International Review of Social Sciences and Humanities
Vol. 11, No. 2 (2016), pp. 37-51
www.irssh.com
ISSN 2248-9010 (Online), ISSN 2250-0715 (Print)

Livelihood Diversification: Strategies, Determinants and Challenges for Pastoral and Agro-Pastoral Communities of Bale Zone, Ethiopia

Birhanu Negeri Debele
(Corresponding Author)
Department of Geography and Environmental Studies
Madda Walabu University, Bale-Robe, Ethiopia, P.O. Box 247
E-mail: biremwu99@gmail.com

Getachew Demissie Desta
Department of Geography and Environmental Studies
Madda Walabu University, Bale-Robe, Ethiopia, P.O. Box 247
E-mail: gechov2013@gmail.com

(Received: 14-4-16 / Accepted: 26-6-16)

Abstract

The issue of livelihood diversification is a critical component of pastoral economies and has been assessed by various researchers; however, in the study site the quantitative analysis is missing. Thus, this study was carried out to analyze livelihood diversification status, challenges and factors influencing pastoral household's engagement in livelihood diversification activities in six peasant associations selected from two districts in Bale pastoral livelihood zone. The study was conducted on 393 randomly selected pastoral households. Data for the study were collected with the help of a structured questionnaire, key informant interview and FGD. Descriptive analytical tools and multinomial logistic regression analysis were used to analyze the data. Furthermore, the Simpson index was used to measure the level of livelihood diversification. Findings of the study show that the livelihood of the pastoralists diversified into crop production, petty trades, firewood and charcoal production. The contribution of livestock and livestock products to the household's income is the highest. Result of the multinomial logistic model indicates that factors such as age and education level of household head, size of livestock holding, distance to market and access to rural credit service were the major determinants of livelihood diversification. Moreover, the study proves that the scope for livelihood diversification gets boosted when there is access to credit service, better transportation facilities and proximity to urban market. Hence, policies that reduce the aforementioned challenges to diversification and widen its possibilities should be given attention.

Keywords: Bale Pastoral Livelihood Zone, Livelihood Diversification, Livelihood security, Pastoral community.

1. Introduction

Pastoralists are households or populations where more than 50% household income or consumption is derived from livestock or livestock related activities, either as a result of sales

of livestock products or of direct consumption, and agro-pastoralists as deriving 25-50% income or consumption from livestock produce (Swift J, 1998).Ethiopia is home for more than 12-15 million pastoralists and agro pastoralists who reside in 61% of the nation's landmass. Livestock and livestock products provide about 12-17% of Ethiopia's foreign exchange earnings, out of which hides and skins contribute about 90%. It contributes about 33% to the agricultural GDP and 16%to the national GDP. It makes a significant contribution to the national economies both in terms of supporting their own households and export earnings (Adugna Eneyew, 2012).

Due to recurrent drought East African pastoral systems are currently characterized by a dwindling asset base, human welfare deterioration, and the consequent household-level response of poverty driven low-return non-pastoral engagements (Little, 2001; Gebru G, Desta and Coppock, 2004). Population growth and inexorable loss of pastoral grazing lands due to the continuous pressure and territorial contraction resulting from range encroachments by farming cultures are among major challenges that have profoundly threatened pastoralist livelihoods in Africa. In the same manner, the Ethiopian pastoralist's livelihood are characterized by downward spiral of resource depletion, diminishing resilience against drought, loss of livestock and shrinking rangelands (Hailu E, 2008; UNOCHA, 2007; PFE and IIRR, 2010). Because of deteriorating quality of the natural resource base, declining productivity, and falling animal per capita, pastoralists unable to subsist on livestock alone. As a result pastoralists in Ethiopia often forced to seek alternative livelihood options/ strategies such as cultivation, wage employment, sale of charcoal and fuel-wood and other income generating activities) (Gebru G, Desta, S. and Coppock, D.L, 2004).

Diversification as a strategy involves the attempt by individuals and households to find new ways to raise income and reduce environmental risk, which differs sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome ((Ellis F, 2000). Livelihood diversification can be divided into two categories; *on-farm and off-farm* diversification/activities. On-farm diversification means "maintenance of a diverse spread of crop and livestock production activities which are undertaken to generate income from crop production and livestock rearing. Non-farm diversification refers to generating an income from the non-farm activities such as wage employment, sale of charcoal and fuel-wood, processing of agricultural equipment, craft, and other strategies undertaken in order to supplement earnings from agriculture (Losch *et al*., 2010).

As Little et al (Little, P.et al., 2006) pastoral diversification is the pursuit of any non-pastoral income-earning activity, which includes: (1) any form of trading occupation (for example selling milk, firewood, animals); (2) wage employment, working as a hired herder, farm worker, and migrant laborer; (3) retail shop activities; (4) rental property ownership and sales; (5) gathering and selling wild products (for example gum Arabica, firewood, charcoal or medicinal plants); and (6) farming. According to Overseas Development Institute (ODI), there are four dominant livelihood systems in pastoral areas across the Horn of Africa (ODI, 2010): Livestock-based livelihoods; agro-pastoral livelihoods – these combine extensive livestock rearing and rain-fed cereal production; Sedentary farmers - practice mixed farming, cultivating food crops with modest sheep and goat herds; Ex-pastoralists - these are households who have lost their livestock and now depend largely on human labor.

Literature provides a variety of reasons behind livelihood diversification. For instance, Ellis (2000) stated that the motivations of livelihood diversification vary according to context: from a desire to accumulate, invest and the need to minimize risk or maintain incomes, to a requirement to adapt to survive in eroding circumstances or some combination of these. Little PD (2001) stated that wealthier herders may seek diversification to promote economic growth, while the poorer herders may seek diversification to survive. The same source cited that wealthier herders have the option to pursue things like lucrative trading professions, while the poorer are relegated to marginal activities such as fire wood sales or charcoal

production. Therefore, pastoralists'- diversification profiles illustrate clear dualistic tendencies, i.e. the richest diversify in order to promote economic growth and accumulate additional wealth, whereas the poorest diversify in order to reduce risk and to survive (Little PD, 2001).

Currently, due to environmental conditions, declining access to rangeland resources or poor pasture, and low livestock productivity, pastoralists are moving from pure pastoralism to agro-pastoralism. Little PD (2010) argued that since the resource-base of the production system cannot accommodate and absorb the human and livestock resources, pastoral households will continue to diversify to waged employment and different trading activities as supplements to livestock-based incomes. Diversification is a core strategy of contemporary rural livelihood systems in developing countries (Ellis, 2000; Niehof, 2004). However, several research works indicated that there are various factors that might influence the choice of livelihood diversification strategy. The livelihood diversification activities are influenced by factors which can be both internal and external environments of rural households (Butler and Mazur, 2004; Ellis, 2000). Factors like geographical location, population pressure on land, levels of education, lack of market linkage, shortage of water both for human and for livestock and limited access to rural finance are the most common determinants of the choice of livelihood diversification strategies that would be undertaken.

A number of studies have been conducted on the condition of livelihood diversification in Ethiopia UNOCHA, 2007; COMESA, 2009). However, few attempts have been made to investigate it in quantitative approach. The main intention of the researchers in accomplishing this research is therefore, to quantitatively analyze and measure the status of livelihood diversification using the income approach to livelihoods. Moreover, the growing importance of the diversified livelihood in the lives of the rural households and the dynamic nature of livelihood diversification now taking place in rural areas that needs more attention are also another crucial issue that trigger the researchers to conduct this research. In order to address these issues, present research is designed to this end with the objectives to examine the livelihood diversification strategies pursued by pastoral households, to measure livelihood diversification status as well as identifying factors determining the livelihood diversification in the context of achieving sustainable livelihood security in the area under investigation.

2. Research Methodology

The study was conducted in Bale zone, *Oromia* regional state, Ethiopia. It is located between 5°11´03´´N to 8°09´27´´North latitudes and 38°12´04´´E to 42°12´47´´East longitudes. According to CSA (2007) report, the population is estimated at nearly 1,418,864.Bale zone is characterized by rural dominancy and agricultural activity where87 % of the populations are living in rural area. In the rural and lowland areas of the zone, livestock rearing is the main stay of the people. In Bale zone, nine districts, namely, *Rayitu, Sawena, Lege-hidha, Gura-Dhamole, Madda-walabu, Dello-Menna, Harena-buluk, Dawe-Kachen and Dawe-Serer* districts are categorized as pastoralist districts, collectively known as "*Bale Pastoral Livelihood Zone*" (see figure 1). The study was conducted in Dello-Menna and Rayitu districts. Even though mixed farming (crop production and livestock rearing) are the economic activates carried out, livestock rearing is the dominant economic activity in both districts. In other words, livestock husbandry contributes significantly to the livelihood of the people (BZPCDO, 2015).

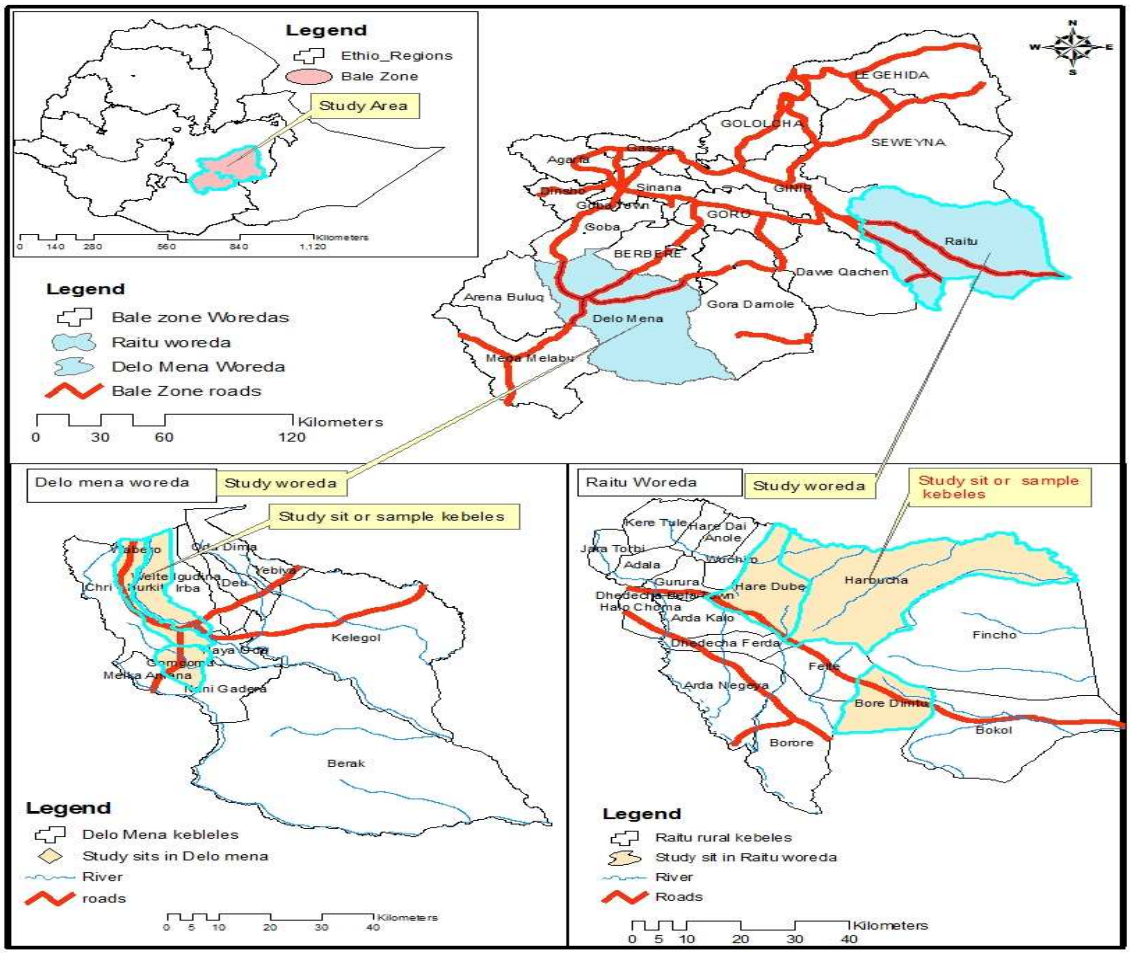

Figure 1: Location of the study area

In this study the main intention of the researchers is to quantitatively analyze the status of livelihood diversification using the income approach to livelihoods, and to identify factors which influence or condition household's livelihood diversification levels. For this reason, the researchers were utilized the quantitative research approach. To obtain well quantified and complete data about livelihood assets (land and other assets holding), number of livelihood activities, farm income, and non-farm income as well as household's demographic characteristics, the researchers were employed the quantitative research approach. The researchers were also used qualitative research approach to complement the data obtained through quantitative approach. The qualitative research approach is known for its importance in the investigation of respondents' perspective about the issue under consideration. Therefore, in this study a mixed of quantitative and qualitative approaches were employed to achieve the desired objectives of the research. The combination of qualitative and quantitative techniques can help the researchers to triangulate the relevance and accuracy of the data. Both Primary and secondary data were used in this research. To supplement and enhance the information presented, secondary data was accessed from both published and unpublished materials. The secondary data used in this study was obtained from various sources such as district agricultural and pastoral offices, district administrative offices, and zonal agricultural office, and others.

In order to get the required sample size, multi-stage random sampling procedure was employed. Among the nine pastoral districts of Bale Zone, two districts (Dello-Menna and Rayitu districts) were randomly selected for the purpose of this study. Then six "PAs" namely: *Burkitu, Gomgoma and Wabero (from Dello-Menna district), while Bardimtu, Haredube and Harbucha* (from Rayitu district) were selected through random sampling

technique. Therefore, the target population of the study was pastoral and agro-pastoral households in Dello-Menna and Rayitu districts. According to the annual report of Agriculture and Rural Development office (2015) of the respective districts, the total numbers of pastoral and agro-pastoral households in the six Peasant Associations (PAs) selected from the two districts are 4,440, from which the required sample size was determined. In order to determine the representative sample sizes for the total target population of this study, researchers were used the formula designed by Yamane (1967). According to Yemane, having a confidence level of 95% with sampling error of 5%, the sample size "n" is determined as follows:

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

Where: "**n"** is sample size, "**N"** is the total population and "**e"** is the level of precision. Accordingly, the total sample size for this study is 393**.**

In the course of this study a total of 393respondents were selected randomly from the six sampled PAs. Since the selected Pashave different number of households; the sample size for each PA's was allocated proportionately using proportionate sample allocation methods in an attempt to make each districts and PAs sampled identical with proportion of population.

Then three data collection instruments such as questionnaires, interviews and focus group discussions were used to obtain the necessary data. The Primary data, both quantitative and qualitative were collected from respondents with the help of structured questionnaire administered by well-trained enumerators (Development Agent workers) who are capable of speaking the local language. Moreover, qualitative data were collected by the researchers themselves with the help of focus groups discussion (FGD) and key informant interviews.
Statistical Package for Social Sciences (SPSS version, 20) and STATA software were used for the cleaning and structuring of data. For the quantitative data analysis various descriptive statistical tools like frequency, percentage, mean, standard deviation, t, F and Chi-square (**χ2)** tests and one way ANOVA were used. Diversification index was also used to measure the level or status of livelihood diversification. Furthermore, Multinomial Logistic Regression model was fitted to identify determinants of livelihood diversification.

The logistic model used is specified as:

$Y = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots\ldots + \beta_8 x_8 + U$

Where:

Y= Livelihood diversification (1= Less Diversified, 2= Moderately Diversified and Highly Diversified= 3)

X_1 = Age of Household Head (Years)
X_2 = Sex of Household Head (1=Male, 2= Female)
X_3= Education Level of Household Head (years)
X_4= Land Holding Size (Hectare)
X_5=Family Sixe (number in Adult Equivalent)
X_6 = Distance to Market (distance in kilometers)
X_7 = Livestock holding in tropical unit (TLU)
X_8 = Credit use by the household (0= No, 1= Yes)
β_o = Constant term
$X_1 - x_7$ = Regression coefficients
U = Error term

Data collected through interviews and focus-group discussions were also incorporated into the qualitative results, and it was described and analyzed with clarity. Finally, the outputs of the statistical techniques were presented using tables and charts, to provide evidence and to support the qualitative information.

3. Results and Discussion

3.1 Major Livelihood Diversification Strategies

Households in the study area engaged in few income generating activities, can be both farm/pastoral and non-farm/pastoral activities. The sampled households reported that they had engaged in one or more income generating activities, among livestock production system, crop production, petty trade, remittance, handcrafts, daily laborer, and selling firewood and charcoal are important. Out of the total households surveyed only19.21%were reported as being participated in off/non-farm/non- pastoral sectors. The survey result indicates that in the study site fire wood and charcoal selling is the dominant off-farm sector that is practiced by about 9.16% of households. It is followed by petty trade (include shop, livestock and crop trading) which accounts for 5.85% (table 1). This implies fire wood and charcoal selling are one of the most common non-pastoral/ non-farm income generating activities in the study area. This finding may indicate the limited options available for pastoralists to diversify their economy. It is widely recognized that fuel wood and charcoal selling is an occupation of the poor pastoralists across East Africa (Little et al., 2006) that arises out of desperation. This may lead to conflict within communities between those who make charcoal and those in charge of natural resource management (Adugna, 2012).This was realized by FGD discussions, as the participants were filled with vehement accusation of charcoal makers for cutting down trees. So that, the negative environmental impact of charcoal making is clear to pastoralists themselves as well as government officials. But, the magnitude of poverty and availability of limited options pushes pastoral households to engage in such low return activities to address this problem.

Table 1: Major Livelihood Strategies by Sampled District and their share

Income Source	**Sampled Districts**					
	Dello-Menna		**Rayitu**		**Total**	
	No. HH	**%**	**No. HH**	**%**	**No. HH**	**%**
Crop	235	97.92	68	44.44	303	77.10
Livestock	205	85.42	151	98.70	356	90.59
Off farm:	16	6.67	7	5.88	23	5.85
❖ Petty Trade	5	2.08	2	1.31	7	1.78
❖ Hand Craft	3	1.25	7	5.88	10	2.55
❖ Remittance	15	6.25	21	13.73	36	9.16
❖ Fire wood & Charcoal	8	3.33	17	11.11	25	6.36
❖ Daily Laborer	13	5.42	29	18.95	42	10.69
❖ Aid					76	19.21
Off-Farm Total						

Source: 2015 Field Survey

Farming (rain-fed cultivation) is often the first livelihood strategy that traditional pastoralists diversify into in the dry lands of East Africa (Little et al.). The same general experience seems

to hold true for pastoralists of the study area. During the course of this study it was found that livestock have been the main assets of pastoralists in the study area with an average livestock holding per household of 10.28in TLU (Tropical Livestock Units = 250 kg non-lactating animal) (table 2). Livestock were also used as sources of food and income generating activities (mainly milk from cattle, goats and camels, and occasionally meat), as well as for social functions and transportation and to supply draught power. 90.59% of respondents derived income from livestock, selling small ruminants and dairy products. Camels and cattle have been used in society as a 'savings account', while small ruminants constitute liquid assets, often being sold during emergencies and at the time of crop failure.

Table 2: Mean Livestock Holdings per Household in TLU

Livestock Class	**Rayitu**	**Dello-Menna**	**Total**	
	Herd size (TLU)	**Herd size (TLU)**	**Herd size (TLU)**	**SD**
Cattle	3.64	3.94	3.85	3.26
Goats and Ships	1.76	0.59	1.22	1.07
Camels	4.53	4.24	4.50	3.31
Equines	1.88	0.54	0.71	0.37
Total	11.81	9.31	10.28	6.72

Source: 2015 Field Survey

In general, in the study area occupationally, 90.59% and 67.10 % of the households have livestock herding and crop production as their main livelihood strategy, respectively. Therefore, one can conclude that both the study districts were universally practiced livestock herding.

3.2 Measuring Livelihood Diversification by Diversity Indices

In this study *Simpson index of diversification*, recommended by Shiyani and Pandya (1998) was used to measure livelihood diversification. The Simpson index of diversity is defined as:

$$SID = 1 - \sum_{i=1}^{N} p_i^2$$

Where, SDI is Simpson Diversification Index, N is the total number of income sources and Pi represents the proportion of income coming from source ***i***. The average Diversification Index in the study area is found to be 0.28 with maximum and minimum diversification index value of 0.94 and 0(table 4). This implies that majority of the households in the study area were under 0.38 (less level of diversification index). The mean diversity score for the highly diversified, moderately diversified and less diversified levels respectively, was found to be 0.87, 0.52, and 0.28, and this is in line with finding of Ellis for most sub-Saharan African countries (Ellis, 2000).

The Simpson Index of Diversity is affected by the number of income sources. Accordingly, based on the SID value, livelihood diversification status can be categorized as Less diversified (households with the value of SID Up to 0.38), Moderately Diversified household (when the value lies between 0.38-0.63) and Highly Diversified (if it is more than 0.63) (Shiyani, R.L. and Pandya, H.R., 1998).Accordingly, households are grouped by number of income sources in order to understand livelihood diversification. Thus, this study considered the number of income sources as a means to conceptualize pastoral livelihoods diversification. Hence, the survey result reveals the sampled households had engaged in one to four income generating activities among livestock, crop, petty trade, remittance, handcrafts, fire wood and charcoal

selling. The descriptive analysis reveals 78.65% of pastoral households were less diversified (they depend on a single income source which was livestock rearing), 19.85% were moderately diversified (depend on two or three income sources), and only 1.5% were highly diversified (more than three income sources) (table 3).

Table 3: Household Heads by Extent of Livelihood Diversification

Diversification Index	Diversification Status	Dello-Menna		Rayitu		Total	
		No. HH	%	No. HH	%	No. HH	%
= < 0.38	Less Diversified	166	69.17	143	93.46	309	78.65
0.38-0.63	Moderately Diversified	69	28.75	9	5.88	78	19.85
> 0.63	Highly Diversified	5	2.08	1	0.66	6	1.5
	Total	240	100.0	153	100.0	393	100.00

Source: 2015 Field Survey

The average number of income generating activities or sources per household for the whole sample was found to be 2.12. The corresponding figure for highly diversified, moderately diversified and less diversified households was found to be 3.50, 2.37, and 1.74, respectively (table 4). The mean value is statistically different at P<0.05 probability level. This implies that households under the highly diversified level have more opportunity to diversify income sources than those households under the moderately and less diversified level in the study area.

Table 4: Diversity Indexes and Number of Income Sources

	Diversification Level		
	Highly Diversified	**Moderately Diversified**	**Less Diversified**
Diversity Index			
Mean	0.87	0.52	0.28
SD	0.51	0.42	0.21
Number of Income Sources			
Mean	3.50	2.37	1.74
SD	0.55	0.48	0.44
Minimum	3	2	1
Maximum	4	3	2
F	**2.73733**		
P value	**0.007****		

Source: 2015 Field Survey

**Significant at less than 5% probability level

It is recognized that diversification can increase resilience and reduce vulnerability to risks and shocks in the arid environments (Barrett et al., 2005; McCabe et al., 2010). Thus, livelihood diversification in Bale Zone's pastoral and agro-pastoral community is considered primarily as a survival and coping mechanism in the uncertain environment threatened by so many factors: Poor rangeland productivity, land shortage and dispossession, population pressure as well as frequent drought. It is, therefore, not surprising to find most households in the study area diversify into low return and often environmentally destructive activities that

may actually exacerbate, rather than alleviate the ever-increasing poverty in the pastoral communities of Bale zone.

In addition, Adugna (2012) stated that, households can be grouped by shares of income earned in different sectors of the rural economy in order to understand livelihood diversification. Similarly, in this study the total values of each crops and livestock product were calculated using nominal local prices. This is used to see the level of livelihood diversification. The average value in Birr was found to be 45,848.47 and standard deviation of 45,068.82, with maximum and minimum of 241,000 birr and 990 birr, respectively. The survey result signifies that the income share of livestock rearing and farming sectors accounts for 76.71% and 18.08%, respectively. The most impressing figure is that, in the study area income share of off farm/off pastoral sources accounts only 5.22% (figure 2). This result leads to the understanding that there are challenges which prevent pastoralists to insulate themselves from environmental and economic shocks, trends and seasonality and improve livelihoods. The survey result reveals, in the study site the fire wood and charcoal selling is the dominant off farm sector accounts for 3.34% and is followed by petty trade which accounts for 1.04.

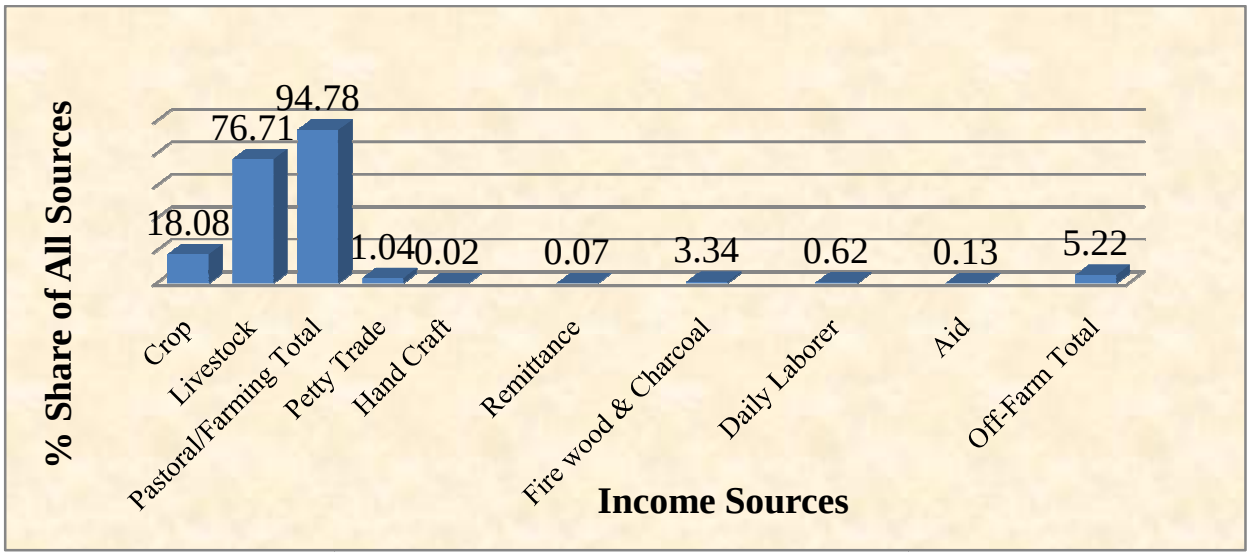

Figure 2: Share of income by source

On the other hand, the one-way ANOVA results confirm that the proportional mean variation of households' income from all sources and income from crop was found to be significant (at $P<0.01$, $P<0.05$ and $P<0.1$) probability level among the diversification levels. The mean income for highly diversified, moderately diversified and less diversified households is found to be 50,931.67, 32,914.35, and 17,501.07 birr, respectively. Low-return combinations of activities in less diversified livelihoods yield little income, and this does not allow households to move out of the vicious cycle of poverty traps. It is therefore evident that poverty reduction strategies through diversification strategies need more attention.

Table 5: Livelihood Diversification by Income Source

Income Source	Diversification Status						F	Sig.
	Highly Diversified		Moderately Diversified		Less Diversified			
	Mean	SD	Mean	SD	Mean	SD		
Crop	10603.33	5502.67	15855.18	9062.74	6604.94	6862.81	50.465	.000**
Livestock	30750.00	10467.81	24263.29	12006.47	24383.16	25908.45	.266	.767
Off farm	9578.33	7716.22	5721.55	6676.29	9329.21	14177.77	1.600	.207
Total Income	50931.67	22459.30	32,914.35	19845.81	21,467.25	17501.07	14.858	.000**

Source: 2015 Field Survey

**significant at less than 1%, 5% and 10% probability levels

In this study, in order do stratify sample households in to distinct diversification strategies; the level of diversifying income source is compared by the share of livestock income in total household income. Study by FAO as stated in Swift (1988) indicates that a household with more than 50% income share from livestock is considered to be a pastoralist, while households with annual income share of less than 50% from livestock is considered as diversifying income. Accordingly, a household with less than 25%, between 26%-75% and greater than 76% income share from livestock is, respectively grouped under highly, moderately and less diversified households. The survey result in table 6 shows that, 3.6%, 50.1%, and 46.3% households have respectively found to fall under highly, moderately and less diversified levels. The survey result indicate that about 85.6% of pastoral households in the study site had income share from livestock, so that considered as pastoralist, while only 14.4% of them had an income share from livestock, which in contrary considered as diversified income.

Table 6: Diversification statuses of sample households by income share from livestock

Share of Livestock Income	Diversification Status	Dello- Menna		Rayitu		Total		
		N	%	N	%	N	%	Mean
<25%	Highly Diversified	11	5.24	2	1.33	13	3.60	14.44061
26 – 75%	Moderately Diversified	176	83.81	5	3.31	181	50.14	58.78819
>76%	Less Diversified	23	10.95	144	95.36	167	46.26	92.73848
Total		210	100.0	151	100.0	361	100.00	

Source: 2015 Field Survey

3.3 Determinants of Livelihood Diversification

The multinomial logistic Regression model was employed to identify factors which influence or condition household's livelihood diversification strategies. The dependent variable of the model is *diversification level*. Dependent variable of the model is diversification status which is nominated as 1= less diversified, 2= moderately diversified and 3= highly diversified (table 7). The independent variables were chosen based on theoretical assumptions and a total of 8 explanatory variables were entered into the model, and then statistically significant variables were identified in order to measure their relative importance on pastoral and agro-pastoral households' livelihood diversification level. The estimation from MNL (multinomial logistic) model is statistically significant in explaining pastoral and agro-pastorals' level of different livelihood diversification category. The $\chi 2$ value is 78.52, which is statistically significant at

1% levels. The model explained 13.68% of the variation in livelihood diversification level in the study area. The category *"less diversified livelihood level"* was used as a base category (reference category) so that average marginal effect estimates are probability of being moderately and highly livelihood diversified levels over this base category. This indicates that the discussion of the results focuses on the impact of the explanatory variables on having moderately and highly diversified livelihood levels relative to being less diversified livelihood households (the base category). Thus in all cases, the estimated marginal effects are compared with the base category of less diversified livelihood source.

The result from coefficients of multinomial logistic regression on the existing alternative livelihood diversification levels in the study area indicates that among 8 hypothesized explanatory variables, six variables were found to significantly determine the category of highly diversified level of livelihood. Compared to the base category (less diversified livelihood level), age of head (AGEHEAD), Sex of the household head (SEXHEAD), Education level of the household head (EDUCLEVEL), Tropical Livestock Unit (TLU), distance from the nearest market (DISTMARK) and access to credit service (CRDTACSS) determined the highly diversified livelihood categories while the five variables, namely, age of head (AGEHEAD), Sex of the household head (SEXHEAD**)**, Education level of the household head (EDUCLEVEL), Tropical Livestock Unit (TLU) and distance from the nearest market (DISTMARK) affected moderately diversified livelihood category households in relation to the base category (table 7).

Table 7: Result from Multinomial logistic model for Livelihood Diversification Level

Independent variables	**Highly Diversified**		**Moderately Diversified**	
	Coefficient	**z**	**Coefficient**	**z**
AGEHEAD	0.1556145(0.0666023)**	2.34	0.0327602(0.0116008)**	2.82
SEXHEAD	2.604384(1.356609)*	1.92	-3251708(0.3314733)	-0.98*
EDULEVEL:				
Elementary	-2.71651(1137.545)	-0.01	0.0316331(0.3285731)	0.1
Junior	3.733614(1.835995)**	2.03	-0.645262(0.4849704)***	-3.39
Secondary	3.228711(1.884378)*	1.71	-0.020679(0.8781153)	-1.16
FARMSIZ	-0.040664(0.6746601)	-1.54	0.0995596(0.1097568)	0.91
LIVESTOK(TLU)	0.1107177(0.359607)	0.31	-0474605(0.0928778)	-0.51
FAMLSIZ	-3016358(0.12306)**	2.45	-0482686(0.0183702)**	2.63
DISTMARK	-9579155(0.4320441)***	-2.22	-2303175(0.0398799)***	-5.78
CRDTACSS	0.0059004(0.0053708)*	0.01	0.020956(0.059364)**	0.035*
Constant	-.681769(4.175143)**	-2.08	-0.1322826(0.6699654)	-0.2

Multinomial Logistic Regression	*Number of obs*	=	*393*
	LR chi^2(18)	=	*78.52*
	Prob> chi^2	=	*0.000*
Log Likelihood = 247.7496	*Pseudo R^2*	=	*0.1368*

Source: Own computation based on survey data, 2015

***, ** and * indicates level of significance at 1%, 5% and 10% respectively.

The results of the estimated marginal effects are discussed below in terms of the significance and signs on the parameters. The positive estimated coefficients of continuous variable indicates that the probability of the household higher and moderate livelihood diversifications level categories' relative to less diversification status would increase as these explanatory variables allowed to increase by a unitary value. The implication is that the probability of the pastoral and agro-pastoral households to be on these outcomes is greater than the probability

of being in less diversified livelihood level (the base category). The negative and significant parameter indicates the probability of falling back to the base category that is less diversified livelihood levels. Results of marginal effect for the three livelihood diversification levels are indicated in Table 8 below.

Table 8: Marginal effects of the multinomial model for Livelihood Diversification Level

Independent variables	**Highly Diversified**		**Moderately Diversified**	
	Coefficient	**z**	**Coefficient**	**z**
AGEHEAD	0.0015903(0.0008803)*	1.81	0.009274(0.002197)***	4.22
SEXHEAD	0.0158956(0.0129833)	1.22	-0.06178(0.066696)	-0.93
EDULEVEL				
Elementary	-0.0059004(0.0053709)	-1.1	0.004263(0.068369)	0.06
Junior	0.2574353(0.0705094)***	3.65	-0.30903(0.05963)***	-5.18
Secondary	0.0835285(0.0628656)	1.33	-0.09432(0.182861)	-0.52
FARMSIZ	-0.0076946(0.008032)	-0.96	0.085428(0.024176)***	3.53
LIVESTOK(TLU)	-0.0066535(0.0035236)*	-1.89	-0.03425(0.005588)***	-6.13
FAMLSIZ	0.0064627(0.0053944)	1.2	-0.01495(0.018555)	-0.81
DISTMARK	-0.0034074(0.0018398)*	-1.85	-0.00965(0.003562)***	-2.71
CRDTACSS	-0.0059004(0.0053708)	-1.1	0.020956(0.059364)	0.35

Note: Figures in parentheses are standard errors

Source: Own computation based on survey data, 2015
***, ** and * indicates level of significance at 1%, 5% and 10% respectively.

The Educational Level (EDULEVEL) of household head was found to have positive correlation with highly diversified livelihood and moderately diversified strategy, so that it was found to be one of the important determinants of livelihood diversification. Elementary, Junior and Secondary Education of household head found to be significant at $p<0.01$. This finding indicates that those households with high educational level are more likely diversify livelihood strategies into moderately and highly diversified level than those do not. Therefore, the finding confirms that an increase in education level of head will increase the likelihood of being in highly and moderately diversified compared to the probability of being in less diversified strategy. This is due to most probably educated person gain better skill, experience, knowledge, literate individuals are very ambitious to get information and determine the capacity of finding jobs and these help them to engage in diversified livelihood strategies. This finding is similar with that of Ng'ang'a, et al (2011) assumed education as an essential in increasing off/non-farm earnings and time allocation of rural families and to diversify the rural economy away from agriculture. Therefore, investing in education and increasing access to education will help the pastoralist households in getting alternative income as it increases the probability of engagement in rural non-farm activities and livelihood diversification.

Age of Household Head (AGEHEAD): From the multinomial estimation for diversification levels it was found that the probability of having highly diversified livelihood category is affected positively and significantly by age of the respondent. The model result indicated that the age of household head influenced positively and significantly the household's livelihood diversification strategy at less than1% and 10% probability level. In other words, multiplicity of activities increases with advancing age. This is because, experience increases with age, and consequently, experienced persons have more prospects of diversifying livelihood strategies. From the model result, other variables being kept constant, the probability of households' being either highly diversified or moderately diversified will be increased by 0.16% with a

unit change in age. This is in lined with Dilruba and Roy (2012) and Ellis (2005) found that household head's age is the main driving force towards livelihood diversification. Therefore, the marginal effect of the respondent's age is 0.0016(0.16%) showing that those aged households prefer to diversify their livelihood options relative to those who are younger in the study area.

Sex of Head (SEXHEAD): It was found that the probability of having highly diversified livelihood category is affected positively and significantly by sex of the respondent. Being male headed household was found positively and significantly to affect the likelihood of highly diversified livelihood categories. The marginal effect of being male indicates that, if the household is male headed, the likelihood of having highly diversified livelihood options by 1.6% relative to base category (less diversified livelihood categories').

Livestock Holding in TLU (LIVESTOK) is found to have a significant (at P<0.01 and P<0.1) negative correlation reducing the probability of being in either moderately or highly diversified household, respectively. This implies that the likelihood of a household's diversification decreases with the size of livestock holding. In other words, this result suggests that a household having larger size of livestock are less likely to diversify the livelihood strategies into non-farm/ non-pastoral and/or off-farm activities compared to those who own small number of TLUs. Therefore, the negative association between livelihood diversification and number of TLU indicates that herd size creates better opportunity to earn more income from livestock production. According to this study, keeping other variables constant, then likelihood of diversifying into moderate or highly diversified level decrease by 3.43%and 0.67 % respectively, for those households with more TLU. Study by Adugna (2012) supports this idea.

Distance to Market (DISTMARK): Is found to have a significant (P<0.1 and P< 0.01) negative correlation with reducing the probability of being both highly diversified and moderately diversified household, respectively. This negative relationship tells us that the larger the distance the lesser the tendency of households to diversify and vice versa. The possible justification could be households who are closer to the market centers do not have much cost to access market incentive for diversification of livelihoods. From the model result, the marginal effect reveals the likelihood of a household diversifying into moderate and high level of diversification increase by 0.34% and 1.31%, respectively, as a household is near to market center by one kilometer. In other words, distance from nearest local market center decreases the probability of finding the households in highly diversified categories' by 1.31 % (highly diversified) and by 0.34 % (moderately diversified) relative to those in less diversified categories'. This finding is in agreement with that of Ibrahim et al., (2009) argues that distance from market center influences decision to build highly diversified livelihood options.

Access to Credit Service (CRDTACSS) was found to have a positive effect on the level of livelihood diversification. The co-efficient was statistically significant (at P<0.01 and P< 0.05) level of probability. Since resource-base is very poor for most of the rural households, providing credit to households will improve their livelihood. This finding is in line with Birhanu (2014). On the other hand, there are several challenges to successful livelihood diversification. Identification of such challenges in pastoral area is crucial for future policy formulation. Cognizant to this fact, this study tried to identify some of the socio-economic, environmental, institutional and policy constraints/challenges to livelihood diversification. These include: shortage of land and decline in rangeland productivity, lack of credit facilities, market and marketing facility, road and transport problem, crop and animal disease as well as agro-climatic condition.

4. Conclusion and Recommendations

The findings of this study are in broad agreement with the general patterns of livelihood diversification among pastoralists across East Africa in that, the primary motives for pastoral and agro-pastoral households were confirmed to be survival. Therefore, from the finding, the study concluded that decline in livestock holdings, agro-climatic condition, and lack of better options/opportunities for livelihood diversification are appear to be the principal challenging factor that forces pastoral and agro-pastoral households into low return economic activities, such as fire wood and charcoal selling. The income contribution of activities outside of the farming and livestock sector were insignificant in this study area contributing only 5.22% of the total household income. In terms of participation, about 19.21% of sample households are participants of non-farm/ non-pastoral activities. Moreover, the findings of the study have revealed that there is need to address the issue of diversified livelihood income portfolios among pastoral communities for sustainable livelihood. Enabling and facilitating environment for the spread of diverse non-pastoral income-generating activities can be a solution especially for poor households.

In an attempt made to identify factors determining livelihood diversification strategies, the result of the multinomial logistic regression model revealed that the probability of diversifying in to highly and moderately diversified livelihood category is affected positively and significantly by age, sex, education level and access to credit facilities of the household head. Besides, it is found that the probability of being in moderately and highly diversified livelihood category is affected negatively and significantly by tropical livestock unit and distance from the nearest market. Therefore, the study has concluded that the pastoral and agro-pastoral households in the study area are likely to have a diversified livelihood when they have more experience (age), higher educational level and access to credit facilities. The scope for livelihood diversification also gets boosted when there is proximity to urban market.

Therefore, the study concluded that the scope for livelihood diversification gets boosted when there are access to credit service, better transportation facilities and proximity to urban market. Hence, policies that reduce such challenges to diversification and widen its possibilities are in general desirable. A powerful way of coming up with new strategies is to expand education facilities and educate young pastoralists. This is because; education is an effective means of increasing the livelihood diversification strategies as it relaxes the entry barriers to different remunerative non-farm activities.

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