.org/10.1186/s40100-019-0124-x

Gebreyesus, B. (2016). Determinants of livelihood diversification: The case of Kembata Tambaro Zone, Southern Ethiopia. *Journal of Poverty, Investment and Development*, *23*(0), 1–10. https://www.iiste.org/Journals/index.php/JPID/article/view/30208.

Gebru, G. W., Ichoku, H. E., & Phil-Eze, P. O. (2018). Determinants of livelihood diversification strategies in Eastern Tigray Region of Ethiopia. *Agriculture & Food Security*, *7*(1), 1–9. https://doi.org/10.1186/s40066-018-0214-0

Huseynov, R. (2019). Multidimensional determinants of national food security in Azerbaijan: An application of the ARDL approach. *Zeszyty Naukowe SGGW w Warszawie - Problemy Rolnictwa Światowego*, *19*(4), 58–68. https://doi.org/10.22630/PRS.2019.19.4.56

John A. O., Carolyn Afolake, A., & Olubunmi Lawrence, B. (2020). Effect of livelihood diversification and technology adoption on food security status of rice farming households in Ogun State. Nigeria. *Agricultural Social Economic Journal*, *20*(3), 233–244. https://doi.org/10.21776/ub.agrise.2020.020.3.7

Kassie, G. W., Kim, S., Fellizar, F. P. Jr., & Ho, B. (2017). Determinant factors of livelihood diversification: Evidence from Ethiopia. *Cogent Social Sciences*, *3*(1), 1369490. https://doi.org/10.1080/23311886.2017.1369490

Kassegn, A., & Endris, E. (2021). Review on livelihood diversification and food security situations in Ethiopia. *Cogent Food & Agriculture*, *7*(1), 1882135. https://doi.org/10.1080/23311932.2021.1882135

Khatun, D., & Roy, B. C. (2012). Rural livelihood diversification in West Bengal: Determinants. *Agricultural Economics Research Review*, *25*(1), 115–124.

Komikouma, A. W. N., Tnsue, G., & Kaiyu, L. (2021). Determinants of participation in non-farm activities and its effect on household income: An empirical study in Ethiopia. *Journal of Development and Agricultural Economics*, *13*(1), 72–92. https://doi.org/10.5897/JDAE2020.1231

Mekonnen, A., Tessema, A., Ganewo, Z., & Haile, A. (2021). Climate change impacts on household food security and adaptation strategies in southern Ethiopia. *Food and Energy Security*, *10*(1), 1–14. https://doi.org/10.1002/fes3.266

Natarajan, N., Newsham, A., Rigg, J., & Suhardiman, D. (2022). A sustainable livelihoods framework for the 21st century. *World Development*, *155*, 105898. https://doi.org/10.1016/j.worlddev.2022.105898

Neglo, K. A. W., Gebrekidan, T., & Lyu, K. (2021). The role of agriculture and non-farm economy in addressing food insecurity in Ethiopia: A review. *Sustainability*, *13*(7), 3874. https://doi.org/10.3390/su13073874

ODI. (1999). *Rural livelihood diversity in developing countries: Evidence and policy implications* (vol. *40*). Overseas Development Institute.

Russell, J., Lechner, A., Hanich, Q. A., Delisle, A., Campbell, B. M., & Charlton, K. (2018). Assessing food security using household consumption expenditure surveys (HCES): A scoping literature review. *Public Health Nutrition*, *21*(12), 2200–2210.

Saha, B., & Bahal, R. (2014). Livelihood diversification pattern among the farmers of West Bengal. *Economic Affairs*, *59*(3), 321. https://doi.org/10.5958/0976-4666.2014.00001.1

Sime Kidane, M., & Wale Zegeye, E. (2020). The nexus of income diversification and welfare: Empirical evidence from Ethiopia. *African Journal of Science, Technology, Innovation and Development*, *12*(4), 343–353. https://doi.org/10.1080/20421338.2019.1640930

State, P. R. (2017). Rural household livelihood strategies choices: The case of Humbo Woreda, Wolaita zone, southern nation nationalities and Peoples Regional State, Ethiopia. *Journal of Economics and Sustainable Development*, *8*(3), 69–85.

Tashikalma, A. K., Michael, A., & Giroh, D. Y. (2015). Effect of livelihood diversification on food security status of rural farming households in Yola South local government area, Adamawa State, Nigeria. *Adamawa State University Journal of Agricultural Science*, *3*(1), 33–39.

Tyenjana, A., & Taruvinga, A. (2019a). Determinants of rural on-farm livelihoods diversification: The Case of Intsika Yethu local municipality, Eatern Cape, South Africa. *Journal of Agribusiness and Rural Development*, *54*(4), 373–384. https://doi.org/10.17306/J.JARD.2019.01200

Tyenjana, A., & Taruvinga, A. (2019b). Determinants of rural on-farm livelihoods diversification: the case of Intsika Yethu local municipality, Eastern Cape, South Africa. *Journal of Agribusiness and Rural Development*, *54*(4), 373–384. https://doi.org/10.17306/J.JARD.2019.01200

UNDP. (2019). Ethiopia offers a good example of fast growth, rapid poverty reduction and stable inequality. Income inequality trends in Sub-Saharan Africa (pp. 294–315).

Waha, K., van Wijk, M. T., Fritz, S., See, L., Thornton, P. K., Wichern, J., & Herrero, M. (2018). Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biology*, *24*(8), 3390–3400. https://doi.org/10.1111/gcb.14158