

Research Article

Factors Influencing Household Livelihood Diversification: The Case of Kebri Dahar District, Korahey Zone of Somali Region, Ethiopia

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In Ethiopia, livelihood diversification has become a major source of income for rural communities. This study was carried out in rural kebeles in the Kebri Dahar district, and it focuses on livelihood diversification strategies and the factors that affect livelihood diversification. The collected types of data were from primary and secondary sources based on a qualitative and quantitative basis. Multistage sampling techniques were employed in selecting the representative households of 119 respondents. Furthermore, multinomial logistic regressions were used to analyze and achieve the objective. Statistical Package for Social Sciences (SPSS) version 20 was used to analyze the collected data. The results revealed that 33.6%, 3.30%, 10.1%, and 52.9% of the respondents participated in the on-farm, off-farm, nonfarm, and combinations of livelihood activities, respectively. The descriptive statistics showed that 52.9% of the respondents diversified their livelihoods and 47.1% did not. The multinomial logistic regression shows that being male-headed as well as the increased age of HH head were found to be significant at a 1% significance level in three livelihood activities which positively and negatively influenced livelihood diversification. Livelihood diversification has a positive impact on security in the study area. Thus, it should be promoted not only by the government and nongovernmental organizations but also by individuals who are interested in livelihood diversification since it implies food security.

1. Introduction

Livelihood diversification is an important strategy for income-generating activities for rural households in developing countries. Agriculture has remained the dominant livelihood strategy, contributing 15% of total GDP, 80% of smallholder farms, and employing approximately 175 million people directly in the labor force in sub-Saharan Africa [1]. Agricultural productivity is the lowest and even shows a decreasing trend, causing a decline in per capita cereal consumption at the national level [2]. However, the diversification of the livelihoods of rural households is no single activity, and the factors determining farmers' decisions for choosing and adopting diversification activities

are different. For instance, the distribution of assets and wealth background status plays a crucial role in households' choice of what type of livelihood diversification strategy is appropriate for them.

The determinant factors of livelihood diversification are very important in determining a household's food security status [3]. Livelihood diversification leads to livelihood outcomes consisting of improved food security, an increment in income, reduced vulnerability to shocks, and sustainable use of natural resources.

However, undiversified livelihood options and complete dependence on agricultural products were the main problems that exacerbated food insecurity in rural areas. The ability to diversify livelihood at all levels is often critical for

the most vulnerable rural populations [4]. In many rural areas, agriculture alone cannot provide enough livelihood opportunities, but diversification may have a positive impact on the livelihoods of rural households both for consumption and market purposes. Resource-poor households use livelihood diversification as a survival strategy to cope with shocks and risky environments, whereby resource-rich households use livelihood diversification in an attempt to reap the benefits of development [5].

Furthermore, some empirical evidence on livelihood diversification is limited to nonfarm income generation, with little variation in how income affects other important outcomes such as food consumption, education, training, credit, dependency ratio, family size, and health [6]. Therefore, this study tried to respond to the gaps explained previously by investigating the determinant factors influencing the diversification of livelihoods. Additionally, there is a wide difference in the literature on the share of nonfarm and nonfarm livelihood strategies [7]. About 33% of rural households engage in off-farm livelihood activities, indicating that income from farming is not sufficient to support the household's livelihood needs.

Most Ethiopians' livelihoods are agriculture-based, labor productivity is low, and large numbers of the population are net cereal buyers [3]. Due to the primary dependence on subsistence crop production in the country, harvest failure leads to household food problems due to the absence of off-farm income opportunities, which leads to asset depletion and destitution at the household level [8].

The Somali regional state has a long history of political and economic marginalization, which makes one of the poorest regions in Ethiopia acutely underserved in terms of electricity, water, and other infrastructure facilities such as roads and social services.

Kebri Dahar district is one of the drought-prone and vulnerable districts in the Koraheye zone of the Somali Regional State of Ethiopia, which is characterized by permanent drought, malaria, and high temperatures, preventing people from working permanently. As a result, most of society does not have an interest in involving farmland. Instead, they depend on imported and donated food for consumption, which does not cover even household food needs. The reason why the land was not cultivated during rainfall is unknown. The purpose of this study was to identify the factors that influence diversification in the study area.

1.1. Conceptual Framework of the Study. The framework helps policymakers to have broad plans to improve household livelihood activities. By reviewing many studies and actual-world situations, it was found that rural households' livelihood earnings were influenced by institutional, physical and environmental, demographic, and socioeconomic factors (Figure 1). However, no single factor can exist in isolation without the influence of others. Therefore, this study was trying to assess the relationships of independent variables with the dependent variable, which gives us an outcome of either diversified or undiversified livelihood.

2. Methodology

2.1. Description of the Study Area. Kebri Dahar is one of the ten districts in the Koraheye zone of the Somali region state of Ethiopia that is highly affected by climate-related risks such as drought, diseases of both humans and animals, and production failures.

Due to that problem, the district was selected purposefully to investigate the issue of factors influencing livelihood diversification. The district is located in the eastern part of the region, bordered to the south by Kudunbur, to the west by the zone's Bodalay district, to the northeast by the zone's El-Ogaden district, to the north by the zone's Shaekosh district, and to the east by the zone's El-Ogaden district (Figure 2). This district's average elevation is 706 meters above sea level, and temperatures range from around 37 degrees Celsius in April to 27.7 degrees Celsius in November. As a result, Kebri Dahar's average temperature is 31.6°C, with a latitude and longitude of 6.7417°N and 44.2621°E, respectively. The district's area coverage was estimated at 9450.4 km² with an average annual rainfall of 1037 mm. During the most dangerous seasons, annual rainfall varies by an average of 90.2 mm [9].

2.2. Sampling Procedure and Sample Size Determination. A multistage sampling technique was employed to select the representative household heads for this study. The study district was purposefully selected among ten districts of the zone knowing the background of the area to investigate the existence of the gap between diversified and undiversified based on the bases of livelihood activities for the food security of the rural household. Three rural kebeles were selected through the lottery method in the second stage considering time, financial resources, and the representation of the district population. Based on the procedure, Darussalam, Dala, Ada, and Dalad kebeles were selected. The total numbers of households in kebeles were 1000, 950, and 1025, respectively, which yielded a total of 2975 households frame. The third stage involved the selection of household heads from the chosen rural kebeles by using systematic random sampling. The total sample size was estimated to be 119 households using the following sample size determination formula adapted from Israel (1992). $n = N / (1 + N(e)^2)$ where N = the total population that was studied, n = the required sample size, e = the precision level, which is (9%), where the confidence level is 95% at $P = \pm 5$ (maximum variability). The selected kebeles are composed of 2975 households frame. By replacing the abovementioned formula, it becomes 118.577, approximately 119 households. Then, the distribution of sample size across the kebeles by using probability proportional to sample size is as indicated in Table 1.

2.3. Methods of Data Collection. Gathering the required data based on qualitative and quantitative data by triangulating different methods, the following data collection methods were employed. *Household survey:* for a household survey of the study, closed questions were used for the interview

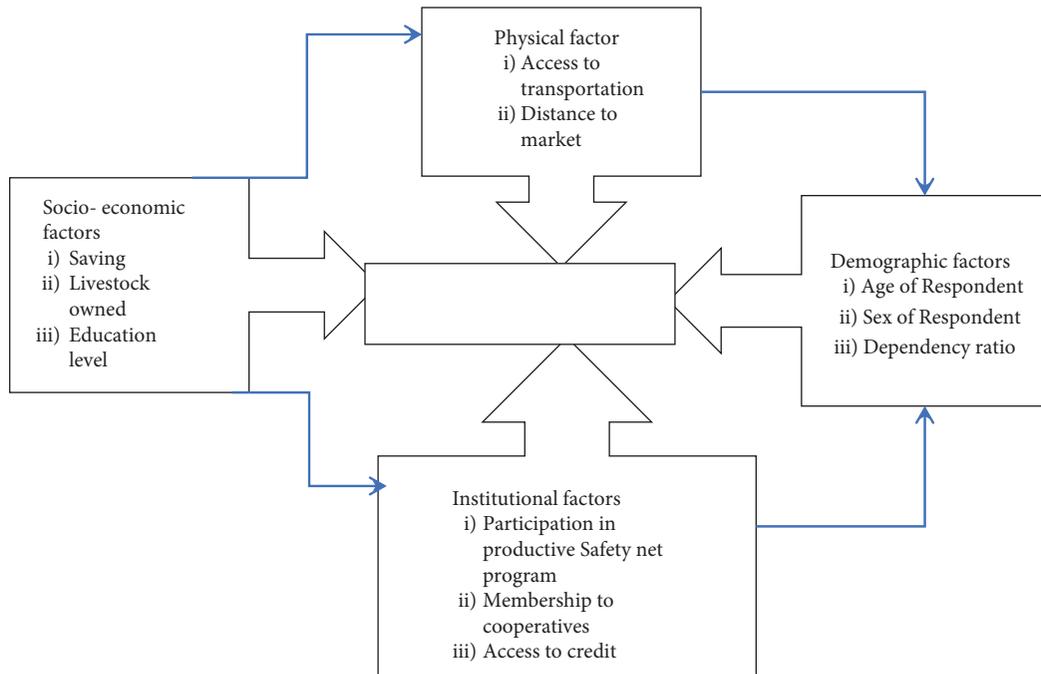


FIGURE 1: Conceptual framework of the study. Source: authors' own constructed.

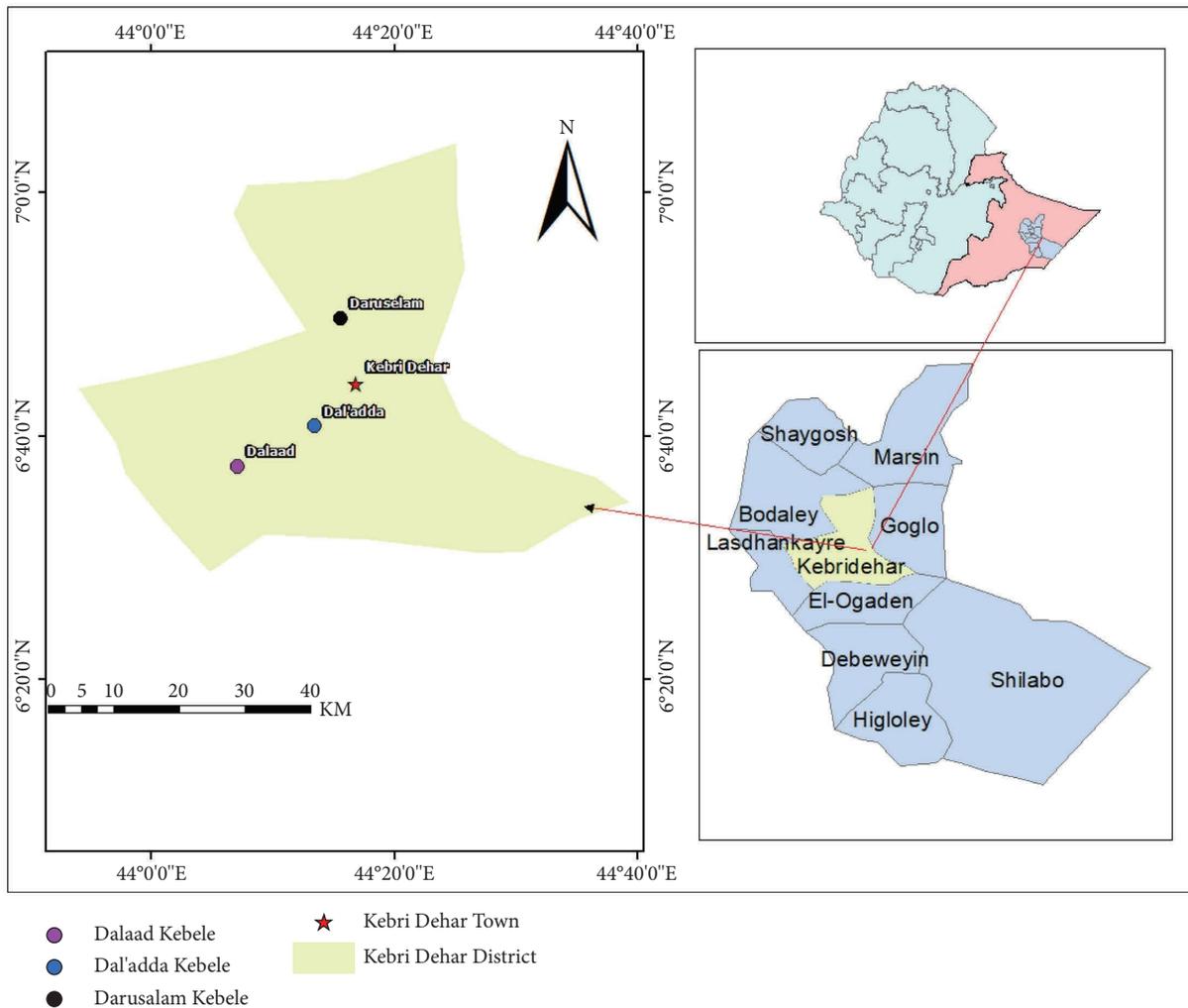


FIGURE 2: Map of the study area. Source: adopted, BOFED (2018).

TABLE 1: Sample size and distribution by sample kebeles.

S/N	Sample Kebeles	Target Population	Selected Respondents
1	Darusalam	1000	40
2	Dalad	1025	41
3	Dala, ada	950	38
4	Total	2975	119

Source: Own survey result (2022)

schedule of the HH heads. The interview schedule was prepared in English and translated into the local language (Somali during data collection). Therefore, before collecting the data, a pretest was conducted to make the necessary modification.

Focus group discussion (FGD): in addition to the household survey, FGD was the most important data collection method to generate qualitative information. A total of six FGDs were conducted for two FGDs each kebele within a limited number of discussants in each FGD. The participants of FGDs were influential and well-experienced individuals from the communities in the study area such as model farmers and active individuals of the community. The questions in the checklist were concerned with the specific objectives areas whether livelihood diversification influences household food security was considered as the guide to discussions, although the participants were contained major in age, male, and female, which have experience in the area background.

Key informant interview: it was conducted with different individuals and officials in the study district. The first three interviews were conducted with kebele administrators of sample kebeles (Darussalem, Dala, Ada, and Dalad). The reason to have a key informant interview with the kebele administrator's level was the due to the fact that they have close relationships with both community members and it was possible to get important information at the grass-root level. The second key informant interview was conducted with the district Food Security Coordination Officer. The district Food Security Coordination, animal, and agricultural office have a responsibility to manage, coordinate, and follow-up the whole process of livelihood activity. Information about livelihood diversification, as well as challenges and opportunities and whether a diversified household has met the primary objective of the program (i.e., food security), was gathered from the coordination office. The third interview was held with the district administrator to get a complete picture of the household's income activity. To cross-check the validity of information obtained from the official key informants, conduct the other key informant interview with individuals from the host community and administrators as part of the data collection process on

the issue of the role of livelihood diversification on households' food security.

Field observation: in addition to the previously mentioned methods, field observations were also made to supplement the data collection process. It includes observation of livelihood involvement such as farming and nonfarming activities; natural resource management and its coverage in the area, social interaction at marketplaces, churches, and mosques, as well as livelihood diversification in household food security of selected kebele of the district.

2.4. Methods of Data Analysis. The information gathered from different sources was compiled in a way that was easy to manage. Types of data analysis, namely, statistics (descriptive and inferential) and econometric models, were used to analyze the data collected from sampled households. The qualitative data were analyzed through narration, summarization, and discussion and interpreted to obtain accurate results on the role of livelihood diversification of livelihoods on the food security of rural households food security; whereas the quantitative data were analyzed using simple descriptive statistics such as frequency, mean, and standard deviation. The significance group differences test (*t*-test and chi-square test) was used. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 20 to examine the role of diversification for rural households' food security of rural households in general and the analysis of diversification strategies, determinant factors of livelihood diversification, and impact of livelihood diversification for food security in particular.

2.5. Statistical Analysis. The study used one-way ANOVA (Analysis of variance) to compute whether there are differences among groups with different livelihood strategies concerning the average of the continuous dependent variable. While the Chi-square test was conducted to test the association between categorical variables and the livelihood strategies identified.

Lastly, multinomial logistic regression (MLR) was used to test the effect of dependent variables (metric or dichotomous) on the dependent variable with more than two categories. In this study, the dependent variables, livelihood

diversification, have three categories, and food security status is an outcome that fits MLR [10]. Before the estimation of the logistic regression model, the existence of multicollinearity was checked among explanatory variables. The correlation between two variables is simply the square root of R^2 , combined with a sign indicating a positive or negative association. If we see values close to 1 or -1 that indicates variables are strongly associated with each other and we may have multicollinearity problems.

The easiest way to measure the extent of multicollinearity is to simply look at the matrix of correlations between the individual variables. In addition, the variance inflation factor (VIF) was used to check the degree of linear relationships among continuous explanatory variables, and the contingency coefficient was used to check for association among discrete variables. VIF for all variables used in the study was less than 10, and thus, the nonexistence of association between the continuous variables included in the model was confirmed.

$$VIF(\beta_j) = \frac{1}{1 - R_j^2}. \quad (1)$$

2.6. Econometric Model Specification. Both Probit and logit analysis are well-established approaches in the literature to estimate dummy dependent variables [11]. However, when there are many observations at the extremes of the distribution, then logit is preferred over probit [12]. [13] also reported that the logit model is computationally easier to use than the other type. Therefore, the logit model was applied in this study to assist in estimating the probability of livelihood diversification that can take one of two values, diversified, or undiversified. According to Gujarati [14], the functional form of the logit model is presented as follows: Following the work of [15], the multinomial logit model can be specified as follows. Let U_{ij} denote the utility that the household i gets from choosing an alternative activity.

$$U_{ij} = u_{ij} + \beta_{ij} = X_{ij}Y_j + \beta_{ij}, \quad (2)$$

where Y_j varies and X_i remains constant between alternatives and is a random disturbance term reflecting intrinsically random choice behavior, measurement or specification error, and unobserved attributes of alternatives.

Let also P_{ij} ($j=0, 1, 2, 3, 4, 5, 6, 7$) denote the probability associated with the off/nonfarm activities choices of household i with; $j=0$ if the household does not participate in any livelihood activity, $j=1$ if the household participates on farm livelihood activity, $j=2$ if the household participates in off-farm livelihood activity, $j=3$ if the household participates nonfarm livelihood activity, $j=4$ if the household participates on-farm plus off-farm livelihood activity, $j=5$ if the household participates on-farm plus nonfarm livelihood activity, $j=6$ if the household participates off-farm plus nonfarm livelihood activity, and $j=7$ if the household participates combination of livelihood activity. Then, the multinomial logit model can be given by the following expression:

$$P_{ij} = \frac{\exp(X_i Y_j)}{\sum_{j=0}^x \exp(X_i Y_j)}. \quad (3)$$

By setting Y_0 , the multinomial logit model can be written as follows:

$$P_{ij} = \frac{n \exp(X_i Y_i)}{1 + \sum_{j=1}^7 \exp(X_i Y_j)} \quad (j = 1, 2, 3, 4, 5, 6, 7) \text{ and } P_i^0 \\ = \frac{1}{1 + \sum_{j=1}^7 \exp(X_i Y_j)}. \quad (4)$$

The slope tells how the log odds in favor of a given livelihood diversification change as independent variables change. If P_i is the probability of a household being diversified, then $1 - P_i$ indicates the probability that a given household is undiversified.

Furthermore, on the behavior of the impact of livelihood diversification on household's food security, the probit regression model was used by analyzing the impact of independent variables on household food security status which is a dependent variable by model analysis taking the value of 1 for food secure household and 0 for food insecure household.

2.6.1. Definition of Variables and Working Hypothesis

Dependent variable: the dependent variable of the study was the diversification of the livelihood, which is categorical of containing on-farm, off-farm, nonfarm, and a combination of livelihood activity (Table 2). Based on the number of livelihood activities involved by the households' it can be further classified as diversified and undiversified on the basis of the number of livelihood activities. The former was obtained by asking respondents the number of livelihood activities they engage such as on-the-farm, off-farm, and nonfarm activities.

Explanatory variables: it was hypothesized as a farmer's decision to diversify or reject multiple components of livelihood activity to gain a profit was highly influenced by different factors. Based on previous studies, the researcher hypothesized these factors can be categorized as physical, environmental, socioeconomic, demographic, and intuitional factors. These factors were used to determine farmers' decision to diversify or not (Table 2). For example, the following independent variable in the study area was operationalized to influence livelihood diversification as an outcome by using descriptive statistics, multinomial logit regression model, and former empirical literature studies shreds of evidence.

Sex of HH: it is a dummy variable representing the sex of the house head (HH) of men and women that have different access to resources and opportunities, women are subject to discrimination in labor, credit,

TABLE 2: Hypothesized relationship of independent variables.

Variables name	Measurements of variable	Types of variables	Expected relationship
Diversification of income	Number of activities (on, off nonfarm, and combined activity)	Categorical	±
Sex of HH	1 = male, 0 = female	Dummy	±
Age HH	Year	Continuous	-
Access to transportation	1 yes, 0 no	Dummy	+
The educational level of the HH head	Year	Continuous	+
Dependency ratio	km	Continuous	+
Livestock owned	TLU	Continuous	±
Distance from the market	km	Continuous	-
Participation in the safety net program	1 = yes, 0 = no	Dummy	+
Membership to cooperatives	1 = yes, 0 = no	Dummy	+
Saving	1 yes, 0 no	Dummy	+
Access to credit	1 = yes, 0 = no	Dummy	+
Frequency of extension contact	Year	Continuous	+

Source: own survey result (2022).

and a variety of other markets and they own less property compared to men. Therefore, it was expected that sex and livelihood diversification are negatively related in female-headed households [5, 16] also revealed that the sex of the household is one of the important driving forces toward occupational livelihood diversification.

Age HH: it is a continuous variable that measures the age of the head of the household in years. Rural households mostly devote their time to farming activities. As the age of households increases, they can acquire more knowledge and experience about livelihood diversification benefits and the feasibility direction of household food security. Hence, in this study, the increase in age is hypothesized to be positively related to the diversification of livelihood activity [17].

Access to transportation: it is among the important factors that affect the livelihood activities of a household. Any kind of weather-driven vehicle, on foot and animal back, has a high influence on diversifying their livelihood activities. Households who have access to

vehicle roads had nonfarm livelihood opportunities. Therefore, the relationship between access to transportation used by respondents and diversification was expected to be positively significant (Table 2).

The educational level of the household head: education level refers to the years of schooling of the HH head in years. Investment and reproductive choice are all influencing the household heads' level of education [18]. However, education and household livelihood have a direct relationship in the context of subsistence farming; literate farmers are expected to be better than their illiterate counterparts in several ways. Education determines the ability of an individual to find a new job. This variable was expected to have a positive relationship with the diversification of livelihoods (Table 2).

Dependency ratio: it is the ratio of dependent people younger than 18 years and older than 64 years to the working-age population those ages 18 to 64 years [19]. It is computed by using the following formula.

$$\text{Dependency ratio} = \frac{\text{number of people aged 17 and people age 65 and above}}{\text{number of people age between 18 - 64}} \times 100. \quad (5)$$

Livestock owned (TLU): this variable is a continuous variable defined as the total livestock owned by the heads of a household that is measured in the Tropical Livestock Unit (TLU) (Table 2). It is an indicator of wealth status, which requires more grazing land for rearing, ranching, and use is an important source of income, used for draft power, manure, income from the sale of milk, butter, and sale of life in times of risk to buy necessities. A household has a larger size of livestock can have a better chance to have a better income from livestock. The more livestock owner household has the less possibility of the choice to participate in incentive off and nonfarm activities. On the other hand,

poor households who own no or less livestock are likely to rely on sources of income other than livestock. Therefore, in this study, livestock owned was hypothesized to have both positive and negative relations with livelihood diversification [20].

Distance from the market: it refers to the nearness or farness of the household's residence from the nearest marketplace within walking hours. It was measured by the walking hour (Table 2). Access to the market and other public infrastructure can create opportunities for more income by providing diversification of livelihood strategies through non- and off-farm employment and

easy access to input and transport facilities; households near the center of the market have a better chance to increase diversification [3]. In this study, this variable was expected to be negatively related to livelihood diversification.

Participation in a productive safety net program: the overall objective of the program is to improve the food security of food insecure society and food sufficiency for those unable to achieve food security, of male and female members of chronic food insecure households in chronically food insecure districts achieved. The program allows beneficiaries to involve in different activities which are called cash for work or food for work. So, it is expected to have a positive relationship with livelihood diversification and improve the food security of the household.

Membership to cooperatives: membership in cooperatives represents whether a household is a member of cooperatives or not (Table 2). Cooperatives worldwide are committed to the concept of mutual self-help. This makes them natural tools for social and economic development and provides significant additional benefits to communities and social systems. Formal as well as informal associations, such as indigenous co-operation groups, enforce widely agreed standards of behavior and unite people with bonds of community solidarity and mutual assistance. Membership in cooperatives also increases a household's access to services that might be granted by being a member [3]. This variable is expected to be positively related to the diversification of livelihoods.

Saving: household savings are a vital source of start-up finance for running multiple livelihood activities [21]. Households that combine agricultural and non-agricultural livelihood activities predominantly use saving with mixed livelihood activities. Therefore, this variable is expected to be significantly related to livelihood diversification.

Access to credit: it refers to access to credit services. Farmers use credit primarily to buy agricultural inputs, and also, they used it to invest in non-agricultural activities which supplement their farm income. Alogo Loison [22] said that credit encourages the investment of farmers to augment their farm productivity and widen their participation in non-farm livelihood strategies. Credit utilization and livelihood diversification were expected to be significant and positively associated.

Access to extension contact: extension contact is a continuous variable that measures the frequency of extension contact of the household head per year (Table 2). Extension contact plays an important role in improving household food security for the household by promoting knowledge, training, and livelihood information to households with high extension contact. On the contrary, other studies revealed that farmers who have better extension

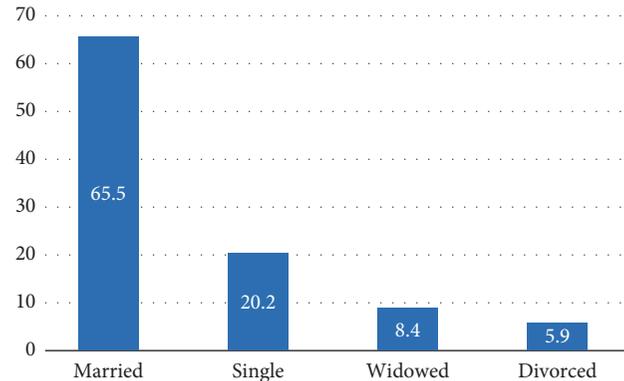


FIGURE 3: Marital status of the respondent.

contact have better access to livelihood information and technical assistance that increase agricultural production and productivity [23]. However, the high frequency of extension interaction by household heads had a positive impact on diversification [24]. Moreover, in this study, extension contact was expected to have a statistically significant and positive impact on food security.

3. Results and Discussion

3.1. Descriptive Results

3.1.1. Demographic and Socioeconomic Characteristics of Respondents. Among the total respondents, 20.2% were single, 65.5% were married, 5.9% were divorced, and the remaining 8.4% of the respondents were widowed (Figure 3). According to this study, single and married respondents are low-viability participants as compared to their counterparts because they are independent in taking any responsibility based on their interests without any influence from their family or husband. So, they can participate freely in livelihood activities without any intervention.

3.1.2. Constraints Related to the Diversification in the Study Area. Institutional challenges such as access to clean and crop irrigation water, a lack of health care, and a lack of formal savings institutions are major obstacles to households diversifying their livelihood activities. As a result, the institutions that can limit households' livelihood options have been appointed based on information from respondents and FGD. The information earned from 119 sampled households (Table 3) indicated that 52.9% of them responded that they did not have safe water for drinking, and 80.7% of them responded that they had faced illness during the last 12 months, which prevented them from following up on livelihood activities.

Furthermore, the key informant interview provided data that supports the respondent's reaction to water and health-related issues. Furthermore, 69.7% of respondents complained about not having access to saving institution services, whereas 30.1% had access to saving institution services, which can be classified as follows: only 4.2% of them save their money in

TABLE 3: Challenges related to livelihood diversification in the study area.

Main terms	Yes		No		Total
	Frequency	Percent	Frequency	Percent	
Access to safe water	56	47.1	63	52.9	119
Members who were sick in the last 12 months	96	80.7	23	19.3	119
Formal saving institution	36	30.3	83	69.7	119

Source: own survey result (2022).

formal institutions such as the Commercial Bank of Ethiopia, while 10.9% save at home, 10.1% save in equipment, and 5.9% save by purchasing animals for future use (Table 3).

Furthermore, as mentioned in the focus group discussions and key informant interviews, the major barriers to livelihood diversification include market distance and information, a lack of telecommunication and transportation facilities, a lack of access to society-appropriate credit, a lack of contact with extension agents, a lack of agricultural inputs, and *Prosopis juliflora*' dominance of farming land. This finding is consistent with that of reference [25], which states that lack of market access and knowledge limitations about nonfarm activities are the major factors discouraging households from engaging in diversification activities, which account for 54.6% and 15.2% of the households in the study area, respectively. Even though the federal government of Ethiopia has developed various policies, strategies, and programs designed to improve the livelihoods of the people by reducing poverty and food insecurity [26]. Eventually, existing institutional responses were more oriented toward emergency assistance and asset protection. Nevertheless, future intervention needs to consider the new enabling pathways and consider pastoral development as an integral part of urban development rather than treating it purely as rural development in order to increase the adaptive capacity of the pastoralist communities through livelihood diversification programs in both the short and long terms [27].

3.2. Livelihood Diversification Strategies of Respondents. The livelihood strategy of the study area encompasses both agricultural and nonagricultural livelihood activities based on the household's ability to exercise the different livelihood activities in aspects of knowledge, skill, and experience.

3.2.1. Perception of the Respondents on Livelihoods of Diversification Benefit Ability. The quality and profitability of livelihoods are important factors influencing a household's ability to engage in a variety of livelihood activities. Approximately, 23.5% of respondents believe that relying solely on agricultural activities can meet household livelihood needs by promoting agricultural products as less durable and more beneficial than nonagricultural activities (Table 4). Furthermore, 29.4% believe nonagricultural activities are more beneficial than agricultural activities, while 47.1% believe a combination of activities can meet the household livelihood goal (Table 4). Interestingly, this can be understood to mean that households that involve a larger stock of livestock achieve their livelihood needs by relying on

TABLE 4: Respondent perception of livelihood activities.

The livelihood activity contents of the study		
Activities	Frequency	Percent
Farm activities	28	23.5
Nonfarm activities	35	29.4
Combination of both activity	56	47.1
Total	119	100.0

Source: own survey result (2022).

agricultural activities alone. Similarly, livestock smallholders encourage household livelihood needs to be achieved through a variety of livelihood activities.

This is consistent with the study findings [10], which found that 40.7% of the respondents are involved in agricultural activities such as crop production and livestock, while 52.5% encourage participation in a variety of livelihood activities. This means that increasing the number of livestock has a strong negative impact on households choosing nonfarm livelihood activities because they perceive a lack of sources of feeding their family through livestock sales.

3.3. The Role of Domesticating Livestock for Livelihood Improvement. Livestock is the backbone of livelihood development and economic activities in the Somali region in general and particularly in the study area. According to the responses, approximately, 82.4% of respondents in this study stated that the reason for raising livestock is to sell and use their products, while 15.1% and 2.5% stated that the reason for raising livestock is to sell and purchase food and to sell during a livelihood emergency, respectively. Most of the types of livestock found in the study area include camels, goats, sheep (shoats), cattle, and donkeys. However, livestock plays a significant role in the improvement of people's livelihoods in both rural and urban areas of the study, which is interdependent on the exchange of goods in the market between rural and urban people. For example, in the region as a whole, most of the populations are pastoralists or pastoralist-based mobile communities, even though, currently, there is an improvement in their mobility relative to permanently installed communities. Moreover, most of their lives depend on domestication and the purchase of livestock.

3.4. Current Diversification Status of the Study Households. Livelihood diversification was categorized in terms of livelihood activities such as on-farm, off-farm, nonfarm, and a combination of livelihood activities. A household that

involves more than one source of income activities can be considered a diversified household, and a household that involves fewer than two sources of livelihood activities can be considered an undiversified source of livelihood activities. Based on that information, 52.9% of them were diversified households, while 47.1% of them were undiversified households (Figure 4).

Following the physical observation of respondents, participating in a single source of livelihood activity seems better as compared to multiparticipant livelihood activities. For instance, undiversified households have fewer opportunities to improve food security due to their limited sources of income. As a result, households that diversify their livelihood activities are less vulnerable than those that do not diversify their livelihood activities. This agrees with the study of Gebru et al. [28], who stated that 83.1% of the sampled households were able to diversify by involving a combination of livelihood strategies, while 16.9% of them were unable to diversify their livelihoods because they lacked the means to engage in any system of income-generating activities away from agriculture. Livelihood diversification is a strategy that can boost farmers' income and promote sustainable land management practices [29], especially among richer households with favorable agricultural conditions, where livelihood diversification is driven by motivations to increase income or accumulate wealth [14, 30]. Although the study households, like other parts of the country, engaged in different livelihood activities in addition to basic agricultural activities, this finding indicated that 47.1% of the sampled households were unable to diversify their livelihoods, where most of them involved a single livelihood activity and others involved fluctuating livelihood activities based on external support (Figure 4).

3.4.1. Inferential Statistical Tests. The results of the independent *t*-test and chi-square test analysis are presented separately as continuous and discrete variables, respectively. These tests help see the relationship between the variables and the mean differences between diversified and non-diversified households.

Therefore, in the *t*-test, six continuous variables were hypothesized to check the determinant factors influencing livelihood diversification activities (Table 5). The results of continuous variables show that only the age of the respondent was found to be 5% statistically significant in the mean difference between nondiversified and diversified households (Table 5). Thus, insignificant variables may influence the livelihood options of households differently among diversified and undiversified households.

The chi-square test found that the head of the gender of the household and access to credit were significant at a probability level of less than 5% in influencing the decision choice of households to diversify or not diversify (Table 6).

3.5. Determinant Factors Influencing Livelihood Diversification in the Study Area. A multinomial logistic regression model was used to demonstrate the relationship

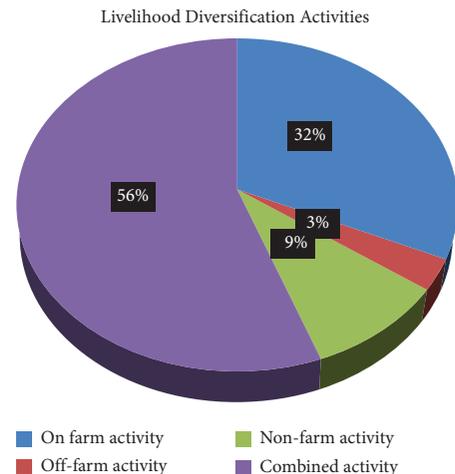


FIGURE 4: Choices of the livelihood diversification strategy adopted by the sampled household.

between independent variables and the dependent variable. To analyze the determinant factors that influence households to choose and adopt diversification when the dependent variable is categorical with multiple outcomes, it is always advisable to check the relative fitness of the model before directly estimating. In this regard, the model is a good fit for the data because the MNL model result was fairly revealed with a pseudo R^2 of 58%, which means that 58% of the independent variables explain the dependent variable. A low R^2 value means that diversified households do not have many distinct characteristics overall, and as such, finding a good match between diversified and nondiversified households becomes easier [31].

Generally, the multinomial logistic regression model investigation found that three livelihood activities were statistically significant, including farm, farm, and nonfarm, but the combination of livelihood activities was not significant.

Sex is a dummy variable that is measured as either a male or female head of household. The model result indicates that the sex of the household head significantly influences the diversification at a 1% ($P = 0.00$) significant level (Table 7). Therefore, according to prior expectations, the sex of the respondents positively and significantly affects the diversification of the household's livelihood. This implies that other factors remain constant; being a male household head is more likely to diversify than its female counterparts. The possible explanation for this would be that male-headed households have a better opportunity for resource control, interaction with others, agricultural technologies, and social perception of masculinity. All these increase participation in livelihood activities and diversify more than female-headed households by a factor of 16, 12, and 4.6, respectively, in the abovementioned activities. This result is similar to that of Zakaria et al. [17].

Age: age was found to be significant at 1% ($P = 0.002$) and had a negative influence on diversification. Holding other things constant (Table 7), as age increases by one year, the probability of households engaging in on-farm,

TABLE 5: Descriptive result for continuous variables on diversification of households.

Explanatory variables	Sample HHs N = 119 (100%)	Diversified HHs N = 63		Not diversified. HH N = 56		t-value
		Mean	Std. deviation	Mean	Std. deviation	
Age (yrs)		36.1429	11.87007	41.0893	14.57554	2.039**
Dependency ratio		3.3333	1.61645	3.3214	1.61928	-0.040
Livestock (TLU)		24.0312	20.45233	23.6839	23.85668	-0.085
Market distance (?)		4.0794	1.31126	4.0357	1.30683	-0.182
Access to transport		1.8095	0.83968	1.8571	0.96160	0.288
Education (year of schooling)		1.9841	1.34994	1.6071	1.13904	-1.635

Source: own survey result (2022).

TABLE 6: Descriptive result for dummy variables on comparison livelihood diversification.

Variables	Categories	Livelihood diversification		Chi-square
		Not diversified	Diversified	
Sex	Female	14	28	4.908**
	Male	42	35	
Saving	Yes	17	19	0.001
	No	39	44	
Credit	Yes	8	18	3.543**
	No	48	45	
Coop	Yes	14	20	0.661
	No	42	43	
PSNP	Yes	22	21	0.455
	No	34	42	

Source: own survey result (2022).

TABLE 7: Factors influencing livelihood diversification in terms of (on-farm, off-farm, and nonfarm activity).

Covariates	Result of a multinomial logistic regression											
	On-farm				Off-farm				Nonfarm			
	B	Std. error	Sig	Exp (B)	B	Std. error	Sig	Exp (B)	B	Std. error	Sig	Exp (B)
Intercept	5.432	2.299	0.018		3.165	2.570	0.218		6.215	2.497	0.013	
Sex	2.775	0.485	0.000***	16.037	2.487	0.549	0.000***	12.021	1.528	0.513	0.003***	4.610
Age	-0.062	0.020	0.002***	0.940	-0.116	0.023	0.000***	0.890	-0.081	0.022	0.000***	0.922
Education	-1.182	0.303	0.000***	0.307	-0.244	0.295	0.408	0.784	0.068	0.269	0.801	1.070
Dependent ratiom	0.009	0.179	0.961	1.009	0.318	0.200	0.111	1.375	0.600	0.190	0.002***	1.822
TLU	0.041	0.013	0.002***	1.042	0.069	0.014	0.000***	1.071	0.017	0.015	0.266	1.017
Market distance	-0.102	0.177	0.564	0.903	-0.012	0.196	0.950	0.988	-0.436	0.191	0.022**	0.647
Transportation	0.060	0.222	0.788	1.062	-0.502	0.303	0.097*	0.605	0.173	0.248	0.485	1.189
Saving	-1.037	0.548	0.059*	0.355	-0.177	0.633	0.780	0.838	-1.408	0.590	0.017**	0.245
Credit	-0.458	0.709	0.519	0.633	-0.772	0.733	0.292	0.462	-2.316	0.668	0.001***	0.099
Cooperative	0.683	0.494	0.166	1.980	-0.753	0.559	0.178	0.471	1.096	0.560	0.050**	2.992
Productive safety net. P	-0.366	0.472	0.438	0.694	1.094	0.569	0.055*	2.987	0.388	0.519	0.454	1.474

Number of obs = 119, LR chi² (77) = 242.28, prob > chi² = 0.0000 logarithmic likelihood = -87.826054 pseudo R² = 0.5797*, **, and *** significant level at 10%, 5%, and 1%, respectively. Source: own survey result (2022).

off-farm, and nonfarm livelihood activities declines by 0.940, 0.890, and 0.922, respectively. The possible reason is that young household heads are relatively more educated and informed people who are ready to accept better technologies and search for alternative livelihood opportunities for their future endeavors. Old-age household heads are immobile to change their livelihood activities. This study is in line with that of Fitsum [18] and Gebru et al. [28].

Household head's educational level: its continuous variable measures the years spent in education of the household head. As the model result, education was found to be significant at a 1% ($P = 0.00$) probability level and influenced on-farm livelihood activity negatively. As HH heads spend one year in education, the probability of on-farm livelihood diversification declines by 0.307, holding other things constant (Table 7). Because educated people do not like to diversify their livelihood options based on on-farm

livelihood activities, they prefer respectable salaried jobs and self-employment livelihood activities. This finding is similar to that of Kassie et al. [29], who found that the educational level of farm households has a negative impact on livelihood diversification, as educated farmers may employ better farm technologies.

Dependence ratio: it is a continuous variable measured in the number of people in the family who are economically inactive due to youth, old age, or other circumstances such as illness and physical or mental inability. It was expected to have a negative relationship with the diversification of livelihoods. However, based on the model results, this variable was found to be significant and to have a positive association with the decision to choose household nonfarm livelihood diversification at a 1% ($P = 0.002$) significance level (Table 7). As a dependent member in the family increases by one, the probability of livelihood diversification increases by 1.822 percent, keeping other factors constant. The possible reason is that when one additional dependent member is added to the household, the economically active members of the household increase the option of enhancing livelihood activities through nonfarm livelihood diversification strategies. This finding is consistent with that of Abawa Tizazu et al. [32] and agrees with that of Dessalegn and Ashagrie [33].

Tropical Livestock Unit (TLU): it is a continuous variable measured in the number of cattle owned by households (TLU). The TLU was found to be positive and 1% ($P = 0.002$) significant enough to influence on-farm and off-farm livelihood diversification (Table 7). By holding other factors constant, as TLU increases by one unit, the probability of livelihood diversification rises by a factor of 1.042 and 1.071 for on-farm and off-farm livelihood activities, respectively. For example, households that own more livestock have the opportunity to participate in other livelihood options compared to households that have fewer or no livestock. This result is in line with that of references [15, 34]. This would suggest that it had a positive effect on farm and off-farm livelihood diversification because farmers with a larger stock of livestock had more money to invest in on-farm and nonfarm activities. Therefore, to be able to bring about a positive change in well-being, natural capital (livestock) is exchanged for different assets. Abawa Tizazu et al. [32] discovered that the prior expectation of this variable was consistent with their findings.

The negative association between livelihood diversification and the number of TLU implies that herd size creates a better opportunity to earn more income from livestock production and helps farmers fulfill family requirements, including food consumption.

Market distance: it is a continuous variable measured in the distance from a household's residence place to the nearest market in km. As expected, market distance is found to be significant at a 5% ($P = 0.002$) probability level and negatively influences nonfarm livelihood diversification (Table 7). As the market distance increases by one km, the probability of nonfarm livelihood diversification declines by a factor of 0.647, holding other factors constant. The market may facilitate individuals' involvement in all types of livelihood options, and the likelihood of individuals diversifying

beyond agricultural practice decreases as the market distance from their resident villages increases. Those households that live near the market have a greater opportunity to engage in other income options beyond their usual pastoral activities, such as wage labor and petty trading, and market brokering. This conclusion is consistent with [34].

Transportation types: It is a continuous variable measured in the availability of transportation services for their products in the market. As expected, this variable was found significant at a 10% ($P = 0.05$) probability level and influenced off-farm livelihood diversification negatively (Table 7). Holding all other variables constant, the probability of off-farm livelihood diversification falls by a factor of 0.605.

The possible reason is that the majority of the respondents economically depend on livestock marketing and selling food for household consumption, followed by the unavailability of access to permanent vehicle transportation. Most of the respondents use foot travel and animal back-to-market exchange of goods. For example, as livestock marketing distance increases, the chance of participation in off-farm livelihood activities decreases. This is in line with the finding of reference [25], which revealed the problem of the availability of the market for their products.

Saving habit of household head: it is a dummy variable that measures whether households saved money or not. The model result indicates that the saving habits of household heads significantly and negatively influence farm and nonfarm livelihood activities at 10% and 5% ($P = 0.059$ and 0.017) statistically significant levels, respectively (Table 7). As the access to saving services increases by one unit in formal institutions, the probability of on-farm and nonfarm livelihood activities declines by a factor of 0.355 and 0.245, respectively, keeping other things constant. Although saving is a mechanism that changes production destruction and conformists during drought occupancy as compared to nonsaving, the possible reason that influences this variable negatively is that the majority of the respondents did not have a formal institution to save their money. Instead, their daily income was used for daily food consumption or they saved at home and bought an animal for future use, which is highly susceptible to climate occurrence risk events.

Participation in a productive safety net program: it is a dummy variable that indicates whether or not a household receives outside assistance in the form of food or money. The result of the MNL regression model revealed that participation in a productive safety net program (PNSP) was found to have a positive and statistically significant relationship with the diversification of off-farm income at a 10% ($P = 0.055$) level of statistical significance (Table 7). Holding all other variables constant, increasing access to PNSP by one unit of formal food or money donation increases the likelihood of off-farm livelihood diversification activities by a factor of 2.987.

Therefore, by increasing the number of rural households participating in productive safety net programs, household members have the opportunity to enhance the total income of the household, which plays an active role in improving and smoothing the problems of household food security. Such efforts can strengthen social networks, children's

schooling, saving habits, and investment options that help households diversify other livelihood opportunities like trading and improve their livelihood as a whole. On the other hand, sometimes PNSP can affect the home by encouraging dependence on others' hands unless the government and other stakeholders are aware through training that the purpose of the donation is to escape poverty and related challenges but not sleep. The study coincides with the findings of Titay et al. [3].

Access to credit: it is a dummy variable that measures whether or not households have access to credit. Contrary to popular belief, household livelihood diversification based on nonfarm livelihood activities was found to be negatively and statistically significant at 1% ($P = 0.001$). As access to credit increases by one unit at formal donation institutions, the probability of livelihood diversification decreases by a factor of 0.099, keeping other factors constant (Table 7).

Although there are no more formal savings and credit institutions in the study area, households observed in the area have low interest rates on credit receipts.

Except for the returnable interest-free amount from relatives and friends, because of cultural and religious affairs, access to credit has negatively influenced livelihood diversification based on nonfarm, whereby there are insignificant relationships with on-farm and off-farm diversification activities. This study is consistent with the study of Asfir [23], who found that access to credit services harmed livelihood diversification because farmers who have access to credit may be inclined to purchase fertilizers to improve their agricultural production and productivity rather than diversify their livelihoods. On the other hand, this finding contradicts the findings of Gebre et al. [28]. Also, the findings of Arega et al. [35] on access to credit showed a positive and significant correlation with the annual income of households. Access to credit services was found to have a positive effect on the diversification of livelihoods. Moreover, they concluded that giving credit to resource-poor farmers improved livelihood diversification [36].

Membership in the cooperative: it is a dummy variable that measures whether a household is a member of a cooperative organization or not. The prior prediction of cooperative organization membership was found to be positive and statistically significant at 5% ($P = 0.050$) with household livelihood diversification based on nonfarm activities as predicted. By holding other factors constant, as access to membership in a formal cooperative organization increased by one unit, the probability of nonfarm livelihood activities increased by a factor of 2.992 (Table 7).

The possible reason is that households that are members of formal cooperatives gain benefits such as sharing income and labor, access to credit, reduced individual transaction costs, updated market information about production and productivity such as inputs and farm equipment, and working in collaboration for goals. The result agrees with the findings obtained by reference [28].

On the other hand, the model result on membership in the cooperative in the study kebele contradicts the key informants' interview by stating that the society does not

TABLE 8: The frequency of extension contact per year in the study area.

Extension contact	Frequency	Percent
Highly contact	3	2.5
One time per month	20	16.8
Relatively contact	21	17.6
Less contact	34	28.6
No contact	41	34.5
Total	119	100.0

Source: own survey result (2022).

encourage members to maximize their income cooperatively through agricultural and nonagricultural activities or by participating in a combination of livelihood activities. This indicates a weak cooperative organization in the area, which was also supported by focus group discussants. According to the focus group discussion, cooperatives are simply being advised to focus on diversifying and participating in different activities rather than a more active collaboration between members in the study area for the achievement of improved food security.

3.6. The Influence of Extension Contact on Livelihood Diversification. Effective extension contact influences livelihood diversification in response to drought; it is critical to recognize seasonality fluctuations in order to be aware that livelihood activities take place at different times of the year. For instance, extension agents have to provide training and information at the household and community level. The impact of diversification on food security has several compounding factors. While diversification usually means increased income for a household, it may depend on the extent to which it has disrupted household farming and whether the income derived is sufficient for food purchases and farm investments. Agricultural extension workers are important for strengthening the links between agricultural inputs and outputs.

As a result, according to the information elaborated during the interview, only 2.5% of respondents reported having a large number of extension contacts, while 16.8% reported having only one extension contact. As a result, 17.6% and 28.6% of the sampled respondents responded to relatively more and less contact, respectively. Approximately, 34.5% of the sampled respondents stated that they had no extension agent or worker. In general, 80.7% of the study population was dissatisfied with the extension service (Table 8).

As a result, problems exist in the study area's kebele of the Kebri Dahar district. This finding is in line with the FGDs' saying that involvement in nonfarm livelihoods highlights the greatest constraint to diversification as a lack of skilled provision agents. These include both financial skills and basic managerial skills to ensure the sustainability and growth of enterprises. Community members engaged in diversification either had the skills passed down in the family or, at one time, benefited from some training. This means that teenagers who wish to engage in nonfarm livelihoods

continue to be constrained by a lack of training opportunities and local support.

4. Conclusion and Recommendation

According to the study's findings, characteristics such as the household's head's age, education, market distance, access to credit, mode of transportation, and saving habits have a negative and statistically significant effect on livelihood diversification. Whereas, cooperative membership, participation in the Productive Safety Net Program (PNSP), dependence ratio, and holding in the Tropical Livestock Unit (TLU) were found to have a positive and statistically significant effect on livelihood diversification.

The results of the study indicate that although individuals from the area of study have the opportunity to engage in a wide range of different livelihood activities, the vast majority of them are involved in agriculture. However, more than half of the households in the study area do not use multiple livelihood diversification strategies to make their livelihoods more diverse.

Moreover, based on key findings, the government and nongovernmental organizations should expand livelihood options in the study area, but they should also pay due attention to diversifying livelihoods, as the region is notorious for food insecurity and diversification implies household food security. The majority of respondents are illiterate, which implies that conventional agricultural practices are also uninformed about nonagricultural means of subsistence. According to the aforementioned conclusion, they lacked access to savings and loans, which hindered the diversification of their livelihoods. Therefore, they should encourage the participation of family heads in both agricultural and nonagricultural businesses, pursuing culturally acceptable credit access and enhancing saving practices. Rather than educating families about reliance, donor organizations should intervene in development initiatives. The district administrator should prioritize the area's infrastructure development, such as the allocation of transportation facilities, extension contact training, and electricity, because it influences the household's participation in various income-generating activities, which implies household food security. Since fewer studies were carried out than those reported on the topic of livelihood diversification and food security, researchers should examine doing further studies in this area [37].

Data Availability

The data available in this manuscript are acknowledged scientifically, and any supporting data needed for these findings can be obtained from the corresponding author upon request.

Ethical Approval

According to Kebri Dehar University, all critical steps of its ethical implications were considered when designing this research article. This ethical approval passed all the processes

of voluntary participation, informed consent, anonymity, confidentiality, harmfulness, and result communication.

Consent

Written informed consent was given to the legal expert of the Kebri Dahar Agricultural Office to publish this report in accordance with the journal's patient consent policy.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Bishar A. Yussuf and Abduselam A. Mohamed contributed equally to this article's work. The authors each contributed equally to the overall scope of this research article. Moreover, the authors read and incorporated all comments according to the reviewers' report for this manuscript.

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