

RESEARCH

Open Access



# Determinants of livelihood diversification strategies in Borena pastoralist communities of Oromia regional state, Ethiopia

Amare Molla Dinku\*

## Abstract

**Background:** Livelihood diversification strategies play a key role in development process. However, identification of the factors that determine households' choice of livelihood strategies of pastoralists has received little attention. This research was therefore proposed with the aim of generating location specific data on livelihood strategies and its determinants in Borena district of southern Oromia, Ethiopia.

**Methods:** Multistage random sampling technique was employed to select 110 household heads from three kebeles of Borena district. Data were collected using both qualitative and quantitative methods. Descriptive statistics and multinomial logit model have been employed to analyze the data.

**Result and conclusion:** The income portfolio analysis revealed that pastoral production still plays a leading role by contributing higher share of the total household income. Different socioeconomic characteristics of the household significantly influence the level of livelihood diversification. Age of household head, farm input use, extension contact, market access, credit access and owned cattle size are the main factors. Therefore, household livelihoods are highly diverse and policy makers need to reflect on the most suitable ways of supporting this diversity and they should empower pastoralists to engage with policy formulation on more appropriate pastoral legislation that protect pastoral land rights and sustainable livelihoods options.

**Keywords:** Determinants, Ethiopia, Livelihood diversification, Pastoralist communities, Policy

## Background and research problem

Pastoralists represent approximately 10% percent of the Ethiopian population (over 72 million), and approximately 40% of the land area of Ethiopia is considered to be under pastoral production system. They live in much of the peripheral lowlands that surround the central highland plateaus dominated by rain-fed small-scale agriculture [1].

The pastoral system in Ethiopia is vulnerable to environmental degradation and food insecurity. Livelihood of pastoralist communities in Ethiopia is constrained by diverse natural, social and economic problems including recurrent drought, lack of basic infrastructure, conflict, and they have low resilient capacities to cope with

and recover from such vulnerable situations. The large majorities' livelihoods in most seasons of the year are depending on food assistance of the government. About 15% of *Borena* pastoralists are food-insecure throughout the year [2]. Currently, as an emerging alternative of livestock destitute, pastoralists in Ethiopia are benign settled in and around urban centers to exploit the upcoming livelihood opportunities defined as nonpastoral livelihood options like petty trading and wage employment that would otherwise be unavailable in rural pastoral areas. The contribution of livelihood diversification to rural and pastoral livelihoods has often been ignored by policy makers, and there is a general perception among policy makers and technocrats that pastoral lands are underutilized and therefore should be brought under the plow. The pastoral mode of life based on mobility is perceived to be backward and needs to be transformed.

\*Correspondence: amare0399@gmail.com  
Collage of Agriculture, Wollo University, Dessie, Ethiopia



Government development efforts focus on sedentarization of pastoralists in favor of cultivation instead of transhumant nomadism and for ease of provision of social services [3–5].

Annually, massive resources are invested by humanitarian aids and government for food security programs. However, food insecurity is becoming persistent, especially in pastoralist areas that do not have sufficient livelihood diversification option around them [6]. The Borana pastoralists have been hit hard by recurring droughts and consequent loss of livestock for the last three decades, the most recent one being in the period between 1999 and 2000. The study by [7] estimates that during the years 1980–1997 alone, monetary losses due to livestock deaths in the Borana plateau exceeded US \$ 300 million. The study further argues that “cattle crashes”, or widespread loss of cattle, occur in every 5–6 years, particularly during times of low rainfall and high stocking rates.

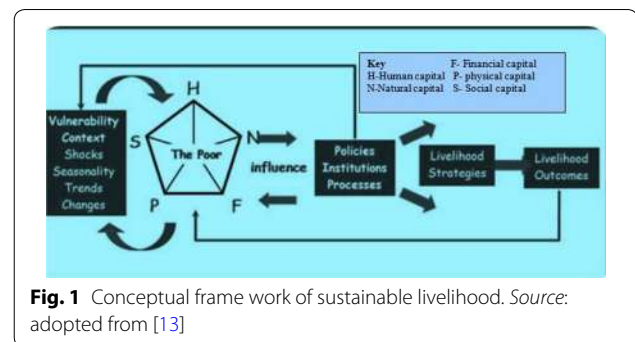
The probability of drought occurrence remains high, and at the same time several factors are causing the decline of livelihood diversification. It is difficult to recover from such shocks and stresses. Problems like seasonal migration, alienation of traditional pastoral rights of accessing pastoral resources and restrictions of free movement in search of pasture and water are among triggering factors of this problem [8].

Thus, a thorough understanding of alternative livelihood strategies of pastoral households and communities is crucial in any attempt to bring the improvement of livelihood. It is important to commit a limited resource available for pastoral development based on new assumption about the rural poor and their livelihood strategies [9, 10]. This study, therefore, attempted to see the determinants of pastoral livelihood diversification choices of Borana pastoral communities of Ethiopia in their struggle to achieve food security goals.

### Conceptual framework and basic research questions

The livelihoods framework provides comprehensive and complex approaches in understanding how people make a living. It can be used as a loose guide to a range of issues that are important for livelihoods, and it can be rigorously investigated in all its aspects [10]. Livelihood approaches emphasize the understanding of the context within which people live, the assets available for them, livelihood strategies they follow in the face of existing policies and institutions, and livelihood outcomes they intend to achieve [11, 12] (Fig. 1).

The key question to be addressed in any analysis of livelihood is given a particular context (of policy setting, politics, history, agroecology and socioeconomic conditions), what combination of livelihood resources (different



**Fig. 1** Conceptual frame work of sustainable livelihood. Source: adopted from [13]

types of “capital”) results in the ability to follow with what combination of livelihood strategies (agricultural intensification/extensification, “livelihood diversification” and migration) with what outcomes? [13]. The ultimate goal of livelihood diversification is therefore bringing sustainable livelihood outcome like securing more income, improved food security, reduced vulnerability and increased welfare.

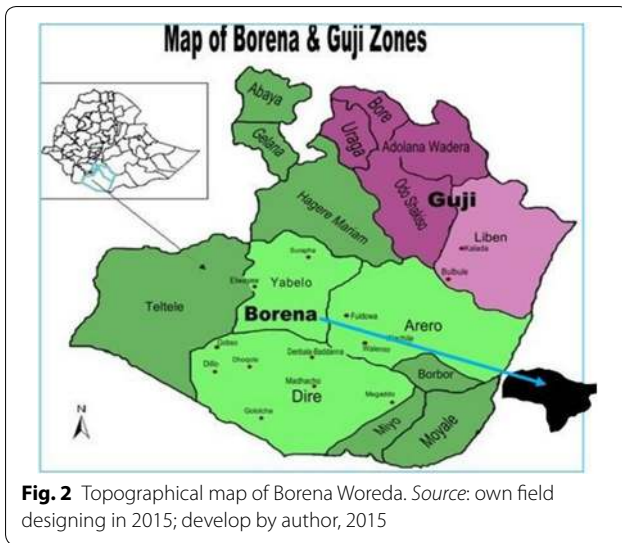
Based on this general assumption, the study formulates the following specific research question:

1. What are the major determinant factors which affect the practice of livelihood diversification in Borana pastoralist community?

### Methods: sampling strategy, data collection and analysis

#### Study area, data and sampling

The study has been undertaken in Yabello Woreda of Borena Zone, Southern Oromia Ethiopia. It is located 570 km in south of Addis Ababa. It is the second largest Woreda in the zone with total landmass coverage of 5523 km<sup>2</sup> [14]. The Woreda was selected as it was assumed to be the high concentration and attraction areas for pastoral livelihood dropouts. Both qualitative and quantitative approaches were employed for data collection. Multistage simple random sampling technique was undertaken for the selection of 110 household heads. First Yabello Woreda was selected from Borena Zone, and second three kebeles (the smallest administrative unit in Ethiopia), namely Hadi-Alle, HarWuyue and Dhirtu, were selected among 23 kebeles based on their agroecological location and its proximity to the Woreda urban center of Yabello town. Finally, 110 household heads were selected using Yemane, 1967, sampling formula ( $n = N/N(1 - e)^2$ ) using 95% confidence intervals. This was proportionally distributed among three kebeles. Finally, the individual households were selected randomly for conducting household interviews. The geographical map of study



Woreda was delineated using geographical information system (GIS) data as shown in Fig. 2.

**Model specification**

To identify the determinants of pastoral households’ decision choices from various livelihood diversification options, multinomial regression model was preferred [15]. The assumption is that in a given period at the disposal of its asset endowment, a rational household head chooses among the four mutually exclusive livelihood strategy options that offer the maximum utility for a given household at a given circumstances. Following [15], for the *i*th respondent faced with *J* choices of pastoral livelihood diversification options, the utility choice *j* was specified as:

$$U_{ij} = Z_{ij}\beta + \varepsilon_{ij} \tag{1}$$

If the respondent makes choice *j* in particular, then we assume that *U<sub>ij</sub>* is the maximum among the *J* utilities. So the statistical model is derived by the probability that choice *j* is made, which is:

$$\text{Prop } (U_{ij} > U_{ik}) \text{ for all other } K \neq j \tag{2}$$

where *U<sub>ij</sub>* is the utility to the *i*th respondent from livelihood strategy *j*. *U<sub>ik</sub>* is the utility to the *i*th respondent from livelihood strategy *k*.

If the household maximizes its utility defined over income realizations, then the household’s choice is simply an optimal allocation of its asset endowment to choose livelihood that maximizes its utility [16]. Thus, the *i*th household decision can, therefore, be modeled as maximizing the expected utility by choosing the *j*th livelihood strategy among “*J*” discrete livelihood strategies, i.e.,

$$\max_j = E(U_{ij}) = f_j(x_i) + \varepsilon_{ij}; \quad j = 0 \dots J \tag{3}$$

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 chooses *j*th livelihood strategy and 0 otherwise. The probability that a household with characteristics “*x*” chooses livelihood strategy *j*, *P<sub>ij</sub>* is modeled as:

$$P_{ij} = \frac{\exp(X'_i\beta_j)}{\sum_{j=0}^J \exp(X'_i\beta_j)}, \quad J = (0 \dots 3) \tag{4}$$

with the requirement that  $\sum_{j=0}^J P_{ij} = 1$  for any *i* where *P<sub>ij</sub>*=probability representing the *i*th respondent’s chance of falling into category *j*. *X*=predictors of response probabilities.  $\beta_j$ =covariate effects specific to *j*th response category with the first category as the reference.

Appropriate normalization that removes an indeterminacy in the model is to assume that  $\beta_1 = 0$  (this arises because probabilities sum to 1, so only *J* parameter vectors are needed to determine the *J*+1 probabilities), [15] so that  $\exp(X_i\beta_1) = 1$ , implying that the generalized Eq. (4) above is equivalent to

$$\text{Pr}(y_i = j/X_i) = P_{ij} = \frac{\exp(X_i\beta_j)}{1 + \sum_{j=1}^J \exp(X'_i\beta_j)},$$

For *j* = (0, 2...*J*) and

$$\text{Pr}(y_i = 1/X_i) = P_{i1} = \frac{1}{1 + \sum_{j=1}^J \exp(X'_i\beta_j)}, \tag{5}$$

where *y* = *a* polytomous outcome variable with categories coded from 0...*J*. Note: the probability of *P<sub>i1</sub>* is derived from the constraint that the *J* probabilities sum to 1.

That is,  $p_{i1} = 1 - \sum p_{ij}$ . Similar to binary logit model, it implies that we can compute *J* log-odds ratios which are specified as: the dependent variable is the log of one alternative relative to the reference alternative. Then, coefficients in a multinomial logit model are difficult to interpret [15]. Therefore, the marginal effects of the explanatory variables on the choice of alternative livelihood diversification strategies are derived as follows:

$$\ln \left[ \frac{p_{ij}}{p_{i1}} \right] = x'(\beta_j - \beta_1) = x'\beta_j, \quad \text{if } J = 0 \tag{6}$$

According to [15], the marginal probabilities measure the expected change in the probability of a particular choice

**Table 1 Description of variables. Source: own articulation, 2015**

Variable name	Description
Livelihood diversification strategy options of households	"Y = 0", (AG) pastoralism alone "Y = 1", (AG + OFF) pastoralism and off-farm combination "Y = 2", (AG + NF) Pastoralism and nonfarm combination "Y = 3", (AG + OFF + NF) Pastoralism, off-farm and nonfarm
Age of household head	A continuous variable measured in years
Sex of household head	Sex of household head (1 = female and 0 = male)
Education of household heads	Education level of household heads in number of years
Family size of the households	The number of families in the household
Land holding size	Land holding size of the households in hectare
Livestock (TLU)	The total number of <i>livestock</i> in the household in tropical livestock unit
Farm input	If Farm input used by the Household 0 = no 1 = yes
extension contact	Frequency of extension contact a farmer has with extension agent in a year
Cooperatives	Participation of the household in cooperatives (0 = no, 1 = yes)
Credit access	Credit access and use by the household (0 = no, 1 = yes)
Market access	Distance of market center from their residence in kilometers
Access to remittance	If a household has external economic support from relatives (0 = no, 1 = yes)
Dependency ratio	Dependency ratio of dependent household members over independent household members

being selected with respect to a unit change in the independent variable.

#### Definition of variables

See Table 1.

### Result and discussion

#### Description of livelihood strategies

Livelihood strategies are defined as those activities undertaken by households to provide a means of living. It is diverse and variable at micro–macro levels. As it has been reviewed from [17], there are several different methods of characterizing household livelihood strategies that are available in the real world. Most commonly, economists group households by shares of income earned from different sectors of the rural economy. Similarly, this study considered the income shares of each livelihood activity to conceptualize livelihood strategies. In addition, the local people have also their own wealth

ranking criteria to say poor, less poor and better income. Accordingly, this study uses community wealth ranking criteria as bench mark to say poor, less poor and rich in the analysis of livelihood diversification. Income portfolio analysis has been done for each pastoral household to measure the share of income from different livelihood options (Table 2).

From the income portfolio analysis, the percentage share of the broad livelihood activities indicates that the share of pastoral livelihood alone covers about 64.1%, nonfarm 22.8% and off-farm 13.1% in decreasing orders. Further observation of the study revealed that off-farm activities (daily wage, market brokering and environmental gathering) are survival mechanisms pursued mainly by the lower-income groups. This idea has been also reflected in focus group discussion sessions. The participants' opinion on off-farm livelihood opportunities indicates that engagement with such activity is mostly preferred by (poor pastoralist groups) individuals who do

**Table 2 Income composition of sample households. Source: own survey, 2015**

Cash income composition (%)	Poor (N = 51)	Less poor (N = 42)	Better off (N = 27)	Total
Agriculture subtotal (crop and livestock)	48.2	69.2	86.3	64.1
Nonfarm (petty trade, remittance and rural craft) sub total	29.14	20.9	13	22.8
Off-farm (gathering, wage and land rent) subtotal	22.8	9.3	0.5	13.1
Mean annual income per a year	313.4	398.4	1122.5	525.2
F value				14.604
P value				0.0001***

\*\*\*, \*\*, \* implies it is significant at < 1%, 5% and 10% significance level respectively

not have herds and those with limited option to construct sustainable (strategic) livelihood diversification. Non-farm activities, such as rural craft, are also main choice of the poor than their counterparts. Thus, off-farm activities seem more of a coping mechanism for the poor pastoral community groups than as a means to accumulate wealth and reduce poverty by all pastoral community groups. According to the interviews, the poor tend to concentrate on off-farm activities characterized by low entry constraints (gathering, charcoal making and fire wood collection and wage). The finding indicates the need to understand the challenges faced by the poor and less poor that prevent them from engaging in pastoral production and more remunerative nonfarm activities (Table 2).

### Results of multinomial logit model

Multinomial logistic regression model was used to identify determinants of farmers' decision choice on the use of livelihood diversification options. The result of logistic regression analysis is presented to identify determinants of livelihood diversification options by pastoral households.

The maximum likelihood method of estimation was employed to estimate the parameter estimates of the multinomial logit model, and statistically significant variables were identified. In order to measure factors' relative importance on the farmers' choice of livelihood diversification options, STATA version 11 software was used to generate the parameter estimates. To identify the problem of multi co-linearity or association among the potential explanatory variables, variable inflation factors (VIF) (for continuous variables) and contingency coefficients (for the categorical) variables were checked and it shows good result. The result of the maximum likelihood estimates is presented in Table 3.

The likelihood ratio test statistics is used to test the overall significance of the model [15]. The value of Pearson Chi-square indicated the goodness of fit for model fitting information. The overall likelihood test ratio statistics indicated by the Chi-square statistics is highly significant at 0.00001 point suggesting that strong explanatory power of the model. Parameter estimates of multinomial logit model provide only the directional effect of independent variables on dependent variables, and it represents neither actual magnitude of change nor probability levels [18]. However, the marginal effects or odds ratio (relative risk ratio) measures the expected change in probability of a particular choice being made with respect to a unit change in an independent variable [15]. Accordingly, it has been implemented for analyzing both direction and magnitude of changes.

As indicated in Table 3, among 13 hypothesized explanatory variables 11 of them were significantly affecting the farmers' choice of decision to different livelihood options (pastoral and off-farm, pastoral and nonfarm and the combination of all) using pastoral livelihood alone as a base case scenario.

Age structure of household heads was found to be negatively and significantly affecting pastoralists' decision choice of pastoral and off-farm combination and pastoral and nonfarm combination. This implies that in comparison with those who use only pastoral livelihood options as their livelihood means (base case), a year increase in age of household heads will likely shift choices of farmers' livelihood option to off-farm and nonfarm activities by the probability of 0.9 units than those who use pastoralism as their only sources of livelihoods. Therefore, keeping other factors constant, younger farmers' are motivated to engage more in nonfarm and off-farm activities than pastoral livelihood practices alone. This is also in proved by the research done [19]. He explained that younger pastoralist households do not have enough

**Table 3 Determinants of livelihood diversification practices p value and RRR (marginal effects). Source: own calculation from STATA result (2015)**

Explanatory variable	AG + OFF-FARM. P(RRR)	AG + NON-FARM. P(RRR)	AG + OFF-FARM + NON-FARM. P(RRR)
AGE (continuous)	.94 (.08)*	.93 (0.03)**	.98 (.63)
Farm input use 1 = yes	0.27 (0.087)*	0.25 (0.07)*	0.12 (0.036)**
Livestock extension contact	1.5 (.035)**	1.5 (.032)**	1.34 (.20)
Access to remittance (1 = yes)	1.8 (.5)	6.8 (0.019)***	1.5 (.7)
Cattle size (TLU)	1.08 (.15)	1.06 (.2)	1.22 (.003)***
Market distance in km	.94 (.10)	.98 (.62)	.88 (.007)***
Credit access (1 = yes)	.58 (.49)	.42 (.25)	-.18 (.09)*

Pastoralism practice alone is used as a base case

\*\*\*, \*\*, \* implies it is significant at < 1%, 5% and 10% significance level respectively



livestock herds and resources that support their livelihood compared to the older farm households (resource rich). Furthermore, researchers' inquiry on focus group discussion regarding sustainability of pastoral livelihood indicates that as the land in the pastoral community is fragile due to continuous communal grazing for longer time, it is less productive to continue pastoral livelihood practice as usual. As well, interview on farmers' perception on new livelihood options indicates that experienced farmers are more likely to stay in pastoralism. They also diversify their livelihood on other related livelihood options such as livestock market negotiator. Due to cultural and social realities, experienced pastoralists are also practicing livestock production for the sake of social recognition like getting appreciation in their societies. This is also in line with previous studies done by [18, 20–22].

In the pastoralist communities, agricultural inputs are supplied by the District agricultural office aiming to improve health and productivity of livestock. In this study, pastoralists who use agricultural inputs (veterinary services and animal feeds) are more likely and significantly employing off-farm and nonfarm activities in addition to their pastoralism practices. For example, those who practice all combination of livelihood options (pastoralism, nonfarm and off-farm) are more likely motivated to use agricultural input by 0.12 units better than those who practice pastoralism practices alone at 0.036 significant levels. This study indicates that application of multiple options of livelihood can increase earning incomes and enables pastoralists to purchase and use better livestock technologies or inputs. However, the study conducted by [23] in Yabello indicates that the percentage proportion of sum of expenditure for farm inputs (forage seed, farm tools and veterinary service) is decreasing when we see the status of rich, medium and poor income households (8.5, 6 and 0%). Thus, input suppliers have to consider the economic backgrounds of pastoralists and there must be credit schedule for resource-scarce farmers.

The number of veterinary extension service providers contact dates has a positive and significant contribution for pastoralists to participate in off-farm and nonfarm livelihood activities at 0.04 and 0.03 significant level, respectively. The likelihood of choosing pastoral plus off-farm and pastoral plus nonfarm livelihood strategy by pastoralists is increasing as the number of veterinary extension contact dates increases as compared to pastoral practices alone. This implies that a day increase in pastoral extension contact with relevant extension message raises the likelihood of farmers' choice of pastoral plus off-farm and pastoral plus nonfarm activities by 1.4 and 1.5 units, respectively. Since the objective of government extension service is to enhance farmers' capabilities

of solving their own difficulties by their own effort and resources; frequent extension contact with relevant messages has significant contribution in promoting pastoral livelihood diversification practices [24]. Thus, the information obtained and the knowledge and skill gained from veterinary extension service providers may influence farmers' skill and decision making on seeking and utilizing diversified livelihood options. Frequent extension contact with veterinary services provider personnel regarding their livestock health, production and productivity is likely to increase the engagement of households to other off-farm and nonfarm sectors. This is because timely and better agricultural (veterinary) extension services help to enhance productivity at household level. This can be also assured by the content of the message that farmers gain from extension agents that initiate them to use risk aversion strategies through the diversification of income within and out of pastoral livelihoods strategies.

Remittance is another important income source for pastoralist communities. Remittance refers to money sent from inside and outside the country from families and relatives of household members. The system of supporting families is a continuous process. In this research, remittance has positive and significant contribution to households' entry to diversification of livelihood strategies toward pastoral and nonfarm combination at significance level of 0.019. Households' likelihood of diversifying nonfarm livelihood activities is increasing by 6.8% if they have access of remittance income in reference to those who employ pastoral practice alone as their livelihood means. The result is analogous with the findings of [17, 25]. In pastoralists, remittances constitute only a small part of total household income on average. However, it contributes positively in supporting rural households diversifying activities. It contributes about 10, 13 and 20 percents to the household income of the rich, medium and poor households, respectively.

Livestock holding (cattle size in TLU) is positively influencing household's choice of combinations of pastoral, nonfarm and off-farm livelihood strategy at 0.01 significance level. This means that the probability of pastoralists who diversify their livelihood toward nonfarm and off-farm activity is increasing as it amplifies their opportunity to create other assets by exchanging and selling of their livestock herds.

It is in contradiction with research finding conducted by [20]. His report indicates that pastoralists with lower livestock holding would be pressed to diversify livelihoods into off-farm and nonfarm activities as an "opportunistic" diversification activity in order to meet their household needs. However, the results of this study confirmed that livelihood diversification activity is capital intensive and requires assets and resources which

can be mobilized to create and develop other livelihood options. Accordingly, households with higher livestock holdings are more capable of affording the cost of strategic livelihood diversification which aims at the accumulation of wealth. Therefore, to be able to bring about positive change in wellbeing, natural capitals (livestock) are exchanged to different assets. This is in line with the findings of [9, 10, 18] that are conducted at different pastoralist areas.

As hypostasized, the market access of the residents had negative correlation with the decision of individuals to enter into livelihood diversification activities. Market facilitates individuals' involvement in all types of livelihood diversification options. This study implies the probability of individuals diversifying beyond the agricultural practice is likely to be reduced as the distance to market place increases from their villages. This is due to the fact that individuals who live near the market area had higher opportunity to engage in other livelihood option beyond their usual pastoral activities. It creates opportunities like wage laborer and petty trades, and market brokering. Market distance influences livestock marketing negatively. Chattel experiencing long distance travels to arrive at market places are usually exposed to weight losses that intern affecting their market price.

Level of credit access and use is found to have significant ( $p < 0.1$ ) and negative impact on the likelihood of choosing diversified livelihood strategies (pastoralism, off-farm and nonfarm). Households who have better access and utilization of credit are 0.18 times more likely to withdraw from livelihood diversification activities than those whose livelihood is dependent on pastoral production practices alone. This negative impact may be attributed to the fact that credit use allows pastoralists to follow agricultural intensification by providing better access to farm inputs which in turn improves productivity. This implies that the formal and informal credit facilities that avail for rural farmers are a very important financial asset in rural livelihoods not only to finance agricultural inputs activities, but also to protect loss of crucial livelihood assets such as cattle due to seasonal food shortage, illness or death in bad seasons [10]. The result of the study, therefore, suggest that farmers' access and use of credit would play important role in promoting pastoral livelihood development and strategic livelihood diversifications processes. The result is also in line with that of [17, 18, 26] findings. This implies that the incentive for accessing credit accelerates pastoral production.

### Conclusion and recommendation

The pastoral system in Ethiopia is vulnerability to environmental degradation and food insecurity. More specifically, livelihood insecurity has been characterized by

the area where the large majority of pastoralists depend on food assistance (food aid). The vulnerability is due to the lack of livelihood diversification constrained by lack of basic infrastructure services, external shocks such as recurrent drought, flood, conflict and people's capacities to cope with the shocks, which depend on factors such as social networks, assets and political status [2].

Livelihood analysis using an assets framework could help to foster the appreciation of the way that combinations of assets are vital to secure livelihoods. Assets are not simply resources that people use in building livelihoods; they give people the capacity to be and to act. Clearer identification of livelihood strategies would provide an opportunity to focus on practical poverty reduction interventions and to assess outcomes. The sustainable livelihoods approach seeks to develop an understanding of the factors that lie behind people's choices of livelihood strategies and then reinforce factors which promote choice and flexibility, because the more choice and flexibility people have in their livelihood strategies through livelihood diversification, the greater their ability to withstand the external shocks and stresses.

With the above-mentioned issues in mind, this study sought to identify the major determinants of farmers' decision choice on different livelihood diversification options and examine the extent to which different diversification options contribute for household income sources using a multinomial logit model, the study brings useful insights into policy formulation. From the income portfolio analysis, the share of agriculture (pastoral) accounts for about 64.1%, nonfarm (nonpastoral) for 22.8% and off-farm for 13.1% of the household income.

Youth pastoralists show better performance for adopting available livelihood diversification options. Therefore, local government needs to design inclusive livelihood strategies that considered the demographic characteristics of pastoralists in general and age structure in particular. As well, frequent extension visit of pastoralists by development agents has shown an important motivation for utilizing the available livelihood diversification options. Hence, the contents of extension message (veterinary services) has to be revised as it can incorporate services of nonpastoral livelihood activities (off-farm activities).

Infrastructure services (market access, credit access) were observed as motivating factor for expanding strategic livelihood diversification. Thus, deliveries of infrastructure services need to get special focus from government and nongovernment actors who work in the area. However, further research is still needed to gauge the challenges of livelihood diversification across different socioeconomic contexts of pastoralists.

**Abbreviations**

TLU: tropical livestock unit; H: human capital; S: social capital; P: physical capital; F: financial capital; N: natural capital.

**Authors' contributions**

The author read and approved the final manuscript.

**Acknowledgements**

I would like to thank Yardstick International College and Wollo University for arrangement of such opportunity to travel to the area by securing vehicles. My gratitude also goes to Borena Zone Agricultural Office for giving us necessary information about the study area and for their unlimited support by providing informed consents. I also thank data collectors and supervisors for their unreserved effort for the successful completion of collection of the data. Finally, the author would like to acknowledge all other concerned bodies that have shared their support for the successful development and completion of this study.

**Competing interests**

The author declares that there are no competing interests.

**Availability of data and materials**

The author wants to declare that he can submit the data at any time based on publisher's request. The datasets used and/or analyzed during the current study will be available from the author on reasonable request.

**Consent for publication**

Not applicable.

**Ethical approval and consent to participate**

Ethical clearance letters were collected from Wollo University research and community service directorate and Borena Zone administrative office to care for both the study participants and the researchers. Official letters were written for each kebele, informed verbal consent was obtained from each client, and confidentiality was maintained by giving codes for respondents rather than recording their name. Study participants were informed that clients have full right to discontinue or refuse to participate in the study. Therefore, all participants of the research including survey households, case studies, enumerators, the supervisors and key informants were fully informed about the objectives of the study. They were approached friendly in free moods.

**Funding**

Not applicable.

**Publisher's Note**

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 1 November 2017 Accepted: 6 June 2018

Published online: 26 June 2018

**References**

1. Fecadu G. Pastoral nomadism and rural development. In: Pauswang S, Cheru F, Brune S, Chole E, editors. Ethiopia: options for rural development. London: Zed Books; 1998.
2. Beruk Y. Food insecurity in Pastoral Areas of Ethiopia unpublished document Harumaya University, Ethiopia; 2003.
3. Barrett CB, Swallow BM. Dynamic poverty traps and rural livelihoods, Ch: 2. In: Ellis F, Freeman HA, editors. Rural livelihoods and poverty reduction policies. London: Routledge; 2005. p. 16–28.
4. Carswell G. Livelihood diversification in southern Ethiopia IDS working paper 117. 2000.
5. Roa J, Niehof A, Price L, Moerbeek H. Food security through the livelihoods lens: an integrative approach (the case of less favored areas in the Philippines) 2004. <http://edepot.wur.nl/22061>. Accessed 23 Dec 2015.
6. Frankenberger TR, Sutter P, Amdissa T, Alemtsehay A, Mulugeta T, Moges T, Alemayehu S, Bernard T, Spangler T, Yeshewamebrat E. The path to self-reliance, volume I: final report in Ethiopia; 2007.
7. Desta S, Coppock DL. Cattle population dynamics in the southern Ethiopian rangelands, data from 1980-97. *J Range Manag.* 2002;55:439–51.
8. Baxter PTW. Immediate problems: a view from a distance. In: Mohammed Salih MA, Dietz T, Ahmed AGM, editors. African pastoralism: conflict, institutions and government. London: Pluto Press; 2001.
9. Beruk Y. The reality of pastoralism in Ethiopia. Paper presented at CRDA workshop on non-governmental organizations and sect oral development: pastoralism panel, Addis Ababa; 2001.
10. Lemma Tesfaye. Diversity in livelihoods and farmers strategies in Hararghe highlands, Eastern Ethiopia. Pretoria: University of Pretoria; 2003.
11. DFID. Sustainable rural livelihoods guidance sheet, London; 2000.
12. Ellis F, Freeman HA. Rural livelihoods and poverty reduction policies. London: Routledge; 2005.
13. Scoones I. Sustainable livelihoods, a framework for analysis, IDS working paper number 72, Brighton; 1998.
14. CSA. Central statistical authority population estimates, unpublished document Ethiopia, Addis Ababa, Ethiopia; 2007.
15. Green HW. Econometric analysis, 4th edn. New York University, Macmillan Publishing Company; 2003.
16. Frankenberger TR, Sutter P, Amdissa T, Alemtsehay A, Mulugeta T, Moges T, Alemayehu S, Bernard T, Spangler T, Yeshewamebrat E. The path to self-reliance, volume I: final report in Ethiopia; 2007.
17. Brown DR, Stephens EC, Okuro MJ, Murithi FM, Barrette CB. Livelihood strategies in the rural Kenyan highland; 2006.
18. Berehanu E. Livelihood strategies of smallholder farmers and income poverty in draught prone areas: the case of Gena-Bosa woreda, SNNPRS. An M.Sc. thesis presented to the School of Graduate Studies of Harumaya University; 2007.
19. Edlam A. Pastoralists and development: the impact of development interventions on Borana pastoralists, Southern Ethiopia. Unpublished report M.Phil. Thesis, University of Cambridge; 2003.
20. Adugna L. The dynamics of livelihood diversification in Ethiopia unpublished report: evidence from Panel Data. Boston: Department of Economics, University of Massachusetts; 2005.
21. Barrett CB, Reardon T, Webb P. Non-farm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy.* 2001;26:315–31.
22. Destaw B. Non-farm employment and farm production of small holder farmers: a study in Edja District of Ethiopia. A thesis submitted to the School of Graduate Studies Harumaya University; 2003.
23. Kanji N, MacGregor J, Tacoli C. Understanding market-based livelihoods in a globalizing world: combining approaches and methods. London: International Institute for Environment and Development (IIED); 2005.
24. Samuel G-S. Summary report on recent economic and agricultural policy. Paper prepared for the Roles of agriculture international conference 20–22 October 2003, Rome, Italy. 2001.
25. Bezemer DJ, Lerman Z. Rural livelihoods in Armenia. The Centre for Agricultural Economic Research, The Department of Agricultural Economics and Management Discussion Paper No. 4.03; 2002.
26. Holden S, Bekele S, Pender J. Non-farm income, household welfare, and sustainable land management in a less favoured area in the Ethiopian highlands. Department of Economics and Resource Management Agricultural University of Norway; 2004.