

Determinants of Agro-pastoral Households' Livelihood Diversification Strategies in Awbare District, Fafan Zone of Somali State, Ethiopia

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Abstract: Pastoralism and agro-pastoralism with extensive livestock production are the dominant livelihood sources for the Somali regional State's population. However, recent decades marked with climatic shocks such as recurrent drought have negatively impacted livestock production and forced many pastorals and agro-pastoral households to face livelihood crises. To cope with this situation, seeking alternative livelihood sources become inevitable. The objective of this study was to assess the determinants of agro-pastoral household's livelihood diversification strategies in Awbare district, Fafan zone of the Somali State, Ethiopia. A multi-stage sampling technique was used to capture the necessary data, and 153 respondents were randomly selected from the agro-pastoral population using a semi-structured questionnaire, focus group discussion, and key informant interview. Descriptive and inferential statistics such as ANOVA and chi-square and Multinomial logistic model were used to identify determinants factors. The study has revealed that 45.1% of the surveyed agro-pastoral households were engaging livelihood diversification of non-farm, off-farm, and farm+non-farm+off-farm whereas the rest of 54.90% of the respondents were unable to diversify and were practicing only farm activities. The multinomial regression model has identified that the educational status, farm size, use of agricultural farm input, and total annual income of the households were positively associated with the likelihood of engaging livelihood diversification strategies. In contrast, the age, dependent ratio, and access for credit use were negatively associated with the likelihood of livelihood diversification. In conclusion, livelihood diversification among Awbare agro-pastoralists was low due to underlying factors like education and income, and enhancing these factors could improve their livelihood asset. The study suggests that the future policy toward pastoral and agro-pastoralist should consider these factors.

Keywords: Agro-pastoralists, Livelihood, Determinants, Awbare, Somali State

1. Introduction

Globally, pastoralism, which uses extensive rangeland grazing for livestock production, occurs on about 25% of Earth's land area, mainly in the developing countries, from the drylands of Africa and the Arabian Peninsula to the highlands of Asia and Latin America [1]. Pastoralism and agro-pastoralism are some of the primary livelihood sources for many communities living in the arid-semi-arid lowlands of

the world. These drylands are recently classified as areas most threatened by the negative impact of global climate change as characterized by a high temperature, low drought frequency, fluctuating rainfall, and increasing disease outbreaks [2].

Pastoralism is critically important in supporting huge human populations, providing tremendous ecological services, maintaining long-standing civilizations, and

making significant contributions to the subsistence economy in some of the world's poorest regions [1]. However, pastoralism practices have been overwhelmed by agricultural expansion, industrial development, and sedentary livestock farming in recent decades. Pastoral societies worldwide will have more unpleasant fates with the stress of global change in the future [3].

In arid and semi-arid areas of the Horn of Africa, pastoralism is one of the dominant livelihood activities that millions of lowland communities of this region's people livelihood depend on livestock rearing. Pastoralism highly contributes to the GDP of the Horn of African countries. Pastoral and agro-pastoral populations are estimated at 60% in Somalia, 33% in Eritrea; 25% in Djibouti; 20% in Sudan, and 12% in Ethiopia [4].

In Ethiopia, pastoral communities are found in arid and semi-arid lowlands of North-Eastern, Eastern, Southern-Eastern, and Southern, and Southwestern parts [3]. Somali State, which lies south-eastern part of the country, pastoralism is a principal livelihood of Somali communities, and they have been practicing this model through their history [5].

Agro pastoralists often use transhumance of maintaining livestock farming in which they make seasonal migration during dry periods "*Jiilaal*"¹ for access to water and pasture [6] while during wet seasons engage with crop cultivation. Mixed of domesticating livestock and crop production, and their byproducts such as forage, meat, butter, and milk are the primary sources of food and income generation. However, the increasing frequency of drought occurrence, desert locust infestation, widespread invasive weeds [7, 8], and repeated flash floods combined have been pressuring the survival of agro-pastoral livelihood. Livestock and crop productions have been drastically lowered, which risked food security for rural agro-pastoral households living in Somali Regional State. For instance, one of the worst droughts historically experienced by the region happened during the 2016/17 period claiming around half of the region's total livestock population and crop harvests [9].

Subsequently, these factors transformed into widespread crop failure and the death of both livestock and human lives [10]. Furthermore, the negative impacts of climate change exacerbated the intensity and frequency of hazards, which forced many agro-pastoral households to look for an alternative strategy option to diversify livelihood [11, 9].

Thus, as never before, many pastorals and agro-pastoral households currently living in the Somali region in particular and at the country level, Ethiopia in general, have been increasingly adopting livelihood diversification strategies as means of adaption or coping strategies to generate additional alternative income sources [12].

Diversifying livelihood sources among pastoral and agro-pastoral communities have significantly played a

significant role in household resilience to recurrent climate extremes and potentially increased their income by offering them a form of insurance against the losses [13]. Previous empirical studies have shown that 35–50% of developing world rural communities engage in alternative livelihood choices [14]. These livelihood diversification strategies consist of on-farm, off-farm, and combining farm+on-farm +off-farm activities. However, several factors determine the adoption of livelihood diversification activities' choices like age, educational status, credit availability, etc. [15].

Therefore, this study aims to assess livelihood diversification strategies and identify their determinants among agro-pastoral households in Awbare district, Somali Regional State, Ethiopia. Moreover, conducting such a study to understand the status and determinant factors for livelihood diversification strategies in pastoral areas where information scarcity exists is equally crucial for future policy recommendation and testimony for predecessor studies that have been conducted from other identical areas.

2. Methodology

2.1. Description of the Study Area

The study was conducted in the Awbare district of Fafan zone, Somali Regional State, Ethiopia. Fafan zone administers nine districts of Somali Regional State, Ethiopia. Awbare is among one of those nine districts. It lies from 9°, 18' and 10°, 12' N. Latitude and 42°, 37' and 43°, 26' E. Longitude. Its temperature ranges from 16°C to 29°C. The total area of the district is 3,862km². It is bounded by Siti zone in the west and north-west, Jigjiga district in the south, Kebribayah district in the south-east and Somalia in the north and north-west. The district is predominantly classified as arid and semi-arid agro-ecology characterized with erratic and unreliable rainfalls.

In terms of the population, the total population of the Awbare district is 339,056 people. The livelihood of the district mainly depends on the livestock rearing and crop production farming system. Major cultivated crops are maize, wheat, sorghum, teff, watermelon, onion, tomatoes, and haricot beans. The principal livestock traditional breeds are camels, sheep, goats, cattle, and donkeys. The Woreda has 66 villages, of which 7 are urban, and 59 are rural [16].

2.2. Sampling Techniques and Procedures

A multi-stage sampling method was used to select target respondents in the Awbare district. The district consists of 66 kebeles², and these 66 Kebeles were stratified based on pastoral and Agro-pastoral livelihood mode. Three Kebeles, namely *Lafa-esse*, *Garbo-haadlay* and *Gobyarey* were purposively selected due to their representations. 153 respondents were randomly selected using the Yamane (1967) population proportion sampling formula [17].

¹ Jiilaal is known as dry periods of the year from October to March and May to July

² Kebele is the lowest administrative unit in Ethiopia as peasant association

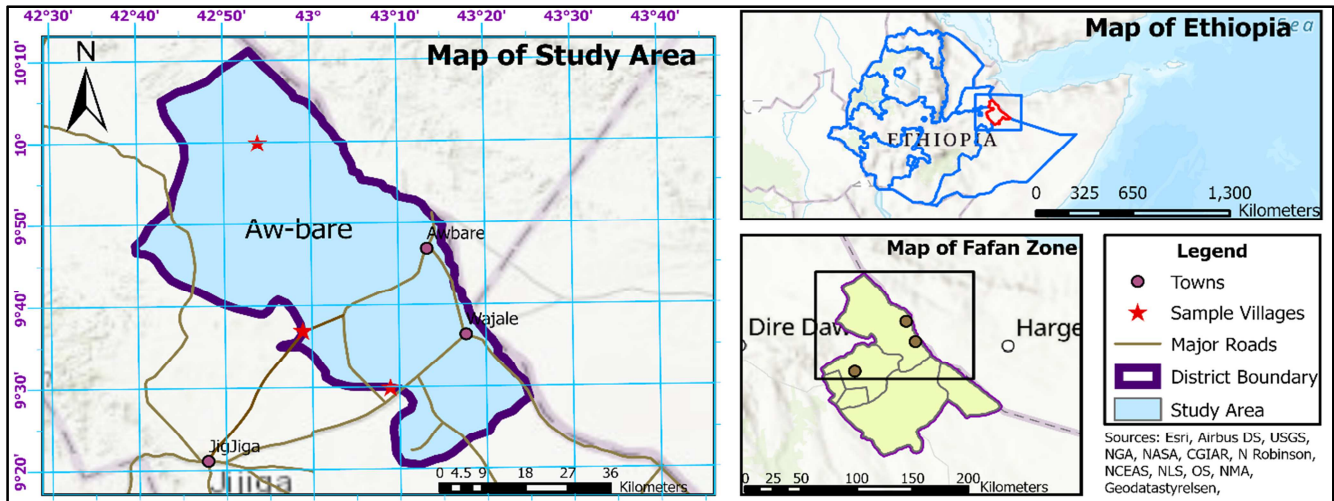


Figure 1. Map of the study area.

2.3. Methods of Data Collection

To achieve the study's objectives, both qualitative and quantitative data collection techniques were used for primary and secondary sources. A semi-structured questionnaire was distributed among 153 randomly selected respondents to capture quantitative data. A predefined question checklist was used for qualitative data collection from key informants and focus group discussion. A pilot test was conducted a prior field survey to check the reliability of the questionnaire.

2.4. Methods of Data Analysis

The collected data was compiled in excel and then exported into STATA 15 for analysis. Descriptive statistics were used to explore the socio-demographic characteristics of the respondents, while inferential statistics like chi-square and ANOVA tests were used. Multinomial logit model was employed to exam the determinant factors of livelihood diversification choices of the agro-pastoral communities in the Awbare district.

2.5. Multinomial Logistic Model Specification

Decreased livestock production due to recurrent drought urged many pastorals and agro-pastor communities in Somali State to seek an alternative livelihood source.

The multi-nominal logit (MNL) is suitable and can predict this likelihood of livelihood diversification among rural households [18]. Underlying assumptions of MNL is that the population in the study should be clustered into diversifying and non-diversifying categories [19].

To identify the determinant factors affecting livelihood diversification choices among the Awbare agro-pastoralist, it is assumed that rational agro-pastoral households engage a mutually exclusive livelihood alternative to reach the maximum utility in a given period. Following [13], suppose for the i^{th} respondent faced with j choices, assume the utility choice j as:

$$U_{ij} = x_{ij} + \beta_{ij} + x\epsilon_{ij} \quad (1)$$

If a household engages j^{th} livelihood strategy in particular, it is assumed that U_{ij} becomes the maximum among the j^{th} utility choices. The probability that a household with characteristics x chooses livelihood strategy j , (P_{ij}) is modelled as:

$$U_{ij} > U_{ik} \text{ for all other } k \neq j \quad (2)$$

Researchers select this model not only because of its superior ability to predict the likelihood of livelihood diversification [13]. The multinomial logit model can allow estimating a set of coefficients β_j corresponding to each occupational category as follows:

$$Pr \left(y = \frac{j}{\chi} \right) = \frac{e^{\beta_j x_i}}{\sum_{\chi} e^{\beta_{\chi} x_i}} \quad (3)$$

Identifying the model, the Multinomial model analysis was carried out by standardizing farm only livelihood choice as a base category as zero ($\beta_1=0$). So, the remaining coefficients β_j measures the change relative to the reference category of the farm only. The probabilities as, therefore, Where Pr stands for probability of an economic activity, i denotes the indexes of the individuals; j represents the three nominal unordered livelihood choice in the samples.

The model can be written as follows;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon \quad (4)$$

Were, Y = Livelihood choices which are categorized as;

1=farm only

2= farm+non-farm

3= farm+off-farm

4= combination of non+farm+off-farm and

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5 \dots \beta_6$ are the coefficients of each independent variable respectively whereas $X_1, X_2, X_3, \dots, X_n$ are explanatory variables and ϵ = Error terms. In the above model, the dependent variable is the likelihood of engaging

alternative livelihood choices with three parameters. The choice as a "farm only" is the reference choice in the study.

Estimated coefficients measure the change in the logit for a one-unit change in the predictor variable while other explanatory variables are constant. A positive estimated coefficient implies an increase in the likelihood that an agro-pastoral household is more likely to diversify its sources of livelihood. In contrast, a negative estimated coefficient specifies that there is less likelihood that a respondent will

choose the alternative other livelihood choices.

Coefficients of each explanatory variable in the model would not interpret the effect of the explanatory variables on the outcome of the dependent variable in terms of magnitude or size. Thus, the study used marginal effects to analyze the results of the multinomial logit model effectively. These effects show the probabilities of occurring the dependent variable in respect to changes in each explanatory variable.

Table 1. Description of the study variables.

Livelihood diversification	Description
(1) Farm only	Relying Farm activities only
(2) Farm+non-farm	Engaging farm plus non-farm activities
(3) Farm+off-farm	Engaging farm plus off-farm activities
(4) Non+farm+off-farm	Combination of farm, non-farm and off-farm activities

Names	Variables Description	Expected outcome
SEX	Sex of the HH Head	+/-
AGEHH	Age of the HH Head	+/-
MARTSTUS	Marital status of the HH Head	+/-
EDUC	Educational status of the HH Head	+
FAMSIZ	Family size	+
DEPR	Dependency ratio	-
TLU	Total livestock holdings	+
CREDITU	Utilization of formal credit	+
DMKT	Distance from the nearest market	-
FARMSIZE	Farm size	+
UAGRII	Use of agricultural input	+
ANFTRA	Access to non-farm training	+
TotalIncome	Total Annual HH Income	+

3. Result and Discussion

3.1. Types of Livelihood Diversification Strategy

The study has identified that (Table 2) a 69 (45.09%) of the surveyed agro-pastoralist were able to diversify their livelihoods into farm+non-farm, farm+off-farm, or the combination of non+farm+off-farm while the rest 84 (54.9) of the sample households, which are the majority were unable to engage alternative livelihood choices in Awbare district, this could be the scarcity of means to diversify their livelihood, and they are solely dependents on their agro-pastoral system. Livelihood diversification has a significant role in reducing pastoral vulnerability but there are some challenging factors for seeking alternative sources of income.

Table 2. Distribution of sample households by livelihood diversification strategies.

Livelihood diversification	Freq.	Percent	Cum.
Farm only	84	54.90	54.90
Farm+non-farm	37	24.18	24.18
Farm+off-farm	23	15.03	15.03
Non+farm+off-farm	9	5.88	5.88
Total	153	100.00	100.00

Recurrent drought occurrence coupled with limited farmland, poor usage of improved agricultural inputs, and privatization of communal rangelands is for extensive livestock rearing is

deteriorating across many Somali pastoralists and worsening their vulnerability to food insecurity and already unstable livelihood situation of the farmers.

3.2. Comparison of Livelihood Diversification Strategies

For continuous variables, analysis of variance (ANOVA) was used to identify whether there was a difference between the four-livelihood diversification choices among households. This study has found significant mean variation between the age, dependence ratio, farm size, and total annual income of the families under the four groups.

The mean variation among the ages of the surveyed household heads was 57.86, 50.76, 49.00, and 53.33 with a 5% level of significance, indicating the household with the highest age mean was only dependent on the farm only while the younger age respondents were diversifying their livelihood sources. Moreover, the mean variation of dependent ratio among households across the four strategies were 0.73, 0.42, 0.37, and 0.33 accordingly. Indicating that the engaging families farm only have the highest dependence ratio rate whereas farm+off-farm households got the lowest rate, which is significant at a 1% significance level. Consistently, the households' mean variation of farm size was 0.77, 0.97, 0.96, and 0.89, respectively, with a 5% significance level. This finding shows that the families with larger farm sizes engage in alternative livelihood choices. The reason could be that larger farms generate more income to invest in other

livelihood sources than households with smaller farms. Interim of total annual income, the mean annual income of farm only, farm+non-farm, farm+off-farm, and non+farm+off-farm ranged as 3751.33, 18909.51, 14647.48, and 27780.56 respectively, with a 1% level of significance. The households engaging farm only strategy were getting the lowest rate of total annual income, while the households engaging under the combination strategies were getting the highest income. This shows that households who adopt alternative income sources are higher than those who depend

on their farms.

For categorical variable analysis, the chi-square test has identified some significant associations between the educational status, credit access, and non-farm training under categories of the farm only, farm+non-farm, farm+off-farm, and non+farm+off-farm on livelihood diversification choices. As indicated in (Table 4), the educational status of the household head, access to credit services, and access to non-farm training have shown at 5%, 1%, and 10% of significance, respectively.

Table 3. Summary statistics for continuous variables by choice of livelihood strategies.

Variables	Farm only	Farm+non-farm	Farm+off-farm	Non+farm+off-farm	Total	F
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
TLU	3.25±1.80	2.62±1.36	3.00±1.57	4.00±1.32	3.10±1.67	2.20
DEPR	0.73±0.44	0.42±0.49	0.37±0.48	0.33±0.50	0.58±0.49	6.7***
FAMSIZE	5.69±1.69	4.95±1.68	4.52±1.53	4.89±1.76	5.29±1.72	3.10**
AGEHH	57.86±11.98	50.76±10.05	49.00±12.24	53.33±15.57	54.54±12.29	5.12**
DKM	11.58±2.89	11.24±2.71	9.87±2.32	11.22±3.93	11.22±2.87	2.19
FARSIZE	0.77±0.45	0.97±0.50	0.96±0.37	0.89±0.33	0.86±0.45	2.25**
TotalIncome	3751.3±214.9	18909.5±1260.5	14647.4±1376.5	27780.6±6003.3	10468.5±8077.8	1210.12***

N.B. ***, **, * Significant at less than 1, 5, and 10% probability level, respectively.

Table 4. Summary of statistics for categorical variables by choice of income diversification strategies.

Variables		Livelihood diversification				Total	X ²
		Farm only	farm+non-farm	farm+off-farm	non+farm+off-farm		
Educational status of the HH Head	Literate	8 (9.5%)	14 (37.8%)	9 (39.1%)	5 (55.6%)	36 (23.5%)	21.609***
	Illiterate	76 (90.5%)	23 (62.2%)	14 (60.9%)	4 (44.4%)	117 (76.5%)	
Access to credit	Yes	23 (27.4%)	21 (56.8%)	15 (65.2%)	5 (55.6%)	64 (41.8%)	16.462***
	No	61 (72.6%)	16 (43.2%)	8 (34.8)	4 (44.4%)	89 (58.2%)	
Use of Agricultural input	Yes	34 (40.5%)	13 (35.1%)	13 (56.5%)	2 (22.2%)	62 (40.5%)	4.139
	No	50 (59.5%)	24 (64.9%)	10 (43.5%)	7 (77.8%)	91 (59.5%)	
Access to non-farm training	Yes	24 (28.6%)	25 (67.6%)	16 (69.6%)	7 (77.8%)	72 (47.1%)	25.856***
	No	60 (71.4%)	12 (32.4%)	7 (30.4%)	2 (22.2%)	81 (52.9%)	

N.B. ***, **, * Significant at less than 1, 5, and 10% probability level, respectively.

3.3. Determinants of Choice Livelihood Diversification Strategies

Table 5. Multinomial logit model results of households' livelihood choices.

Variables	Households' Livelihood diversification strategies								
	Farm+non-farm			Farm+off-farm			Farm+non+off-farm		
	Coef.	St.Err.	M.E	Coef.	St.Err.	M.E	Coef.	St.Err.	M.E
SEX	0.416	0.91	0.078	-0.161	1.132	-0.028	0.537	1.567	0.01
AGHH	-0.088	0.03***	-0.012	-0.138	0.036***	-0.011	-0.061	0.05	-0.001
MARSTUS	1.368	0.729	0.235	0.51	0.883	0.011	0.746	1.104	0.008
EDUSHH	2.496	0.73***	0.377	2.359	0.791***	0.155	3.691	1.116***	0.063
FARMSIZ	-0.02	0.26	0	-0.24	0.35	-0.024	0.533	0.456	0.013
DEPR	-1.035	0.93	-0.165	-0.359	1.164	0	-2.932	1.505*	-0.059
TLU	-0.18	0.18	-0.038	0.055	0.215	0.009	0.583	0.3	0.014
CREDITU	-1.491	0.618**	-0.212	-2.075	.72***	-0.16	-1.396	1.022	-0.018
DMKT	-0.144	0.12	-0.013	-0.456	0.145	-0.04	-0.224	0.177	-0.003
FARMSIZE	1.174	0.623*	0.187	1.057	0.759	0.071	0.321	1.06	-0.002
UAGRII	1.116	0.64*	0.181	0.474	0.724	0.011	2.306	1.178*	0.044
ANFTRA	-3.304	0.737	-0.513	-2.752	0.831	-0.17	-4.187	1.217	-0.068
TotalIncome	2.231	0.321	0.115	0.221	0.541	0.55	0.641	1.661***	0.004
Constant	12.664	3.942***		21.39	4.809***		8.746	6.49***	
Number of observations				153					
LR chi2(33)				128.74					
Prob>chi2				0.00					
Log likelihood				-110.69					

***, **, * Significant at less than 1, 5, and 10% probability level, respectively.

A Multinomial logit model was used to examine the determinant factors for livelihood diversification among Awbare agro-pastoralist. The model has identified that seven of the thirteen hypothesized variables such as age, education, dependency ratio, credit use, farm size, use of agricultural input, and total annual income of the households were significantly determining for diversifying their livelihood.

Significant Interpretation

3.3.1. Age of the Household Head (AGHH)

As it is hypnotized earlier, the age of the household's head is negatively associated with livelihood diversification. However, it is found that Farm+non-farm and Farm+off-farm livelihood diversification strategies at 1 significance level. One-year increase of age decreases the engagement of additional livelihood diversification by 1.2 and 1.1 percent, respectively. It shows that younger farmers are more likely to diversify their livelihood. These findings complied with previous research results conducted from the Kuait District of Amhara region [15].

3.3.2. Educational Status of Household Head (EDUSHH)

Educational status of the household's head has positively and significantly associated with Farm+non-farm, Farm+off-farm, and the combination of Farm+non+off-farm livelihood.

It implies that increased education access to household heads increases the likelihood of engaging Farm+non-farm, Farm+off-farm, and Farm+non+off-farm livelihood activities by 37.7, 15.5, and 6.3 percent, respectively. These findings are in line with previous research results [20, 21, 13].

3.3.3. Use of Credit (CREDITU)

Use of credit is negatively and significantly associated with the Farm+non-farm and Farm+off-farm activities at 5 and 1 significance levels, respectively. Compared to farm only, the livelihood diversification of engaging Farm+non-farm and Farm+off-farm will increase 2.12 and 16 percent, respectively. This negative relation could be explained that the households with access to credit are increasing their farm production and maximizing the farm's output by using the credit. Previous studies have also found that rural farmers' access and use of credit would play a significant role in encouraging pastoral and agro-pastoral livelihood development and strategic livelihood diversifications processes [22].

3.3.4. Dependency Ratio (DEPR)

Dependent ratio is also negatively and significantly associated with the combination of Farm+non+off-farm livelihood diversification strategies at 10 significance level. As one other dependence ratio of the households increases, adoption of livelihood diversification decreases at 5.9 percent. Former similar research conducted complied with these findings [23, 24].

3.3.5. Farm Size (FARMSIZE)

Farm size is positively and significantly associated with Farm+non-farm livelihood diversification activities at 10

significance levels. Indicating that as land size holdings increase by one hectare, the likelihood of engaging alternative livelihood diversification increases by 18.7 percent relative to farm only. It reasons that households with larger farmland holders are likely to invest in other livelihood diversification strategies. These findings are in line with the previous research result [25].

3.3.6. Use of Agricultural Input (UAGRII)

Agricultural input is positively and significantly associated with engaging Farm+non-farm and combination of Farm+non+off-farm at 10 significance level. Indicating that an increase in farm input use increases chances of adopting alternative livelihood by 18.7 and 4.41 percent, respectively. Similar findings were reported in Borana pastoral community [22].

3.3.7. Total Annual Income (TotalIncome)

In agreement with prior expectation, the total annual income of the households has also been positively and significantly associated with engaging the combination of Farm+non+off-farm at 1 significance level. It shows that the agro-pastoralist with more annual cash income is more likely to diversify their livelihood of Farm+non+off-farm activities when compared firmly only. It is noted that the probability of households to engage livelihood diversification by combining the Farm+non+off-farm activities increase by 0.4 percent. Similar research findings have been reported previously [13] and [15].

4. Conclusions and Recommendations

4.1. Conclusion

Agro-pastoralism is the dominant livelihood mode for most Awbare district inhabitants. However, crop and livestock production of the district has decreased due to climatic change-related hazards like recurrent droughts, floods, and diseases. These hazards forced many agro-pastoral households to diversify their livelihood by taking additional income-generating activities from non-farm, off-farm, and the combination of the farm, non-farm, and off-farm activities together as well means to fulfill their basic requirements on livelihood. These diversified sources of income generation activities enabled many households to cushion the adverse hazards related to climate change in agriculture and maintain a normal livelihood.

Consistently, based on the total sampled number of households, the study revealed that 37%, 23%, and 9% of households were engaged in non-farm, off-farm, and farm+non+off choices while the rest 54% has only been involved with activities related to farm only. Moreover, it has been found that the level of livelihood diversification from the study area was relatively low due to the effects of existing factors determining possibilities to diversify the source of income generation. For instance, education, farm size, use of agricultural input, and total annual income factors were

significantly associated with willingness to engage with non-farm, off-farm, and combination of farm, non-farm, and farm activities. In contrast, factors of use of credit, age and Dependency ratios were negatively related to the level of diversification of the community.

4.2. Recommendation

As far as the findings of the study is concerned towards the significant positive factors related to Agro-pastoral livelihood diversification, the study is as a result of this recommending a set of strategies to governmental, non-governmental, and civil society organizations to the mainstream with rural livelihood programs with the following factors which are detrimental to scale up rural livelihood diversification;

Increasing the access of technical vocational training (TVET) education to a rural area is a significant policy issue direction. Linking technical-vocational skills to farmer training centers (FTC) is recommended.

Designing and implementing youth rural job creation programs is essential as young ages are more likely to innovate rural livelihood diversification. Establishing rural enterprises that engage with farm input supplies and petty trades is significant in creating more rural jobs and diversifying rural livelihood.

Establishing linkage between rural financial vendors and urban financial banks is importantly recommended as it increases livelihood diversification. Furthermore, scaling up existing rural village lending credits and cooperatives by building their financial capacities is also equally essential to increase the likelihood of rural livelihood diversification choices.

As a household's land size holdings are positively related to rural diversification livelihood choices, it is better to implement rural land use system. Implementing an extension system enabling collective, cooperative cultivation by merging farmland holdings that can also increase the diversification of livelihood choices.

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