Research Article

The Forest Resources Use and its Determinants among the Pastoralists in Itang Special District, Gambella, Ethiopia

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Abstract: Background: The forests products play a significant role in the rural livelihood of pastoralists. The extractions of subsistence-based forest products were used as coping strategies and activities. **Objectives:** The main aim of this study was to assess the forests resources use and it is determinants among the pastoralists in the study area. **Methods:** The purposive and simple random samplings techniques were used to select the study respondents and locations. Similarly, the quantitative and qualitative data were collected from 156 respondents through Focus group discussion, observation, and interview schedule. In the meantime, the mean, standard deviation, percentage, frequency, chi-square, t-test, and binary logit model were used to analyze the data. **Results:** The result showed that about 64.7%, 49.4%, 66%, 67.9%, and 57.7% of pastoralists were used forests for fuel woods, construction materials, food items, livestock fodders, and medicines respectively in the study area. The result also showed that the market access, forests access, employment status, education status, income, and livestock size contribute to forests resources use in the study area. **Conclusions:** The various forests resources were used by the pastoralists in the study area. And then, several factors determine the forests resources use among the pastoralists in the study area. The pastoralists, civil society organizations, governmental organizations, and NGOs should create job opportunities through the development of various livelihood activities, strengthen the capacity-building strategies, increase the infrastructure services, provide improved forage and livestock and conduct the longitudinal regional study.

Keywords: Forest Resources, Pastoralist, Determinants, and Itang Special District..

BACKGROUND

About 1.6 billion people of the world depend on forests for living (World Bank, 2002). Forests cover about 31% of the world's total land areas; 93% of this is natural forest and only 7% is planted (FAO, 2013). Rural households use a wide range of forest products for their survival (Ahammad *et al.,* 2021). The forests enable the people to live out of poverty and to secure food options in the globe and country context (Hogarth *et al.,* 2013). An increase in the world' inhabitants have headed to a tremendous rise in the demand for living space, foods, and energy (Fakayode *et al.,* 2013). 63% of the forest land in Tanzania was distracted by agriculture, residential, fire woods, and charcoal burning activities (Mihayo & Peng, 2020).

The forest resources were mostly used for satisfying the needs of people and energy supplies (Tolunay *et al.*, 2008). The forest-based systems offer a broad kind of societal and ecological welfares for the whole globe and endure the rural living in tropical unindustrialized nations in many means (HLPE, 2017). Woodlands deliver foods, fuel woods, and bio-products (Lee, 2019). The forests provide home for floras and faunas, seeds banks for nature plants, sources of foods and medicines, incomes sources, and reduce soil erosion (Endalew & Assefa Wondimagegnhu, 2019). In some parts of the world, about 90% of the total annual round

products serve as fuel wood and 60% of this total is used for households' consumption (Fakayode *et al.,* 2013). Forests are the basics in the provision of basic needs, cash saving, and safety nets (Shackleton *et al.,* 2007).

Ethiopia is one of the humid countries in which forests products play an important part in rural living (Wirtu, 2002). The use of woodland produces has gained devotion to solve poverty (Chilalo & Wiersum, 2011). The removal of subsistence-based forest produces commonly takes place within coping strategy and is aimed at achieving protection and emergency needs (Chilalo & Wiersum, 2011). The Ethiopian residents remain directly above the poverty line and reduce income inequality by 15.5% (Yemiru *et al.,* 2010). The forests added nearly 24%-30% of the resident families' wages (Bognetteau *et al.,* 2007) and almost 38% of the annual incomes from community forests (Gatiso, 2019).

Nonetheless, there were inadequate studies about the pastoralists' forest resources use and it is determinants in Ethiopia in general and Itang Special district in particular. Some of the studies had investigated the forest incomes and poverty alleviation in highland (Yemiru *et al.,* 2010); the role of non-timber forest products for diversification (Chilalo & Wiersum, 2011); importance, determinants, and gender

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dimensions of forestry for communities (Amenu & Mamo, 2020) and the households' dependence on community forests and their contributions in rural Ethiopia (Gatiso, 2019).

Thus, the forest resources use and it is determinants study was undertaken to minimize the gap. The general objective of this study was to assess the forest resources use and the determinants among the Pastoralists in Itang special district. The specific objectives of this study were;

- To describe the existing forest resources use among the pastoralists in the study area

- To examine the factors affecting pastoralists forest resources use in the study area

RESEARCH METHODOLOGY

Study Area

The assessment was steered in Itang special district from the Gambella Regional State in Ethiopia. It is located 45 km away from Gambella city. Estimated population of the district was 42,000 among the others in the region. Rest of the districts in the Gambella National Regional State; poor nutrition status are found in majority of the rural households.
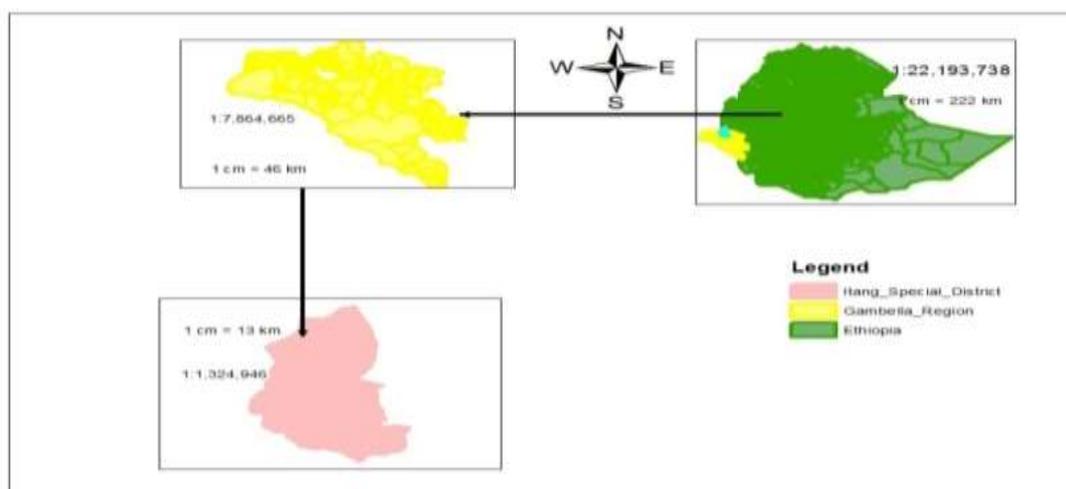

Figure 1. Map of Study Area

Study Design

The cross-sectional study was applied to gather related and obligatory information during the period of January, 1 to February 2021 G.C. This study had used a mix of quantitative and qualitative approaches to assess the nutrition security of the households.

Sampling Techniques and Sample Size

The field assessment was undertaken in Itang special district with the emphasis on the pastoral households. While the district was selected purposively; the Waar, Puldeng, Wathgach, and Pulkod kebele were selected by using a simple random sampling technique. In the same way, these pastoral households were selected using a simple random technique across the study area. The sample size of the pastoralists was calculated based on the (Arsham, 2007) n= 0.25/ (SE) 2, Where n is the sample size and SE is the Standard error (4%). N= 156.

Data Collection Methods

The study was conducted to collect the primary data on the pastoralists' forest resources use and it is determinants in the study area. The interview schedule was carried out to gather data about the determinants of forest resource use among pastoralists across the district. These data were substantiated through key informants' interviews and observation. Besides, the

secondary data were collected, evaluated, and criticized to substantiate the first-hand information

Methods of Data Analysis

The quantitative data were coded, edited, and analyzed using SPSS software version 20. At that instant, the descriptive statistics such as frequency, percentage, mean, standard deviation, chi-square, and t-value were used to organize and describe the data during the field in the study area. Then, the Binary logit model was employed to examine the determinants of pastoralists' forest resources use in the study area. Moreover, the qualitative data of this study was analyzed narratively. These data were analyzed based on the intentions particularly the forests resources.

The dependent variable is the pastoralists' Forest Resources Use in the study areas. The forest resources use is the dummy variable (that is resources users and non-users). The forest resources user= 1 and non-user= 2 respectively. The resources users were the pastoralists who use the resources for at least 3 years whereas; the non-users pastoralists were the people who use the forests resources for less than three years in the study area. In the context of the explanatory variables; their associations with dependent variables were posited as shown in the table below.

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Table 1. Explanatory Variables Hypothesis

Variables	Description and Measurement	Nature	Sign
Sex	SE (1=Male & 0=Female	Dummy	+/-
Marital status	MAS (1=Single, 2=Married, 3=divorce and 4= widow)	Dummy	+/-
Income	ICO (Birr)	Continuous	-
Household size	LSI (Number)	Continuous	+
Livestock size	LSI (TLU)	Continuous	+
Educational status	EDS(1=yes and 0=no)	Dummy	-
Age	AG (Year)	Continuous	+
Market access	MA (1=yes & 0=No)	Dummy	+
Credit access	CA (1=yes and 0=no)	Dummy	-
Training	SKT (1=yes and 0=no)	Dummy	-
Employment status	EMS (1=yes and 0=no)	Dummy	-
Forest access	FA (1=Yes and 0=No)	Dummy	+

RESULTS AND DISCUSSIONS

PASTORALISTS CHARACTERISTICS
Demographics Characteristics

Certain demographics characteristics may perhaps contribute to forests resources use among the pastoralists in the Itang district. The field result showed that about 37.5% (non-users) and 60.5% (users) were illiterate pastoralists respectively in the study area (Table 2). Likewise, about 62.5% (non-users) and 39.5% (users) were literate pastoralists in the study area (Table 2).

Table 2. Distribution of Educational Status

Characteristics	Non-users		Users		x^2-value	Sig
	F	%	F	%		
Educational status Illiterate	12	37.5	75	60.5	5.2	0.002
Literate	20	62.5	49	39.5		

Source: own survey, 2021

The field result also showed that about 46.9% (non-users) and 57.3% (users) were male pastoralists in the study area (Table 3). Equally, about 53.1% (non-users) and 42.7% (users) were female pastoralists respectively in the study area (Table 3)

Similarly, the field result disclosed that about 12.5% (Single), 43.7% (Married), 21.9% (Divorce), and 21.9% (Widow) were pastoralists who have not used the forests resources in the study area (Table 3). Moreover, about 54.9% (Single), 12.1% (Married), 20.9% (Divorce), and 12.1% (Widow) were pastoralists who have used the forests resources in the study area (Table 3).

Table 3. Distribution of Sex and Marital status

Characteristics	Non-users		Users		x^2-Value	Sig
	F	%	F	%		
Sex						
Male	15	46.9	71	57.3	4.7	0.611
Female	17	53.1	53	42.7		
Marital Status						
Single	4	12.5	68	54.9		
Married	14	43.7	15	12.1	1.9	0.001
Divorce	7	21.9	26	20.9		
Widow	7	21.9	15	12.1		

Source: own survey, 2021

The average age of non-users and users was 43.4 and 21.5 respectively in the study area (Table 4). In the same token, the mean households' size of non-users and users were 7.2 and 3.5 respectively in the study area (Table 4).

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*Corresponding Author: Chayot Gatdet Deng

Table 4. Distribution of Age and Households Size

Characteristics	Non-users		Users		t-value	sig
	X	S.D	X	S.D		
Age	43.4	12.3	21.5	10.7	3.5	0.002
Households size	7.2	4.8	3.5	2.4	6.7	0.016

Source: Own Survey, 2021

Institutional Characteristics

The institutional characteristics oblige description among pastoralists in the study area. The field result exhibited that about 71.9% (non-users) and 56.5% (users) were pastoralists who have market access in the study area (Table 5). As well, about 28.1% (non-users) and 43.5% (users) were pastoralists with no access to the market in the study area (Table 5). Moreover, approximately 65.6% (non-users) and 61.3% (users) were pastoralists with access to credit in the study area (Table 5). In addition, the field result indicated that about 34.4% (non-users) and 38.7% (users) were pastoralists with no credit access in the study area (Table 5).

Table 5. Distribution of Credit and Market Access

Characteristics	Non-users		Users		X^2-value	Sig
	F	%	F	%		
Market Access					2.6	0.531
Yes	23	71.9	70	56.5		
No	9	28.1	54	43.5		
Credit Access					1.7	0.003
Yes	21	65.6	76	61.3		
No	11	34.4	48	38.7		

Source: own survey, 2021

About 75% (non-users) and 58.1% (users) were pastoralists who have obtained skill training in the study area (Table 6). As well, around 25% (non-users) and 41.9% (users) were pastoralists who have not gained training in the study area (Table 6). On the other hand, about 78.1% (non-users) and 75.8% (users) were pastoralists who were closed to forests (Table 6). In addition, about 21.9% (non-users) and 24.2% (users) were pastoralists who are not nearby forests in the study area (Table 6).

Table 6. Distribution of Training and Forest Access

Characteristics	Non-users		Users		X^2-value	Sig
	F	%	F	%		
Training						
Yes	24	75	72	58.1	1.5	0.032
No	8	25	52	41.9		
Forest Access	25	78.1	94	75.8		
Yes	7	21.9	30	24.2	2.4	0.045
No						

Source: Own Survey, 2021

Economics Characteristics

This study has explored and described the economic characteristics of pastoralists in the study area. The estimate showed that the mean income of non-users and users were 482 and 137 respectively in the study area (Table 7). Likewise, the average livestock size of non-users and users pastoralists were 17.5 and 10 respectively in the study area (Table 7).

Table 7. Distribution of Income and Livestock Size

Characteristics	Non-users		Users		t-value	Sig
	X	SD	X	S.D		
Income	482	54	137	32	3.1	1.9
Livestock size	17.5	9.5	10	8	0.001	0.001

Source: Own Survey, 2021

About 62.5% (non-users) and 68.5% (users) were pastoralists who have been employed in the study area (Table 8). Similarly, about 37.5% (non-users) and 31.5% (users) were pastoralists who have not been employed in the study area (Table 8).

*Corresponding Author: Chayot Gatdet Deng

Table 8. Distribution of Employment Status

Characteristics	Non-users		Users		X²–value	Sig
	F	%	F	%		
Employment Status						
Yes	20	62.5	85	68.5	6.3	0.038
No	12	37.5	39	31.5		

Source: Survey result, 2021

Forest Resources Use

Forest is vital for continued existence among the pastoral communities in the Gambella region. The indigenous people use the various forests products in the study area. The leading forests resources are fuel woods, material constructions, fodders, medicines, and food items in the district. The field result showed that about 64.7%, 49.4%, 66%, 67.9%, and 57.7% of the pastoralists have used the fuel woods, constructions materials, food items, livestock fodders, and medicines respectively in the study area.

Table 9. Distribution of Fuel Woods and Construction Materials

Forest Resources	Users		Non-users		X²-Value	Sign
	F	%	F	%		
Fuel woods						
Yes	88	71	13	40.6		
No	36	29	19	59.4		
Construction Materials						
Yes	68	54.8	9	28.1		
No	56	45.2	23	71.9		

Source: Own Survey, 2021

Fuel Woods

In the pastoral areas, ample of the pastoral households use the fuel woods in the study area. The estimates of 71% (users) and 40.6% (non-users) were the pastoralists who have used the fuel woods in the study area (Table 9). On the other hand, about 29% (users) and 59.4% (non-users) were pastoralists who have not used the fuel woods in the study area (Table 9). Ahammad *et al.* (2021) indicated that the pastoralists used the forests for fuel woods production. The focus group discussion result showed that charcoal and firewood were gained in forests in the study area.

Materials Construction

In the pastoral areas, ample of the pastoral households use the forests resources for construction purposes in the study area. About 54.8% (users) and 28.1% (non-users) were the pastoralists who have used the forests products for construction in the study area (Table 9). On the contrary, about 45.2% (users) and 71.9% (non-users) were pastoralists who have not used the forests resources for construction in the study area (Table 9). Mihayo & Peng (2020) indicated that the pastoralists used the forests for construction materials. The focus group discussion result disclosed that the stick, timbers, etc. are used for construction in the study area.

Food Items

The pastoral households use the Forests resources as food items in the study area. The estimate showed that about 69.4% (users) and 53.1% (non-users) were the pastoralists who have used the forests as the sources of food items in the study area (Table 10). On the other hand, about 30.6% (users) and 46.9% (non-users) were pastoralists who have not used the food items from the forests in the study area (Table 10). Ahammad *et al.* (2021) indicated that the pastoralists used the forests' food consumption. The focus group discussion result indicated that the pastoral use the forests fruits, vegetables, etc. for consumption in the study area.

Table 10. Distribution of Food items

Forest Resources	Users		Non-users		X²	Sign
	F	%	F	%		
Food items						
Yes	86	69.4	17	53.1		
No	38	30.6	15	46.9		

Source: Own Survey, 2021

Livestock Fodders

The pastoral households use the forests as the source of livestock forages in the study area. About 79.8% (users) and 21.9% (non-users) were the pastoralists who have obtained the livestock fodders from the forests in the study area (Table 11). In addition, about 20.2% (users) and 78.1% (non-users) were pastoralists who have not got their livestock fodders from the forests in the study area (Table 11). Ahmed et al (2008) indicated that the pastoralists used the forests as livestock fodders. The focus group discussion result showed that the people use the leave of the trees, fruits, and grasses as forage for their livestock in the study area.

Indigenous Medicines

The pastoral societies use the forests as the sources of traditional medicines in the study area. About 62.9% (users) and 37.5% (non-users) were the pastoralists who have acquired their indigenous medicines from the forests in the study area (Table 11). Likewise, about 37.1% (users) and 62.5% (non-users) were pastoralists who have not received their medicines from the forests in the study area (Table 11). Ahmed *et al.* (2008) indicated that the pastoralists used the forests as medicines. The focus group discussion result showed that the pastoralists use different forests products as indigenous medicines in the study area. Some of the forests products mainly roots, pods, and leaves are essential for human bodies' treatment.

Table 11. Distribution of Fodders and Medicines

Forest Resources	Users		Non-users		X^2	Sign
	F	%	F	%		
Fodders						
Yes	99	79.8	7	21.9		
No	25	20.2	25	78.1		
Medicines						
Yes	78	62.9	12	37.5		
No	46	37.1	20	62.5		

Source: Own Survey, 2021

Determinants of Forest Resources Use

The multicollinearity among the dummy explanatory variables was tested in this study. The result presented that there was certainly no collinearity among the dummy variables. The results of the explanatory dummy variables showed that the contingency coefficient was below 1 (Table 12). Hence, when the contingency coefficient value was less than 1, it indicated that there was no collinearity problem.

Table 12. Multicollinearity Diagnosis of the Discrete Independent Variables

Variable	SE	MAS	EDS	MA	CA	SKT	EMS	FA
SE	1							
MAS	0.512	1						
EDS	0.132	0.650	1					
MA	0.021	0.210	0.123	1				
CA	0.511	0.32	0.731	0.121	1			
SKT	0.311	0.145	0.331	0.227	0.411	1		
EMS	0.134	0.100	0.221	0.102	0.412	0.311	1	
FA	0.214	0.346	0.512	0.235	0.129	0.400	0.213	1

Source: SPSS Output, 2021

The multicollinearity of the continuous explanatory variables was proved. The result showed that there was no multicollinearity gained from the continuous independent variables of the study. The VIF results showed that the values of the variables were below 10 (Table 13). Thus, the results of multicollinearity identification were briefly shown in tables 13 for clarification.

Table 13. Variance Inflation Factor for continuous independent variables

Variables	R^2	VIF
AG	0.4	1.67
LSI	0.3	1.43
INC	0.6	2.50
HIS	0.2	1.26

Source: SPSS Output, 2021

Similarly, the goodness of fit test was used with Hosmer-Lemshew before the binary logit model execution. The test showed that the p-value (=0.521) of the Homer-Lemshew goodness of fit test is greater than all significant levels (1%, 5%, and 10% respectively). This displayed that the binary logit model fit with the study variables, or it was executed for the analysis of the factors of nutrition security. Therefore, the binary logit model was applicable for data analysis in this study.

Then, the 12 explanatory variables were theorized to influence the decision of forests resources uses in the Itang Special District. Six independent variables were statistically significant toward forest resource use among the pastoralists. The binary logit model showed that livestock size, employment status, educational status, market access, forest access, and income were statistically significant (Table 14).

Table 14. The Results of the Binary Logit Model

Variables	B	S.E	Wald	Sig.	Esp.(B)
AG	0.022	.025	.731	.748	.022
LSI	.055	.002	4.837***	.007	.57
INC	-.042	.000	.761***	.004	.72
SE	.012	.317	2.944	.816	.012
MA	.027	.026	1.086**	.021	.67
EDS	-.444	.003	3.576***	.005	.46
CA	.446	1.004	1.197	.022	.40
HIS	.149	.072	2.577	.990	.031
SKT	-.029	.686	.002	.922	.971
FA	.299	.007	.116***	.522	.349
EMS	-.474	.001	.320***	.276	.79
MAS	.028	.606	3.002	.001	.972
Constant	-45.160	.608	.000	.999	.000

LR Chi^2(16) =142, 5 p-value=0.005
Hosmer Lemshow Chi^2(6) = 7.51, p=0.521
Number of Observation=156
Source: The binary logit model output
Note: ** and *** represent the variables that are statistically significant at 5% and 1%.

Currently, it is time for statistically significant explanatory variables explanation. The relationships between these significant explanatory variables with forests resources use among the pastoralists were briefly discussed below.

LSI (Livestock size)
The livestock size was expected as the determinant of the use of forests resources among the pastoralists in the study area. The model result revealed a positive significant association between livestock size and pastoralists' nutrition security at 1% (p-value=0.002). This showed that the increase of livestock size would increase the pastoralists' use of forests resources in the study area. The estimate directed that increasing the number of livestock would increase the probability of the pastoralists' forests resources use by 57%. This advocates that the pastoralists with livestock use the forests resources. The forests products are used for house construction, fodders, food, and medicines. Ahammad *et al.* (2021) finding detailed that the livestock size determines the forest resources use.

INCO (Income)
The income of the pastoralists was used as the determinants of forests resources use in the study areas. The income of the pastoralists negatively determines the

forest resources use at 1% (p-value=0.000). This showed that the increases in income decrease the forests resources use among the pastoralists. This implies that the increases of income by one birr would decrease the probability of forests resources use among the pastoralists by 72%. This exhibited that the pastoralists with more income do not use the forests resources. Fakayode *et al.* (2013) showed that the income of the pastoral households determines the decision to use forests.

Forest Access (FA)
Forests access was hypothesized as the determinants of pastoralists' forests resources use in the study area. The access to forests influenced the pastoralists' forests resources use positively at 1% (p-value=0.007). This publicized that the increase of access to forests increases the decision of the pastoralists forests resources use in the study area. It was shown that as the access to forests increase, the probability of forests resources use would be increased by 35%. Ahammad *et al.* (2021) showed that the proximate of residents influences the use of forests products among the pastoralists.

MAC (Market Access)

The market access was projected to be the determinants of pastoralists' forests resources use in the study area. The model indicated that the market access positively influenced the forests resources to use at 5% (p-value=0.025). This showed that the increase of the market access increases the pastoralists' decision toward forest resource use. This displayed that the increase of market access would increase the probability of the pastoralists' decision to forest resources use by 67%. Bwalya (2013) result showed that market access influences the decision to use the forests resources.

EDS (Educational Status)

The educational status was assumed to influence the decision of pastoralists toward forests resources to use in the study area. The educational status of the pastoralists was negatively associated with forests resources use at 1% (p-value=0.003). This shows that the increases in educational status decrease the decision of the pastoralists toward forests resources use in the study area. The estimate revealed that the increase of pastoralists' education status would decrease the probability of forests resources use by 46%. Ahammad *et al.* (2021) revealed that the educational status of pastoralists influences the use of forests resources.

EMS (Employment Status)

The employment status was hypothesized as the determinant of forests resources use among the pastoralists in the study area. The employment status was found to negatively influence the forests resources to use among the pastoralists at 5% (p-value=0.001). This showed that as the employment of pastoralists increases; the forests resources use decreases. It was specified that the increase of employment status would decrease the probability of forests resources use by 79%. Olunga (2013) showed that the employment of pastoral households determines the utilization of forests resources.

CONCLUSIONS

Itang special district is one of the woredas in the Gambella region where the pastoralists use the forests resources. This study was about the forest resources use and it is determinants among the pastoralists in Itang special district. It was undertaken to assess the existing forests resources and the factors affecting the forest resource use among the pastoralists in the study area.

Meanwhile, the various forests resources were used by the pastoralists in the study area. The pastoralists make the forests the sources of food items, medicines, livestock fodders, materials construction, and fuel woods in the study area.

Moreover, several factors determine the forests resources use among the pastoralists in the study area.

The livestock size, access to the forest, and market access increase the forests resources use in the study area. As well, the income, educational status, and employment status decrease the pastoralists' forests resources use in the study area. Thus, the civil society organizations, governmental organizations and NGOs should:

- Create job opportunities through the development of various livelihood activities
- Strengthen the capacity-building strategies
- Increase the infrastructure services
- Provide improved forage and livestock
- Conduct longitudinal regional study

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