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RESEARCH PAPER

Factors Affecting the Choice of Rural Households' Livelihood Diversification: The Case of Sayo District, Kelem Wollega Zone, Oromia National Regional State, Ethiopia

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Abstract

The carrying capacity of agriculture to attain livelihood security is extremely declining from time to time. Diversifying livelihood strategies in the current time of rural households to sustain and secure their livelihoods as well as to supplement their agriculture have become a common phenomenon in the study area. Hence the study is to analyze factors affecting the choice of rural households' livelihood diversification in the district. The data were obtained from 202 sample household heads that were selected proportionally from three kebeles. The study used descriptive statistics and an econometrics model. Accordingly Multinomial logit model was employed in analyzing the factors affecting the choice of rural household's livelihood diversification strategies. The result indicates that among 16 hypothesized explanatory variables, 11 variables were found to affect the choice of rural household's livelihood diversification strategies. Accordingly, sex of household head, land holding size, input utilization and participation in social activity have positive and significantly effect on the rural household's livelihood diversification. Furthermore, family size, frequency of contact with agricultural extension agent, remittance received and agro ecology location have negative and significant effect on the rural household's livelihood diversification. However, livestock holding, irrigation facility and access to credit have positive effect across on the rural household's livelihood diversification. Therefore, the results of this study suggest that development interventions, policies makers and supportive services should be designed and strengthened to promote livelihood activities in addition to agriculture through awareness creation to improve the overall wellbeing of the rural societies in improving livestock holding, irrigation utilization and credit facilitation.

Keywords: Livelihood diversification, farm, non-farm, off-farm, Multinomial logit, Ethiopia

Introduction

Agriculture and non/off-farm livelihood diversifications are essential for reducing poverty in sub-Sahara African countries (Emanuel, 2011). However, livelihood diversification strategies are dynamic and sensitive to geographic, socioeconomic and institutional settings, and households with similar capital asset endowments may demand different technologies (Ellis and Allison, 2004, Arega *et* al. 2013). Agriculture alone may not be a long-term option due to factors such as small landholdings, drought, floods, crop loss, poor road status and gaps in market access (Yishak *et al.,* 2014).

For Ethiopia, undiversified livelihood options and complete dependency on agricultural production is the main problems that aggravate food insecurity in rural area (*FDRE,* 2002). According to Wondimagegnhua *et al.* (2016), Yona and Mathewos (2017), the limited opportunity for livelihood diversification, due to the absence of supplementary income from

other non-farm activities has made the Ethiopian rural poor more vulnerable. Similarly, Debele and Desta (2016) argue that the decline in the size of cultivable land (land scarcity) is imagined to further exacerbate the currently observed worse food insecurity situation unless non-farm activities are made to compensate for the livelihood stress prevalent in the rural areas.

The Ethiopian policy focus is on increasing agricultural productivity and farm income to achieve food self-sufficiency (Devereux *et al*., 2005, Beyene, 2008). However, livelihood diversification is playing an important role in rural households' income and food security. Research and extension activities have not been done adequately on the issues related to livelihood diversification, off and non-farm employment. Rural people have their own strategies to secure their livelihoods, which vary depending on socio-economic status, education and local knowledge, ethnicity, and stage in the household life cycle (*Gebru et al.,* 2012).

Like the national economy of Ethiopia, households in the study area are mainly dependent on small scale subsistence agriculture which is highly dependent on rain feed to derive their livelihoods. Nevertheless, the decline in carrying capacity of agriculture forces rural farm households to engage activities takes place outside the agricultural sector and aggregates a range of activities that span from regular salaried work to self-employed; agricultural activities which take place outside the person's own farm or sale of labor for agricultural activities; farm +off-farm + non-farm activities. In diverse off/non-farm livelihood activities and crop diversification to maintain and improve their wellbeing. Thus, understanding the driving factors of each livelihood strategy is crucial to improve the response mechanisms related to poverty, food security and livelihoods improvement in the study area. This study, therefore, aims to identify the existing livelihood strategies adopted by rural households; and to analyze factors that affect the choice of rural household's livelihood diversification in the study area.

Materials and methods

Description of Study Area

The study was conducted in Sayo district, which is located in Kelem Wollega Zone, Oromia National Regional State, Western Ethiopia. Sayo district is one of the Kelem Wollega Zone districts, which is located around the capital town Dembi Dollo.

Based on the 2019 Sayo district data, the total population of the district is 152,654 of whom 76,286 were males and 76,368 were females, and 5.45 % of its population was urban dwellers. The district has three agro-ecology zones; highland 16.2%, midland 78.8% and lowland 5% which has potential for crop, horticulture, coffee and livestock production, which is mainly undertaken by small holder farmers.

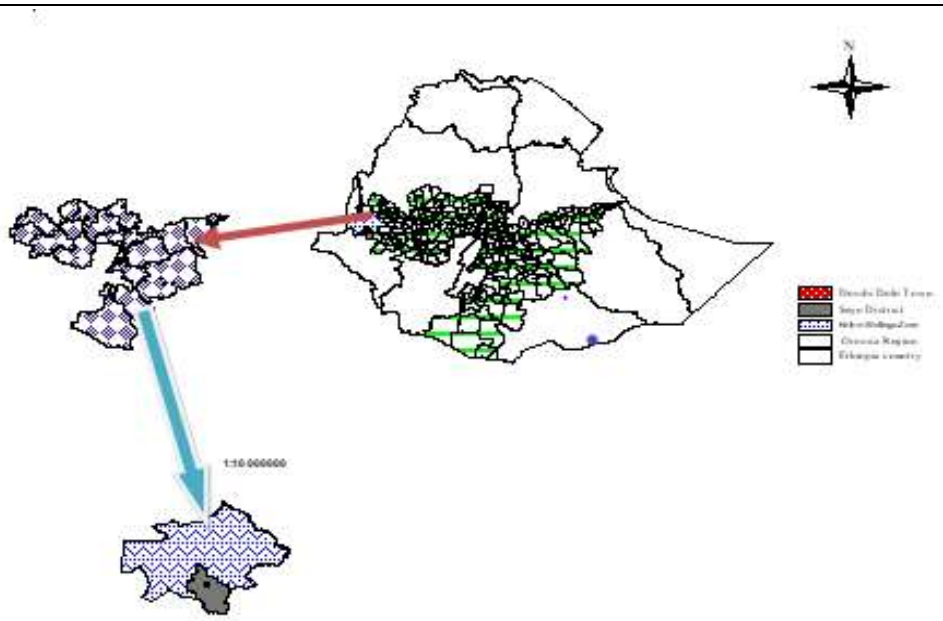

Figure 1. Map of the study area/ Sayo District (2019/2020)

Data Types and Sources

During the study, both quantitative and qualitative data were used to attain the stated objectives of the study. Sampled households, key informants and focus group discussion participants were the main sources of primary data. Secondary data like published and unpublished documents such as books, journals and also office records and reports of the district have been used in this study.

Sample Size and Sampling Methods

The study employed multi-stage random sampling techniques to select sample households. A proportionate to size technique was applied to determine households from each kebele. Accordingly, a total of 202 respondents were randomly selected from three *kebels* (Table 1).

The total sample size for this study was determined by using the formula of Yamane (1967). The formula is given by:

$$n = \frac{N}{1+N(e)2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where,

n= is sample size, N = population of the selected kebele's

e= designates maximum variability or margin of error. Therefore, using the above formula the total sample size is calculated as follows:

$$n = \frac{N}{1+N(e)2}$$

$$n = \frac{502}{1 + 502(0.05^2)} = 202$$

In general, using the above formula total sample size of the respondents' household heads from three *kebeles* 202 were selected at 95% confidence interval and level of precision equal to 5% are used to obtain a sample size required (Table 1).

Table 1. Sample households from each kebeles

Sample kebeles	Total Households	Sample households	Percent
Humbi Kero	191	76	38
Aleku Soti	179	73	36
Yangi	132	53	26
Total	502	202	100

Source: SWANRO, 2019/20 own processed

Data collection and analysis method

Primary data was collected by using qualitative and quantitative approaches. Survey data were collected through face-to-face interview using structured and scheduled that were filled up by recruited and trained enumerators under the close supervision of the researcher. The study employed descriptive and inferential statistics along with a Multinomial logit model to analyze the data. Descriptive statistics such as mean, percentage and frequency were used.

Econometric model specification

Following Green (2003), the multinomial logit model for a multiple choice problem is specified for dependent variables as follows; suppose for the i^{th} respondent faced with j choices, the study specifies the utility choice j as:

$$Uij = Zij\beta + \varepsilon ij \ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

If the respondent makes choice j in particular, then we assume that Uij is the maximum among the j utilities. So the statistical model is derived by the probability that choice j is made, which is:

$$Prob(Uij > Uik) for\ all\ other\ K \neq j \ldots \ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(3)}$$

Where, Uij is the utility to the i^{th} respondent from livelihood strategy j and Uik is the utility to the i^{th} respondent from livelihood strategy k. Thus, the i^{th} household's decision can be modeled as maximizing the expected utility by choosing the j^{th} livelihood strategy among J discrete livelihood strategies, that is:

$$Maxj = E(Uij) = fj(xi) + \varepsilon ij, j = 0..J$$

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

$$Pij = \frac{\exp(X'i\beta j)}{\sum Jj=0 \exp(x'i\beta j), J=0} \ldots\ldots\ldots\ldots\text{(4)}$$

With the requirement that $\sum_{j=0}^{J} Pij = 1 \text{ for any } i$

Where: Pij = probability representing the i^{th} respondent's chance of falling into category J; X = Predictors of response probabilities βj= Covariate effects specific to j^{th} response category with the first category as the reference. A convenient normalization that removes indeterminacy in the model is to assume that $\beta_1 = 0$ (this arise because probabilities sum to 1, so only j parameter vectors are needed to determine the j + 1 probabilities), (Greene, 2003) so that exp $(Xi'\beta_1) = 1$, implying that the generalized equation (4) above is equivalent to;

$$\Pr(yi = \frac{j}{Xi} = pij = \frac{\exp(X'i\beta j)}{1 + \sum Jj = 1 \exp(X'i\beta j)}\ for\ any\ j = 0,1 \ldots\ldots J\ and$$

$$\Pr(yi = \frac{1}{Xi} = pi1 = \frac{1}{1+\sum Jj=1 \exp(X'i\beta j)} \ldots\text{(5)}$$

Where: y = A polynomous outcome variable with categories coded from 1… j. *Note*: The probability of *Pi1* is derived from the constraint that the j probabilities sum to 1. P_{i1}=1-Σ P_{ij}. Similar to binary logit model it implies that we can compute j log-odds ratios which are specified as;

$$\ln[\frac{pij}{pij} = x'(\beta j - \beta J) = x'\beta j, if, j = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(6)}$$

Results and discussions

This chapter discusses and presents the analysis that has been conducted by descriptive statistics with the inferential statistics of testing the statistical significance of the variable and econometrics analysis to address the research objectives.

Descriptive Results

Livelihood strategies are ranges and combinations of activities and choices that people undertake in order to maintain their livelihoods or address existing challenges or vulnerability and to deal with positive and negative effects of policies, institutions and processes (Ellis and Allison, 2004). Accordingly, the most common livelihood strategies pursued by households in the study area were farming, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities.

Out of the total sampled households, households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off farm was 126 (62.4%), 42(20.8%), 20 (9.9%) and 14 (6.9%) respectively. Even if, agricultural sector is characterized by decreasing farm sizes due to population pressure, low levels of output per farm and a high degree of subsistence farming, a significant part of the sample respondents still engaged in farming activities. As observed from the survey result, about 62.4% of the total sample households depend solely on agriculture for their livelihood strategies and the remaining respondents combine agriculture with other activities like non-farm and off-farm (Table 2). Among the main reasons for their engagement in off and non-farm activities of the diversifiers were limited agricultural incomes, seasonal nature of agricultural produce and large family size.

Agricultural /on-farm activities

Agriculture is the sector given attention in policy documents and in practice on the ground as it is expected to be the source of primary surplus to fuel the economic growth. The livelihoods of the surveyed households were mainly dependent on agricultural activities (62.4%). Most of the households in study, kebeles practice mixed farming activities, involving both crop production and animal husbandry.

Different types of crops, commercial and horticultural crops are grown in the study areas. Key informants and focus groups stated that crop production was the major source of income (food and cash) for most households. In this regard, different types of crops (coffee, maize, sorghum, vegetables, faba beans, etc.) are grown in the areas.

Livestock are assets that households quickly change into cash when they need cash. Different kinds of livestock; Cow, Ox, sheep, goats, donkey, mule, and poultry are reared for both income and consumption purposes in the study area. According to the key informants of the study sites, livestock production was the second most important income source, next to crop production and serves as a draught power, transportation service, and provides meat, milk and milk products and manure.

Table 2. Choice of households' livelihood strategies

Choice of HH livelihood Strategies	Frequency	Percent (%)
Agriculture alone (Y1)	126	62.4
Agriculture + non-farm (Y2)	42	20.8
Agriculture + off-farm (Y3)	20	9.9
Agriculture + non-farm + off-farm (Y4)	14	6.9
Total	202	100.

Source: Survey result, 2019/20

The survey results revealed that the overall mean age of the sample households to be found was 47.91 years. The mean age of the households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 47.83, 49.23, 44.90 and 49.21, respectively. This indicates that households engaged in farm and non-farm activities were relatively older than the other categories. The probable justification for this is that as age increases farmers have more chances to have more children, which in turn helps to have available labor to engage in diverse activities. The statistical analysis revealed that there is a significant difference at less than 5%level significance in the mean age of sample household heads across livelihood diversification strategies (Table 3).

The survey results showed that households with an average year of high education level lead a better life by diversifying their livelihood. The mean years of schooling completed by household heads were 6.56. Similarly, the mean years of those engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, nonfarm and off-farm activities was 6.53, 6.04, 7.10 and 7.57 respectively Table 3. This is likely due to the possibility of acquiring salaried jobs and self-employment activities, and better educated households can calculate costs and benefits of income generating activities.

The survey results revealed that the overall mean family size was 5.84 persons per household, which is more than that of the national average, i.e., 5 persons per household (CSA, 2010). Similarly, the mean family size for the households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 5.75, 6.45, 5.25 and 5.85 respectively (Table 3).

Table 3 shows that the overall mean dependency ratio of economically inactive members of the household to active was 1.39. Similarly, the mean dependency ratio for the households engaged in farm only, farm and non-farm, farm and off farm and a combination of farm, non-farm and off-farm activities was 1.38, 1.48, 1.53 and 1.08 respectively. This briefly indicates that, one productive labor force of household members covers all the expenses of 1.39 unproductive members of the household. The survey results also show that the proportion of female headed households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 24 (19.1%), 16 (38.1%), 3 (15.0%) and 0(0.0%) respectively, whereas the proportion of male headed households engaged in farm only, farm and non-farm, farm and off-farm and a combination of-farm, non-farm and off-farm activities was 102 (80.9%), 26 (61.9%), 17 (85.0%) and 14 (100%), respectively. This indicates that in all livelihood diversification strategies the proportion of male headed households exceed that of female headed households. The possible reason is that households headed by female have more responsibilities in home management and are subject to discrimination in labor, credit and a variety of other markets and they own less property compared to men. The statistical analysis revealed that there is a

significant difference at less than 5% level of significance in the variable list of sample household heads across livelihood diversification strategies (Table 3).

The survey results showed that the overall mean land size owned by household heads was 2.36 hectares. Similarly, the mean land size of those engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 2.48, 2.26, 2.11 and 1.98 hectares respectively. This result implies that farmers with large farm size are less likely to diversify their livelihood strategies into non-farm and/or off-farm than those farmers who have small land size (Table 3).

The main livestock types owned by households in the study area are oxen, cows, mule, donkeys, sheep, goats and poultry. The survey results showed that the mean number of total livestock owned by household heads was 5.37 TLU per household. The mean number of total livestock holding for household engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 5.26, 6.62, 3.71 and 4.58 TLU per household respectively. This result suggests that a household having a larger size of livestock is more likely to diversify their livelihood into farm + non-farm activities than compared to those who own small number of TLUs. (Table 3).

Table 3. Descriptive statistic for continuous explanatory variables

Variable	**Households' diversification of livelihood strategies (Mean)**					**F value**
	Y1	Y2	Y3	Y4	Total	
Age of the household	47.83	49.23	44.90	49.21	47.91	4.28**
Education level	6.53	6.04	7.10	7.57	6.56	7.04***
Family size	5.75	6.45	5.25	5.85	5.84	9.01***
Dependence Ratio	1.38	1.48	1.53	1.08	1.39	10.332***
Land size	2.48	2.26	2.11	1.98	2.36	7.58***
Livestock ownership	5.26	6,62	3.71	4.58	5.37	12.31***
Extension contacts	2.42	2.52	2.15	2.64	2.43	3.90**
Market distance	4.34	4.64	4.50	4.35	4.42	2.93*

Source: Survey result, 2019/2020. ***, ** and *stands for statistical significance at less than 1%, 5% and 10% probability level, respectively

Socio-economic characteristics of the sample households

The survey result shows that the proportion of households that participated in social activities were 80(39.6%) while 122(60.4%), did not participate in social activities. Results further showed that households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities were 49(38.9%), 16 (38.1%), 4(20.0%) and 11 (78.6%) participated in social activities while 77 (61.1%), 26 (61.9%), 16(80.0%) and 3 (21.4%), did not participate in social activities respectively (Table 4). The survey results also showed that the proportion of households that received remittances from foreign/urban relatives was 60 (29.7%) while 142 (70.3%), did not receive remittances. Results further showed that households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 24 (19.1%), 26 (61.9%), 5(25%) and 5(35.7%) received remittances while 102 (80.9%), 16 (38.1%), 15

(75.0%) and 9 (64.3%), did not receive remittances respectively (Table 4).

The analysis result showed that the overall mean of total contacts the farmers made with extension agents was 2.43 within a year. Similarly, the mean contact of households engaged in farm only, farm + non-farm, farm + off-farm and a combination of farm + non-farm + off farm activities was 2.42, 2.52, 2.15 and 2.64 within a year respectively. The objective of agricultural extension is to change farmers' outlook towards their difficulties which assists them to adapt better solutions to their livelihoods (Samuel, 2003). The statistical analysis revealed that there is a significant difference at less than 5% level of significance across livelihood diversification strategies of sample household (Table 4).

As Table 4 indicates the mean distance of the household residence to the nearest market center was found to be 4.42 km. Similarly, the mean distance of the household residence from the nearest market center for households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, nonfarm and off farm activities was 4.34, 4.64, 4.50, and 4.35 kilometers respectively. The survey results showed that the proportion of households' participation to cooperatives membership was 140(69.3%) while 62(30.7%) did not participate in cooperative membership.

The survey results showed that the proportion of households used different improved agricultural inputs (improved seed and commercial fertilizers), pest sides and herbicides was 143 (70.8%) while 59 (29.2%), did not use them. Results further showed that households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities was 97(76.9%), 29(69.1%), 8(40%) and 10(71.4%) used different agricultural technologies while 29 (23.1%), 13 (30.9%), 12(60.0%) and 4 (28.6%), did not used agricultural technologies respectively. This implies that those farmers who have used different agricultural technologies are more likely to diversify their livelihood into a non-farm and a combination of farm, non-farm and off-farm activities than their counterparts (Table 4).

Table 4 results showed that 57 (28.2%) of the sample households reported that they were irrigation users while 145 (71.8%) of them were non- users. Results further showed that households engaged in the farm only, farm + non-farm, farm + off-farm and a combination of farm + non-farm + off-farm activities was 27 (21.4%), 27(64..3%) 4 (20.0%), and 0 (0.0%) were irrigation users while 99 (78.6%), 15 (35.7%), 16 (80.0% and 14 (100.%) were non-users of irrigation respectively. The chi-square analysis result shows that there is a statistically significant difference at less than 5% level of significance in irrigation users and non-users' household heads across livelihood diversification strategies (Table 4). The result is in line with the findings of Dilruba and Roy (2012).

The study result showed that 53(26.2%) of the sample households received credit while 149(73.8%) of them did not receive any credit. Results further showed that households engaged in the farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities 30(23.9%), 10 (23.8%), 3 (15.0%) and 10 (28.6%) were received credit while 149(76.1%), 32(76.2%), 17 (85.0%) and 4 (71.4%), did not receive any credit respectively. The survey results suggested that those farmers who have received credit are more likely to diversify their livelihood into the combination of farm + non-farm + off-farm activities than those farmers who did not receive any credit (Table 4).

The study result showed that 76(37.6%) of the sample households live in midland area while 126 (62.4%) of them live in highland area. Results further showed that households engaged in farm only, farm and non-farm, farm and off-farm and a combination of farm, non-farm and off-farm activities 52(41.3%), 11(26.2%), 8(40.0 %) and 10(71.4%) live in midland area while 74(58.7%), 31(73.8%), 12(60.0%) and 4(28.6%) live in highland area respectively.

The result shows that Highland farmers are more likely to diversify their livelihood into farm and non-farm activities due to land quality, rainfall distribution, and soil quality. This leads to increased access to food and income, promoting demand push for farm and non-farm livelihood strategies. However, no significant difference in agro-ecological location was found across livelihood diversification strategies (Table 4).

Table 4. Descriptive statistic for discrete explanatory variables

Variable	Response	Households' diversification of livelihood strategies					χ^2-value	Sig.
		Y1	Y2	Y3	Y4	Total		
Sex of the house holds	Male	80.9	61.9	85.0	100.0	79.20	5.780**	0.016
	Female	19.1	38.1	15.0	0.0	20.80		
Participation in social activities	Yes	38.9.	38.1	20.0	78.6	39.6	1.063	0.302
	No	61.1	61.9	80.0	21.4	60.4		
Cooperative membership	Yes	65.9	80.9	75.0	64.3	69.8	1.883	0.170
	No	34.1	19.1	25.0	35.7	30.2		
Receiving remittance	Yes	19.1	61.9	25.0	35.7	29.7	5.592**	0.018
	No	80.9	38.1	75.0	64.3	70.3		
Improved inputs use	Yes	76.9	69.1	40.0	71.4	70.8		
	No	23.1	30.9	60.0	28.6	29.2	2.204	0.138
Irrigation utilization	Yes	21.4	64.3	20.0	0.0	28.2		
	No	78.6	35.7	80.0	100	71.8	6.030**	0.015
Credit utilization	Yes	23.9	23.8	15.0	28.6	26.2		
	No	76.1	76.2	85.0	71.4	73.8	1.218	0.270
Agro ecology	Midland	41.3	26.2	40.0	71.4	37.6	0.642	0.423
	Highland	58.7	73.8	60.0	28.6	62.4		

Source: Survey result, 2019/20. ***, ** and * stands for statistical significance at less than 1%, 5% and 10% probability level, respectively.

Econometric Model Results

Multinomial logit model regression shows the effect of hypothesized explanatory variables on farmer's choice of livelihood diversification strategies. The dependent variable is the category of farmers' selection of diversified livelihood strategies, taking a value of 1 if a farm household is pursuing agriculture only (Y1=126), a value of 2 if selecting farming plus non farming (Y2=42), a value of 3 if adopting farm with off-farm activities (Y3=20) and a value of 4 if choice is farm plus non-farm and off-farm (Y4= 14). Accordingly, the base category is the household who choose farm only as a livelihood strategy. This strategy is used as a reference category.

The multinomial logit model analysis shows that out of the total sixteen explanatory variables entered into the model eleven variables including sex of households, family size of the household, land holding size (ha), livestock ownership (TLU), frequency of agricultural extension contact, access to irrigation facility, improved agricultural input utilization, access to credit facility, receiving remittances, participation in social activities and Agro ecology were found to be the significant variables of livelihood diversification strategies up to less than 10% level of significance (Table 5). However, the magnitude effect of some significant variables is not similar for the three livelihood strategies. Some may be highly significant to affect the choice of a strategy and may be insignificant for the other. Therefore, multinomial logit analysis results indicate selection of each type of livelihood strategy is affected by different factors and at different levels of significance by the same factor. The possible implication and marginal effects for the significant explanatory variables on the choice of household's livelihood diversification strategies are presented as follows:

In this study, the sex of the households had positively and significantly affected the probability of diversifying the livelihood into the combination of farm + non-farm + off-farm activities at less than 10% probability level. The positive result implies that the households headed by females are more likely to participate in combination of farm + non-farm + off-farm livelihood activities than male headed households. By keeping other factors constant, the likelihood of female headed households to diversifying into the combination of farm + non-farm + off-farm livelihood strategy is more by a factor of 47.1% relative to the base case (Table 5). This implies that, if the households are members or beneficiaries of some developmental programs or projects then they are more likely to be diversified in their livelihoods by more accessing to information, awareness, financial support and scope to intensify their income sources. In the study area, there are developmental programs or projects such as the Agricultural growth program (AGP), Sustainable land use management (SLM), and Catholic micro finance project having an intervention specifically targeting women farmers with tailor made innovations, activities, technical assistance, support business plan preparation and implementation, provision of equipment and inputs to qualifying groups. The result of this finding is in line with the finding of Adugna and Wegayehu (2012).

Family Size of a household is an important variable that impacts livelihood diversification. The result revealed that family size was found to have a negative and significant relation to the diversification of livelihood strategies with farm + non-farm at less than 10% probability level. The marginal effect depicted that, if other factors held constant, the probability of the households to diversify into farm + non-farm activities is decreased by 3.8% as household size increases by one relative to the base agriculture only (Table 5). The underlined point here is that a large household size does not mean all the household members are productive labor force. In fact, those family children may be in school and under productive age. So, the maximum labor force of the family can operate on the existing farm and unable to diversify into other activities and for the newborn child to need care due to this even if the family member was there in diversified livelihood activity may stop it and back to childcare. By gradually expecting that, they diversify their livelihood activities as their labor force increases. The result of this finding is in line with the findings of Gebru *et al.* (2012) and Beyene (2008).

On the other hand, it also negatively and significantly affected the livelihood diversification into farm + non-farm activities at less than 1% probability level. The marginal effect revealed that, if other factors remain constant, the livelihood of rural households to choose farm + non-farm livelihood diversification strategies decrease by a factor of %3.2 as the livestock holding increases by one TLU. This means rural households having large size livestock are less likely to diversify into farm + non-farm livelihood activities compared to other counterparts. The possible reason for this could be attributed to the fact that

households with more TLU have a better chance to earn more income from livestock which enables them to fulfill their livelihood requirements. Consequently, farm households can get the required income from livestock but may not engage in other income generating activities. Conversely, households with a smaller number of livestock endeavor to diversify their income sources by participating in a range of livelihood activities. This is because a small number of livestock holds does not enable them to generate enough income to support family needs which causes them to participate in other alternative livelihood options. (Abera *et al*. 2021).

Table 6 identified that access to extension services plays a central role in improving and attaining the goal of increasing the production and productivity of agriculture. Contrary to prior expectations, the study showed that the frequency of extension contact has a negative and significantly influenced diversified livelihood strategy into a combination of farm + non-farm + off-farm activities at less than 1% probability level. Extension workers' contact with farmers is focused on increasing production and productivity but does not focus on entrepreneurial skills and entry points for non-farm and/or off-farm business activities (Gebru, *et al.,* 2012).

As Table 6 shows, irrigation utilization had positively and significantly influenced the household choices combination of farm + non-farm + off-farm activities at less than 5% probability level. From the model result, other things being constant, the marginal effect reveals that the probability of a household diversifying into a combination of farm + non-farm + off-farm activities increase by 50.8 % for those households who are participating in irrigation utilization activities. The results suggest that those farmers who have used irrigation are more likely to diversify their livelihood activities than their counterparts. A possible justification is that irrigation, whether it is modern or traditional, has a great contribution to increasing production and productivity and enhances the income of the household. Moreover, irrigation opportunities make multiple cropping possible which would create agricultural surplus and improve the income of the households. The result is in line with the findings of Dilruba and Roy (2012) and Mideksa (2019).

On the other hand, this study showed irrigation utilization negatively and significantly influences the household choice of farm + non–farm activities at less than 1% probability level. The model result showed that keeping other factors constant; as irrigation utilization increases by one the farmers dislike diversifying their livelihood into farm +non-farm activities by factor of 25.9%. The possible reason for this could be irrigation is the most interesting income generating and producing throughout the year. Then farmers who are utilizing irrigation as well could earn more income from irrigation which enables them to fulfill their livelihood requirements.

The result showed, input use has been found to influence households' participation positively and significantly in farm + non-farm and farm + off-farm livelihood diversification strategies at less than 1% and 5% probability levels respectively. The model indicates keeping another factor constant, as utilization of agriculture inputs increases with the recommended way the livelihood into farm + non-farm and farm + off-farm livelihood diversification strategy also increases by factor of 13.2 and 12.2, respectively (Table 6). The possible justification is access to agricultural inputs and its recommended application practices are an indispensable part of improving agricultural production and productivity which enhance household income and enable them to participate in diversified livelihood activities. It is obvious that there is no good agricultural production without applying recommended agronomic practices with improved agricultural inputs and no food security without improving agricultural production and productivity in the study district. The result of this study is in line with the findings of Gebru *et al*. (2012).

Capital is the major ingredient in starting up or running any business activity and credit will enhance income generating activities. In this study, credit use is found to have a positive

impact and significant influence for farm + non-farm and farm + off-farm activities at less than %10 probability level and also it has a negative impact and significantly influences the combination of farm+ non-farm + off-farm activities at less than %1 probability level. Credit has a positive impact and significantly influences the diversification of farm + non-farm and farm + off-farm activities at less than 10% probability level. Hence, providing credit for poor farmers will enhance livelihood diversification (Debele and Desta, 2016). Keeping other factors constant, the marginal effect showed, smallholder farmers choosing farm + non-farm and farm + off-farm livelihood diversification strategies increased by a factor of 8.8% and 7.6% respectively as access to credit increased (Table 6). In fact, formal savings and credit institutions are available in the study area and farmer households use credit for the purpose of reducing the problem of working capital, purchase of farm inputs and farm oxen; and to cover social obligatory expenditures. However, most of the smallholder farmers were not users of credit due to high interest rates (18%), fear of the ability to repay, lack of collateral and lack of enough entrepreneurial skills training. The result agrees with the findings of Wondim (2019).

On the other hand, it has a negative impact on livelihood diversification into the combination of farm+ on-farm + off-farm activities. Since credit use allows farmers to follow agricultural intensification (only farming activities) by accessing farm inputs which in turn improves their production and productivity rather than diversifying their livelihoods. The formal and informal credit facilities that avail for rural farmers are a very important asset in rural livelihoods not only to finance agricultural inputs activities, but also to protect against loss of crucial livelihood assets such as cattle due to seasonal food shortage, illness or death. From the model result, the marginal effect reveals that the likelihood of participating in a combination of farm + non-farm + off-farm activities in the household drops by 15.8% for a household using credit (Table 6).

Even though receiving remittance constitutes a small part of total households' income, it is expected to have a positive contribution to the diversification of livelihood strategies (Brown *et* al., 2006). Contrary to the expectation, the model result showed, remittance had a negative and significant impact on farm + non- farm livelihood activities at less than 1% probability level. This may imply that those farmers who received remittances from foreign/urban areas may consume directly what they had gotten, which they do not use for other additional income generating activities. The remittance gained may be too small and insignificant to start non-farming activities in the study area and due to this the negativities relationship happened (Table 6). The result is inconsistent with the findings of Adugna and Wagayehu (2012).

As hypothesized, participation in social activities had positively and significantly influenced the household choices of farm + off-farm activities at less than 5% probability level. The results of this study suggest that those farmers who have participated in social activities are more likely to diversify their livelihood than their counterparts. The possible reason may be farmers' participation in social activities can help to have more access to information, share more experiences with others in a social environment, and creating more social networks with different institutions. From the model result, other things being constant, the marginal effect reveals that the probability of household who are participating in social activity diversifying their livelihoods was increased by 10% in farm + off-farm activities, (Table 6). This result is in agreement with previous studies conducted by Dilruba and Roy (2012).

In line with prior expectations, agro-ecology had negatively and significantly influenced the household choices of farm and off-farm activities at less than 10% probability level. This result demonstrates that the incidence/magnitude of diversifying the livelihood into farming with farm + off-farming increases as we go from highland to midland. A possible reason might be due to differences in the quality and size of land, the amount and

distribution of rainfall that influence highlands and midlands. Diversity in land quality, distribution of rainfall, and ability to grow diverse food crops are different within the agro ecological zones. In the highlands the distribution and amount of rainfall are better as compared to the midlands. From the model result, the marginal effect reveals that the probability of a household diversifying into agriculture + off-farm drops by 8.1% for highland households (Table 6). The result is in line with that of Adugna and Wegayehu, (2012).

Table 2. Multinomial logit model results of households' choice of livelihood diversification

	Household livelihood diversification strategies								
	Y2			Y3			Y4		
Variables	Coef.	Marginal effect	P-value	Coef.	Marginal effect	P-value	Coef.	Marginal effect	P-value
SEX	-0.871	-0.073	0.164	-0.370	-0.025	0.978	20.130	0.471	0.077*
AGE	-0.057	-0.004	0.123	0.038	0.002	0.648	-0.039	-0.000	0.676
EDULHH	0.069	0.005	0.987	-0.129	-0.009	0.474	-0.084	-0.001	0.364
FAMSHH	-0.448	-0.038	0.055*	0.097	0.006	0.719	-0.928	-0.021	0.173
DEPR	0.106	0. 009	0.781	-0.266	-0.018	0.726	1.097	0.025	0.107
LANDSIZ	1.017	0.086	0.005***	0.408	0.028	0.397	0.224	0.005	0.241
TLU	-0.385	-0.032	0.002***	0.408	0.028	0.077*	0.967	0.022	0.008***
AETCON	0.760	0.064	0.375	0.081	0.005	0.476	-4.225	-0.099	0.002***
MKTDIS	-0.320	-0.027	0.277	-0.182	-0.012	0.586	-0.726	-0.017	0.436
IRGU	-3.059	-0.259	0.000***	1.079	0.075	0.276	21.710	0.508	0.018**
IMPRINPU	1.055	0.132	0.044**	1.753	0.122	0.006***	-1.568	-0.036	0.765
CREDITU	1.046	0.088	0.054*	1.090	0.076	0.080*	-6.751	-0.158	0.000***
REMMIT	-1.821	-0.155	0.000***	0.050	0.003	0.782	-1.177	-0.027	0.127
COOPER	-0.929	-0.078	0.120	-0.793	-0.055	0.363	-0.313	-0.007	0.471
PISA	-0.878	-0.074	0.176	1.446	0.100	0.021**	-3.009	-0.070	0.005
AGROECO	-0.644	-0.054	0.610	-1.166	-0.081	0.094*	1.254	0.029	0.699
_CONS	7.964		0.076	-1.540		0.114	22.754		0.163

Source: computed from own survey data, 2022. ***, ** and * stands for statistical significance at less than 1%, 5% and 10% probability level, respectively. Standard errors and z-ratio are not reported here because of space constraints. Number of observations = 202

Log likelihood = -56.479472 LR chi2 (16) = 93.56

Prob>chi2= 0.0000 Pseudo R2 = 0.4530

Summary and Conclusion

The study examined rural households' livelihood strategies in Sayo district, Ethiopia, focusing on socioeconomic status, education, ethnicity, and life cycle stages. Results showed agriculture as the dominant economic activity, with 62.4% of households relying solely on agriculture. 37.6% engage in diverse non-farm and off-farm activities for survival and livelihood improvement.

The research reveals that the agricultural sector alone cannot be the sole source of livelihood for rural households generally in Ethiopia particularly in the study area. Lifestyle diversification is crucial for income and food security. Rural households practice diversified livelihood strategies in addition to agriculture, making it essential to design sustainable interventions that enhance non-farm and off-farm activities. Rural development strategies should focus on increasing agricultural production and productivity while promoting these activities in rural areas.

The study found that sex and family size significantly impact rural households' livelihood diversification choices. To encourage gender equality and reduce fertility, the government should encourage developmental interventions targeting rural women. Family size also affects livelihood diversification, with larger farmland providing better opportunities for non-farm activities. Government support should be provided to help rural households achieve food self-sufficiency and eradicate poverty.

The most important details are that livestock production and productivity is important for rural households' livelihood diversification strategies, and that government should strengthen the agricultural extension system and improve the knowledge gap of the development agent. Irrigation utilization is also important for enhancing rural livelihood diversification strategies and improving rural households' livelihood. Government should supply agricultural inputs to increase production and productivity, while credit use should be increased to protect livelihood assets. Remittance should be advised to start other income generating activities for well-being and capital accumulation. Participation in social activities had positively and significantly influenced the choice of rural households' livelihood diversification. Thus, the service providers of the area should share the experiences of those model farmers, who participate in social activities to other farmers as to get the information which help them in their livelihood diversification. Agro-ecological location was found to be negative and significantly influence the choice of rural households' livelihood diversification strategies. Thus, context specific based on their agro ecology intervention and technologies which can improve the livelihood has to be designed.

In the future, studies on factors affecting the choice of rural households' livelihood diversification strategy should be important to improve alternative sources of livelihoods and employment for the rural poor and provide clues to promote the rural economy. The choice of rural households' livelihood diversification strategies is dynamic and sensitive to geographic, socioeconomic and institutional settings which need area specific investigation to improve the rural household's livelihood problem.

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