ISSN No:-2456-2165

Perception, Traditional Knowledge, Uses, and Status of Gum Arabic Production from A. Senegal Tree in Rural Households of Amibara and Liben District, Ethiopia

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Abstract:- Exploring perception, traditional knowledge uses, and status of gum arabic production from A. Senegal tree is crucial to present the existing situation and prospects in rural households of Amibara and Liben district of Ethiopia. Data was collected using key informant interviews, focus group discussions, and household surveys. The household survey data were collected from 441 randomly selected households. Descriptive statistics like mean, frequency, and percentage were used to present the study results. The findings illustrate that the respondents' perception of gum arabic uses is slight since 90.7% of the sampled households responded to the reasons for not engaging in gum collection is I did not know the benefit before. About 58.3% of the sampled households are not engaged in gum collection. The sampled households indicated that 94.8% of them use natural oozing collection method than tapping for the production of gum arabic. The sampled households responded that the relative abundance of gum and resin trees in the study area and productivity (quantity harvested per unit area) change status are notably decreasing (55.6%) and notable decreasing (56.9%) respectively. Traditional knowledge and uses of gum arabic in Amibara and Liben districts of rural households range from medicinal values and uses to cosmetics and other uses. The results of the study also indicate that about 75.5% of the sampled households responded that there is no market availability of gum arabic in the area and the reasons for facing market problems were lack of buyers, transportation, and lower quality product, high competition from my competent ranked respectively. On the other hand, 89.3% of the sampled households have no credit access. Therefore, the promotion and commercialization of gum arabic in Amibara and Liben districts of Ethiopia both for the economic benefit of the community and sustainable management of the fragile ecosystem is recommended with applicable policy articulation, research and development interventions; to make Ethiopia penetrate the international market of gum arabic and to improve its market share too.

Keywords:- *Acacia Senegal, Gum Arabic, Perception, Production, Marketing.*

I. INTRODUCTION

Dry forests are complex ecosystems that are not entirely apprehended and perceived. Scientific knowledge to better manage dry forests and sustain the livelihoods of people that depend on these ecosystems remains scanty as research to inform policy and practice is still very limited (Lawry *et al.,* 2015). Ethiopia's dry forests cover about 55–60% of the country's drylands (WBISPP, 2004). Numerous studies suggested that the forests and woodlands in Ethiopia's drylands offer good opportunities for improving rural livelihoods and reducing poverty; in spite of the general perception that drylands are resource-poor areas (Lemenih and Kassa, 2011; Worku *et al*., 2011; Gindaba *et al*., 2007; Lemenih *et al.*, 2003). Ethiopia is soundly gifted with over 60 gum and resin bearing species from *Acacia*, *Boswellia,* and *Commiphora* species that are known to produce gum arabic, frankincense, and myrrh, respectively (Tadesse *et al.,* 2007). Gum arabic is the oldest and best known of all-natural gums and is a major gum in commerce produced from the stems and branches of *A. senegal*, *A. seyal,* and *A. polyacantha* (Chikamai, 1996). Amibara and Liben districts from Afar and Oromia regions respectively are also the resource areas of gum arabic from *Acacia Senegal* where this study was carried out.

Gum arabic or gum acacia, a natural tree gum exudate produced from *Acacia Senegal* and *Acacia Seyal* species and has an important part of commerce since precedent. Gum arabic bearing species trees grow broadly through the Sahel belt of Africa situated in the north of the equator up to the Sahara Desert and from Senegal in the west to Somalia in the east (Mariod, 2018). On the map of the Gum belt in Africa, almost all parts of Ethiopia covered this shows Ethiopia is the main source area of gum arabic source tree Acacia Senegal (Assoumane *et al.,* 2009). Gum arabic collection is in the dry season and harvesting does not overlap with pastoral or agricultural activities thus being a vital additional source of income for rural collectors i.e. diversify the livelihoods of the rural households and can be used as a risk aversion strategy of the rural households in face of crop failure, the sudden death of livestock, or other threats to household survival (Chrétin *et al.,* 2008; Freudenberger, 1993). The chemical composition and

ISSN No:-2456-2165

properties of gum acacia vary mainly in genotypic differences, age, climate, soil, and plant pathogens. Gum arabic is employed in industries as an emulsifier and a thickening agent in foods (Mariod, 2018). It's been applied to alleviate the consequences of chronic kidney failure, and it's an honest antioxidant, which protects against cardiac and hepatic toxicities (Mariod, 2018).

Gum arabic still has a significant international market, especially in the European Union. Gum arabic plays a vital role in Sudan's economy and represents about 12% of GDP which is more than 80% of the total world gum arabic (Abdulgadir, 2013;

Forman, 2012; NGARA, 2017). Besides, the source of income from gum arabic is stable for rural households especially in the crop failing time and accredited as a crucial main component of traditional rainfed farming due to its contribution to household income and the country's foreign exchange earnings (Abdelnour, 1999 cited in Hammad and Mohammed, 2018; Taha *et al.*, 2018).

Ethiopia's total production and export quantity of natural gum and resins including gum arabic is a declining trend since 2010 and listed as minor gum arabic producing country which covers only 1.6% of production offered to international market (Muller and Okoro, 2004; NFSDPE, 2018; Tadesse *et al.*, 2020). Like other countries, Ethiopia also can penetrate the international market of gum arabic and improve its market share too. Likewise, Ethiopia has a huge resource and urgent to seek viable strategies that have both actual and potential significance, contribute optimally to the wellbeing of communities, local, national, and international economies as well as the environment, including biodiversity (Worku *et al.*, 2011). Sound and sustainable management of this natural resource are required to ensure socio-economic benefits, processing, and product development of gum arabic (Lemenih *et al.*, 2003).

In Ethiopia, there is an enormous gap between the production potential and actual production of gum arabic. Due to poor documentation, parallel trade across borders, lack of forest product control offices, and obtaining precise quantitative information on actual annual production by gum type in the country is difficult (Tadese *et al.*, 2018). However, information on the existing situation, perception of the local communities, the traditional knowledge, use, production, and marketing of these products about the resource in Amibara and Liben districts are inadequately documented. This paper aims to present the existing situation, perception, traditional knowledge, use, and status of gum arabic production from *Acacia Senegal* tree in rural households of Amibara and Liben Districts of Ethiopia. Hence, the objective of the study was to assess the existing situation on the perception of the local communities, traditional knowledge, uses and status of gum arabic production and marketing from *Acacia Senegal* tree in rural households and analyze the existing challenges, opportunities, and overall future prospects of sustainable gum and resin development, production and commercialization.

II. METHOD

2.1. Description of the study area

The study was conducted within the Amibara and Liben districts of Ethiopia (Fig.1). Amibara is one among the districts within the Afar region. Amibara is a component of the administrative zone 3, bordered on the south by Awash Fentale, on the west by the Awash River which separates it from Dulecha, on the northwest by the administrative zone 5, on the north by Gewane, on the east by the Somali region, and on the southeast by Oromia region. A total population of 63,378 of whom 35,378 are men and 28,004 men with a neighborhood of 2,007.05 square kilometers over 68.86% of were Muslim (CSA, 2007).

Liben is one among the districts of the Oromia region located altitude ranges from 1120 to 1600m.a.s.l about 630 km south of Addis Ababa. Liben is part of the Guji zone and bordered on the south by the Dawa River which separates it from the Borena zone, on the west by Odo Shakiso, on the northwest by Adolana Wadera, on the north by the Ganale Dorya River which separates it from the bale zone, and on the east by the Somalia region. Consistent with CSA (2007), a complete population of 138,813of whom 70,130 were men and 68,683 was women majority of them was Muslim (59.45%), while 21.07% of the traditional beliefs. Species like *Combretum, Terminalia, Acacia, Pistacia, Commiphora, Lannea, Euclea,* and *Olea* are common within the studied area (Amauel *et al.*, 2019).

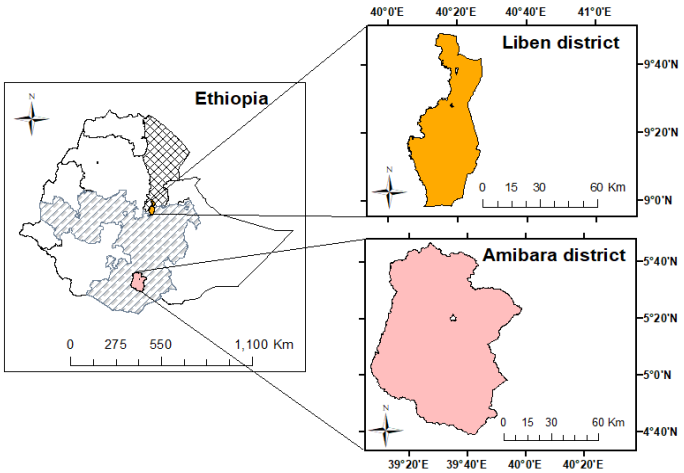

Figure 1: Map of the Study Area

2.2. *Sampling procedure and data collection*

This study, conducted among pastoralist harvesters and other actors involved in the development and business of the gum arabic industry in Amibara and Liben Districts of Ethiopia. Households from the data collection area were selected randomly based on households living around the resource area of gum tree *Acacia Senegal*. 121 households from Liben district from five administrative kebeles (peasant associations): Boba, Melka Guba, Bulbule, Hadessa, and Korati were selected. Four focus group discussions were undertaken by two men and two women at Melka Guba and Boba kebeles. The data collection time was in May 2016.

ISSN No:-2456-2165

Two times data from Amibara district from eight administrative kebeles (Andido, Bedulale, Serkamo, Awash Arba, Angelele, Keleat Buri, Sidha fage, and Halay dege) were taken. The first data were collected from 120 households in duration in April, 2016. Besides, four focus group discussions were undertaken by two men and two women at Andido and Seidha fage kebeles. The second data were collected from 200 households on May, 2017. Besides, six focus group discussions were undertaken three men (Bedulale, Awash Arba, and Halay dege kebeles) and three women (Angelele, Serkamo, and Keleat Buri kebeles).

The study depicts the responses to the survey questionnaire which was administered to the respondents in Amibara and Liben districts kebeles. A standardized semi-structured questionnaire was administered to the respondents through face to face interviews, conducted by enumerators. Below there are the description and definition of variables and their measurement of how the latter variables were operationalized in this study.

Family size: measured as continuous variable the total number of a family member living in the household head house. *Sex:* measured as a dummy variable to assign 1 if the sex of the household head is male 0 otherwise. *Age:* continuous variable the actual number of years lived by the household head. *Education:* a dummy variable 1 if the household head education literate, 0 if illiterate. *Marital status:* = 1 if the household head marital status is married and 0 otherwise.

Land owned (in ha): the amount of farm size the household owned by the household in a hectare.

Distance to gum Forest (in hrs): the distance to *gum arabic* forest resource measured by walking hours. *Distance to nearest Market:* the distance to nearest market measured by walking hours. *Distance to Extension office:* the distance to the extension office measured by walking hours. *Distance to Asphalt road:* the distance to asphalt road measured by walking hours. *Distance to Electric grid:* the distance to electric grid measured by walking hours.

House with Corrugated Iron sheet: = 1 if home roof made corrugated iron sheet; 0 otherwise. *Asset Accumulation in Ethiopian Birr:* measured the household equipment and tools owned in birr. *Net Income (in Ethiopian birr):* income from the crop, livestock, off-farm and non-farm added and their cost deducted. *Training Awareness at least one:* a dummy variable whether the household head attained at least one training and awareness forum in the last three years yes= 1; no =0. *Market Availability (yes/no):* = 1 if the household facing any problem in marketing gum product (yes), 0 (zero) otherwise (no).

Employed in government job: = 1 if the household head is employed in government organization (yes), 0 (zero) otherwise (no). *Crop farming (yes/no):* = 1 if the household head is carrying out in crop farming activities (yes), 0 (zero) otherwise (no). *Livestock production (yes/no):* = 1 if the household head is performing in livestock production activities (yes), 0 (zero) otherwise (no). *Sale of firewood or charcoal:* = 1 if the household head is selling *firewood or charcoal* (yes), 0 (zero) otherwise (no). *Income from wage labor (yes/no):* = 1 if the household head is getting income from wage labor (yes), 0 (zero) otherwise (no). *Food for work (yes/no):* = 1 if the household head is participating in food for work (yes), 0 (zero) otherwise (no). *Cash for work (yes/no):* = 1 if the household head is participating in cash for work (yes), 0 (zero) otherwise (no). *Productive Safety Nets Program (PSNP):* = 1 if the household head is participating in Productive Safety Nets Program (PSNP) (yes), 0 (zero) otherwise (no). *Income from NGOs assistance:* = 1 if the household head is getting income from NGOs assistance (yes), 0 (zero) otherwise (no).

2.3. Data analysis

Statistical Package for Social Scientists (SPSS) version 20.0 software was employed to analyze the household survey data. Descriptive statistics like mean, percentage, and frequency distribution were used to describe the demographic characteristics of the sampled households. Qualitative data generated from key informant interviews and focus group discussion was analyzed and interpreted on spot.

III. RESULTS

3.1. Demographic characteristics of sampled households

The structured household survey was undertaken from a total of 441 households'. Of this, the socio-economic demographic information showed that majorities of the sampled household head were 71.9% was male and the rest was female (Table 1). Moreover, the mean respondent's ages were 39 with a minimum and maximum of age 18 and 100 respectively. Regarding the literacy level, 70.3% are illiterate and the rests are literate. This shows the penetration of formal education is still low i.e. less than half of the sampled households' only 29.7%. Although the educational background of the household head is believed, to be one of the decision determinants for the engagement of households' for gum collection. Besides, 83.9% of the sampled households' religion is Muslim; 14.3% are Wakefeta (religion especially in Guji Oromo ethnic group) and the rest were in other religions.

Furthermore, 85.5% of the interviewed household heads are married. The mean family size is 6 with a minimum and maximum of 0 and 26 respectively (Table 1). The result showed, the majority of the households interviewed were engaged in livestock production i.e. 81.0% and only 29.3% of the households were participating in crop farming (Table 1). This showed the majority of the interviewed households in the study area are pastoralists. The mean land owned by the households interviewed was 1.01 with a maximum of 33ha. The mean livestock holding of the households interviewed were 43.92 in TLU (Tropical Livestock Unit) with a minimum and maximum of 0 and 6001.10 respectively (Table 1). The household preferences of occupation and livelihood activities lie on livestock production 60.5% and 25.6% households responded very

important and important respectively as the study area households are pastoralists while most of the other means of livelihoods (Crop farming, Petty trade, Daily laborer…) are in the least important preference categories (Table 2).

Table 1: Socio-economic characteristics of the sampled households

Socio-economic characteristics	***Descriptions***
Gender (1 if male, 0 female)	Male 71.9% and female 28.1%
Age	Mean 39.76 and ranges 18-100
Marital status(1 if married and 0 others)	Married 85.5% and others 14.5%
Literacy level(Education)	Illiterate 70.3% and literate 29.7%
Family size (in No.)	Mean 6.46 and ranges 0-26
Land owned (ha.)	Mean 1.01 and ranges 0-33
Religions (%)	Muslim 83.9%, Wakefeta 14.3%, others 1.8%
Livestock holding (in TLU)	Mean 43.92 and ranges 0 - 6001.10
Livestock production(yes/no)	Yes 81.0% and no 19.0%
Crop farming(yes/no)	Yes 29.3% and no 70.7%
Employed in government (yes/no)	Yes 27% and no 73%
House with corrugated iron sheet	Yes 8.2% and no 91.8%

TLU:-Tropical livestock unit

About 67.6% of the sampled households were not trained at least one training, about 58.3% of the sampled households were not engaged in gum collection, and from those 75.5% of the households are not receiving market availability of gum (Table 3). The sampled households distance access to infrastructure and services ranges from zero to 2.07 in walking hours (Table 3). The asset accumulation that are equipment and tools owned by the sampled households in Ethiopian Birr (ETB) with mean 2373.20, ranges 0-149010.00 and the standard deviation (STD)=7559.77 (Table 3).

Table 2: Household preferences of occupation and livelihood activities

Means of Livelihoods	**Very important Count (%)**	**Important Count (%)**	**Least important Count (%)**
Crop farming (incl. Gardening)	52(11.8)	77(17.5)	312(70.7)
Livestock production (incl. Dairy products)	267(60.5)	113(25.6)	61(13.8)
Petty trade	12(2.7)	32(7.3)	397(90.0)
Daily laborer	80(18.1)	56(12.7)	305(69.2)
Sale of gum products	17(3.9)	44(10.0)	380(86.2)
Sale of other forest products	3(0.7)	25(5.7)	413(93.7)
Charcoal and firewood selling	13(2.9)	25(5.7)	403(91.4)
Support from relatives/individuals	10(2.3)	27(6.1)	404(91.6)
Support from organizations	11(2.5)	32(7.3)	398(90.2)
Other off-farm activities except for the sale of gum and government employer	10(2.3)	57(12.9)	374(84.8)

Table 3: Descriptions of sampled household's status using different variables

Variables	***Descriptions***
Training awareness at least one (yes/no)	Yes 32.4% and no 67.6%
Sale of charcoal and firewood selling (yes/no)	Yes 1.8% and no 98.2%
Income from wage labor (yes/no)	Yes 5.4% and no 94.6%
Food for work (yes/no)	Yes 9.5% and no 90.5%
Cash for work (yes/no)	Yes 4.1% and no 95.9%
Productive Safety Nets Program (PSNP)	Yes 57.6% and no 57.6%
Income from NGOs assistance	Yes 2.0% and no 98.0%
Distance to gum Forest (in hrs)	Mean 0.03 and ranges 0-0.67 (STD=0.05)
Distance to nearest Market (in hrs)	Mean 0.10 and ranges 0-0.80 (STD=0.15)
Distance to Extension office (in hrs)	Mean 0.06 and ranges 0-0.22 (STD=0.05)
Distance to Asphalt road (in hrs)	Mean 0.08 and ranges 0-2.07 (STD=0.14)
Distance to Electric grid (in hrs)	Mean 0.05 and ranges 0-0.70 (STD=0.10)
Asset Accumulation in Ethiopian Birr(ETB) (Equipment and tools)	Mean 2373.20 and ranges 0-149010.00 (STD=7559.77)
Net Income(in ETB)	Mean 3796.48 (STD=13028.48)

3.2. Perception, Traditional knowledge and uses of gum arabic in rural households

In the study area, *92.3%* the sampled rural households know plant which bears gums and resins i.e. *Acacia Senegal*. The sampled households responded that they use *Acacia Senegal* species trees for purposes of firewood which is 42.4% of the sampled household and for other purposes uses like fencing, house construction, gum collection, medicinal value, and farm implement. Varieties of gum and resins they collect from the area are Gum 423(95.9%), incense 6(1.4%), myrrh 12(2.7%). Perception of the rural households on gum arabic in the study area is slight because about 90.7% of the sampled households responded to the reasons for not engaging in gum collection is I did not know the benefit before and responded too it was not profitable 18(4.1%), I was engaged in other off-farm activities 3(0.7%), other 12(2.7%) and I do not have the right to produce 8(1.8%).

The sampled households responded that the relative abundance of gum and resin trees in the study area are notable decreases (55.6%), no significant change perceived (10.9%), notable increase (7.5%). The sampled households responded to productivity (quantity harvested per unit area) change status are notable decrease (56.9%), notable increase (12.5%), and no significant change perceived (5.9%). The major reasons for relative abundance and productivity of gum and resin tree notable decreasing are the households uses these trees are used for fencing, cultural services, climatic conditions (Elino(in Amibara district), lack of rainfall, drought problem, lack of management, lack of knowledge and awareness on climate change and gum resource, the encroachment of *Prosopis juliflora* (*Prosopis juliflora* invasion) (in Amibara district), deforestation due to house construction, fencing, farm implements, firewood and expansion of agricultural land, engagement in gum collection is increasing while the forest is not increasing.

Traditional knowledge and uses of gum arabic in Amibara and Liben districts of rural households range from medicinal values and uses to cosmetics and other uses (listed below). Further research is needed on traditional knowledge and use of gum arabic since this research only highlights the traditional knowledge and uses of gum arabic.

The traditional knowledge and uses of gum arabic in Amibara and Liben Districts is listed below:-

1. Hairstyle (to form traditional hair dreadlocks of men in the area)
2. Put on Eye borrow (to survive from human eyes), for a clear vision of eye and eye infected
3. While changing goatskin to bags something that holds material (Silicha) and for writing material of Quran: - soaking the skin with water and gum Arabic will remove the hair, the meat from the skin, remove the smell of the skin, and make it strong.
4. Medicinal value and uses

a. They will dissolve in water and add sugar and drink it, it will use as to wash our stomach and it is believed that it will take out our disease and dirty things from their stomach (like informal science castor oil used for washing stomach for abdomen ultra-sound), helps to recover from a diarrhea disease, decrease farting and stomach bolting
b. Used to recover from malaria too.
c. They use the bark and leaf of the *A. Senegal* tree for tonsillitis, abrupt(accidental) stomach disease
d. For wound for stop bleeding and to survive early from it
e. To survive from bone fracture(for human and livestock)
f. For children stomach diseases(smelling it), to remove baby skin rashes and it is useful to recover them from mouth wound
g. Other gum than Gum Arabic had a style of bolting stomach after eating but Gum Arabic had no effect on bolting stomach.
h. It is believed that if someone is eating Gum Arabic he will be healthy.

5. Eating it to survive from hunger and also used as chewing gum

i. It is good for healthy teeth while chewing it, it will kill bacteria's in the teeth, pick dirty from teeth, and make the teeth strong
ii. Used as food with water and milk and the fresh one too used as the food it will fill our stomach and It will give us energy and make us strong

6. The men eat it and had sexual intercourse with his wife to get an active and healthy child(it is believed that the child that will be born is healthy, strong, and active)
7. It is believed that when men eat it their gone sperm will be substituted by it.
8. Incense for fumigation: For women used in the form of steam and using the smoke of it like incense

i. She will feel free after use of it and her tiredness will leave her.
ii. Make her skin clear and soft; her skin color will be changed to white.
iii. It will help her as anti-aging, sports exercise(it help her to be strong and healthy)
iv. The smell of her after steaming the smoke of gum arabic will be changed to good and men's in the area likes it and uses for women's as attracting their men's
v. It is believed that her diseases go out by sweating while she is in steam

9. Insect repellents: When their livestock are under biting of insects like a tick (mezeger), they mix gum arabic with water and put on their body, totally the animals will survive from it.
10. If they didn't get gum arabic one year they believed that year is not good (it is believed that there will be drought, no rain, and famine).

3.3. Current status of gum arabic production, harvesting, processing, and marketing

The collectors of gum arabic in Amibara and Liben districts are pastoralists or rural households (children, women, men, herders, and anyone who goes to *A. Senegal* forest). In the area of gum and resins, stakeholders are pastoral office, cooperative office, trade, and industry office, SOS-Sahel Ethiopia. About 58.3% of the sampled households are not engaged in gum collection (Table 5). Their main motivations behind engagement in gum arabic collection/ reasons for engagement are gum arabic collection

is economically attractive (cash income) 64(14.5%), less income from agricultural production 38(8.6%), scarcity of other products 4(0.9%), no significant economic activity in the season 8(1.8), ease of selling the product and income potential 9(2.0%), others 311(70.5%), when cash income attractive and no significant activity in the season 7(1.6%). The engagement in gum arabic collection for how long ranges from 0 to 25 years and it depends on the household use for medicinal value and other uses like for hunger.

94.8% of the sampled households use the natural oozing collection method for the production of gum arabic. In the study area, the organization of gum arabic harvesting by pastoralist is they collect gum arabic when they go to the forest to other activities like herding livestock, they pick when they see it to chew for the tolerance of hunger or other medicinal values and they had a habit of biting the trees by axe or ingot (tegera) or any other material they hold when they go for any other off-farm activities. They will come to the home with it and they will start storing it. Most of the sampled households store gum Arabic in plastic sacks, jute sacks and others ranked respectively. Their motive behind storing is lack of market demand, expecting high price and saving purpose ranked respectively too. The production time is two times in the year the first time from October to December (especially on this month have high production) and the second time from March (high production time) to April.

Regarding the processing of gum arabic processing activities like only decrease the size 21(4.8%), separate the bark from gum 56(12.7%), grade 5(1.1%), others 359(81.4%) which means they are not a collector or they are not processing. The reasons for not processing before they sell lack of knowledge, lack support from the government, financial constraint, lower profit from processing ranked respectively, and some of them responded to the above two or more together. Generally, the processing of gum arabic activities is not performed well because of the knowledge gap, lack of support, and lack of demand on it.

Table 4: Production, harvesting, processing, and marketing of Gum Arabic

Variables	***Descriptions (frequency and percentage) n= 441***
Engagement in gum collection (yes/no)	Yes 184(41.7%) and no 257(58.3%)
Do you collect on grade level?	Yes 98(22.2%) and no 343(77.8%)
The method you use for the production of gums	Natural Oozing collection 418(94.8%), Tapping 23(5.2%)
Processing before you sell	Yes 109(24.7%) and no 332(75.3%)
Did you store gums	Yes 151(34.2%) and no 290(65.8%)
Your buyers	Unions 8(1.8%), whole sellers 23(5.2%), private investors 17(3.9%), cooperatives 30(6.8), final consumers 56(12.7%), village market 13(2.9%)
Easiness to find a buyer	Difficult 110(24.9%), very difficult 13(2.9%)
Market information from	Extension office 80(18.1%), own survey 33(7.5%), other farmers 10 (2.3%)
Market availability of gum (yes/no)	Yes 108(24.5%) and no 333(75.5%)
Power to bargain price	Yes 47(10.7%) and no 175(39.7%)
Satisfied with the current price	Yes 31(7.0%) and no 192(43.5%)
Access to credit	Yes 47(10.7%) and no 394(89.3%)
Membership of cooperatives	Yes 70(15.9%) and no 371(84.1%)
Formal or informal institution governing access to gums and resin resource	Yes 80(18.1%) and no 361(81.9%)
Legal requirement to engage on gums and resin business	Yes 85(19.3%) and no 356(80.7%)
Willing to engage in activities to upgrade gum and resin business	Yes 233(52.8%) and no 208(47.2%)

In the study area, it is difficult and very difficult to find buyers of gum arabic due to lack of information about buyers 55 (12.5%), inaccessibility of market 39(8.8%), low price offer 10(2.3%). About 75.5% of the sampled households responded that there is no market availability of gum arabic in the area and the reasons for facing market problems were lack of buyers, transportation, and lower quality product, high competition from my competent ranked respectively. The major sources of finance available for gum arabic collection activities are self, informal, and formal ranked respectively. On the other hand, 89.3% of the sampled households have no credit access (Table 4). In Liben district only in one kebele Melka Guba there are cooperatives who can buy gum arabic in small price but the cooperatives are not including those households as a cooperative member, they are serving to cooperate them. In Amibra district only in one kebele (peasant association) i.e. Andido in 2016 the district administrative helping to find buyers the households even if their products are in poor quality at last they sold one kilogram of gum arabic sold by fifteen Ethiopian birr(1.44$ US dollar). In the next year 2017 drivers of higher vehicles to Djibouti buy one-kilogram gum Arabic by one hundred Ethiopian Birr (3$ US dollar in 2017) and the other kebeles (peasant associations) herd this too but still they did not offer to the market. In these years 2016 and 2017 the households annually on average 2.74 kilograms amount of gum arabic collected with average annual cash income generated from sale gum arabic

was estimated to be 40 Ethiopian birr (1.75$ US dollar). In general, the marketing of gum arabic in the area shows there is no market linkage, no link with buyers, low sale prices, lack of information and there is no favorable condition for the market.

3.4. The existing situation and prospects of gum arabic in Ethiopia

Even though there is a huge potential for gum arabic to offer to the development and conservation of the Acacia Senegal resource area, there are several existing challenges that disturb the full utilization in Amibara and Liben Districts Acacia Senegal. The major existing challenges on gum production/collection and marketing mentioned as follows by the sampled households and assessed by the study.

i. *Lack of ownership on gum resources area*: currently there is no restriction in place on the amount of harvesting done by an individual or group of people. Focus group discussion revealed that lack of ownership on gum resources prevents farmer's engagement in gum production and marketing. There is no clear boundary for one cooperative or community in the area everyone can tap and everyone can collect the gum arabic. In the area, baboons are also participating in collecting gum arabic for their food so that the rural households are not benefited.
ii. *Lack of market availability and access*: there is no market linkage from the place. Mujawamariya (2012) suggested that associations of collectors and traders possible potential that will contribute to market access and the main policy implications include the need for expansion and maintenance of *Acacia Senegal* resource base, direct market intervention, continuous sensitization of collectors and traders, and a better organization of the marketing system.
iii. *Lack of value chain development*: there is no developed value chain
iv. *Lack of value addition of gum arabic*: there is no value addition started in the area starting from the small like grading and separating bark and impurities.
v. *Source of knowledge and information*: lack of adequate market information and fair market prices of gum products was a challenge to fully engage in the gum production and marketing sector.
vi. *Lack of appropriate tapping knowledge/technologies and awareness creation on management and production of gum arabic*: lack of appropriate tapping knowledge/technologies and sustainable management and utilization of Acacia Senegal resource area.
vii. *Lack of access to credit*: The study result revealed that since there is a lack of credit access farmers were not involved to engage in gum production and marketing.
viii. *Cooperative initiation and member of cooperative*: farmers mentioned that there are no cooperatives established in the gum production and marketing sector and this discourages engagement in gum production.

Since the drylands of Ethiopia are resource-poor area but they are important in terms of their contributions to human welfare and environmental health and numerous studies indicated that forest and woodlands in Ethiopia's drylands can offer good opportunities for reducing poverty and improving rural livelihoods (Lemenih and Kassa eds., 2011). Ethiopia has one of the largest resource bases for commercial plant gum and resin production (Kuchar 1995; Tadesse *et al*., 2002); despite the resource is not exploited and used. As in other places too, the dry forests in this study area provide diverse goods and services such as fodder, fuel, cash income, building materials, and herbal medicines, and they help to protect the soil from erosion and to restore soil fertility.

Several studies showed that economic development can be energized by the country's natural gum investment subsector (Lemenih, 2005; Roukens *et al.,* 2005). Furthermore, the global demand for gum arabic is steadily increasing. Improving market linkage and access to this global market can increase the income of households and improve their livelihood diversification with high prices that encourage the households' effort to improve the quality of gum arabic and to sustainably manage the dry forest. As a whole, this, in turn, contributes to local and national economic growth.

Provisioning the environment for commercialization of gum arabic in these resource areas wills bright the future prospects of gum arabic in Ethiopia. In the study area market linkage, forming functional cooperatives and making membership the rural households in cooperative and awareness creation on management, production, processing, tapping technology and providing good quality gum arabic pertinent to the commercialization of gum arabic and to make Ethiopia penetrate the global market of gum arabic. The Ethiopian government has to enhance its support for the gum arabic sector by actions on the quality of the commodity, capacities of stakeholders, and promotion of gum Arabic on both national and international market.

3.5. Enabling the improvement of the gum arabic supply chain

Developing value chain and market, the quality management, and enabling the improvement supply chain of gum arabic the product aid the households to increase the ability to survive, provides an economic buffer in times of difficulty, and is one an element of livelihood portfolios even under normal conditions, and develop rural microfinance. To sustain the livelihoods of people that depend on this dry land ecosystem forest product gum arabic market and value chain play a vital role visa-vise to enable the improvement of the supply chain. On the other hand, it assists the countries including Ethiopia to develop business and marketing and acquire foreign currency.

As Centre for the Promotion of Imports from developing countries (CBI), 2018 of market information of natural food additives gum arabic report on exporting gum arabic to Europe, European demand for gum arabic is steadily increasing. The demand has increased by an estimated 2.5% annually in the past five years due to major drivers behind the growth includes new product

development, and substitution of synthetic thickeners (CBI, 2018). In the next five years, the demand for gum acacia is expected to continue growing at a similar estimated rate of 2.5% annually (CBI, 2018). A need for natural thickeners to produce clean labels is the major driver for growth. The main three importers of gum arabic from European countries France, Germany, and United Kingdom ranked respectively (CBI, 2018). The major exporters of developing countries are Sudan, Chad, Nigeria, and Eritrea ranked respectively. In the next five years, imports by France, Germany, the United Kingdom, and Italy are expected to increase in line with the increase in demand at 0-5% annually (CBI, 2018). France and Sudan will continue to dominate trade (CBI, 2018). At this time, the European importers welcome new sources since they are strongly dependent on Sudan presents a high risk for them, as it is a politically unstable country (CBI, 2018). So Ethiopia can also stress in promotion of gum arabic that offers an alternative source of gum arabic to European importers.

Buyers in the European Union have strict requirements for gum arabic. Buyers requirement for natural food additives deals with legal and non-legal requirements especially on the following topics: food safety – traceability, hygiene and control, contamination, adulteration, classification, labeling and packaging, substances allowed in the European Union, extraction solvents, liability, food safety certification, kosher and halal certification, documentation, samples, payment and delivery terms, sustainability, certification of organic production, and quality (CBI, 2018).

In general by providing the legal and non-legal requirements of the European Union to Ethiopia; Ethiopia has to emphasize and tackle to enter into the system of gum arabic trade by providing security to the country, increasing and stabilizing the production of gum arabic (i.e. by giving ownership to the area to the rural households, functional cooperative formation, awareness creation on knowledge and information on management and production of gum arabic, value chain development), and promoting quality gum arabic export. Ethiopia has also to sharpen their projects intended at contributing to poverty reduction and environmental protection by strengthening the gum arabic value-chain in Ethiopia for the commercialization of gum arabic and by developing market opportunities for the sector. As a whole Ethiopia has to enable and implement project management and stakeholder's animation, rural value chain development, and quality management, business development, and marketing, rural microfinance, functional cooperative formation, and membership of rural households capacitive.

IV. DISCUSSION

The uses of gum arabic in Amibara and Liben District are multiple purpose as in most areas of Ethiopia relies on firewood, fencing, house construction, gum collection, medicinal value, and farm implement; this is a similar to studies in Borena Zone Southern Ethiopia (Worku *et al*., 2011); Metema in North Gonder Zone (Eshete *et al.* 2005) and Liban Zone in Southeastern Ethiopia (Lemenih *et al.* 2003). In the study area, livestock husbandry is the predominant occupation and the livelihoods of the community are dependent on it, this also was discussed in Lemenih *et al.* (2003), Worku *et al.* (2011), and Dalle *et al.* (2005) studies. Some of the traditional knowledge and traditional uses of gum arabic is similar with to studies in Borena Zone Southern Ethiopia (Worku *et al.,* 2011) and Liban Zone in Southeastern Ethiopia (Lemenih *et al.* 2003).

Perception of the rural households on gum arabic in the study area 90.7% households responded I do not know the benefit before for why they are not engaging themselves in gum collection; this is similar to study in Borena Zone Southern Ethiopia (Worku *et al.,* 2011) about 93% of the households responded to very little knowledge on the economic value of gum and resin resources on national and international markets as well as on the use of gums and resins in advanced industries. These knowledge gaps in the country, in association with the existing poor link to market, prevent stronger engagement of the households in the production of gums and resins.

The major sources of livelihoods in the study area are livestock husbandry, daily labor, crop farming and sale of gum product ranked respectively; this is inconsistent Lemenih *et al.* (2003) and Worku *et al.* (2011) in Liben and Borena Zones of Ethiopia where their three major sources of livelihoods livestock husbandry, collection of gums and resins and farming.

Communities in Amibara and Liben districts can be said production of gum arabic only for domestic consumption thus the sale of gum arabic is still small in amount. This is not similar to other studies communities living in the arid and semiarid parts of Tigray (Tadesse *et al.,* 2003); Borena communities Southern Ethiopia (Worku *et al.,* 2011) and Amhara (Eshete *et al.,* 2005) National the Regional States, northern Ethiopia, produce gums and resins for both domestic consumption and sale. The production of gum arabic differs from other places 94.8% of the sampled households use the natural oozing collection method in Amibara and Liben districts while they had a habit of biting the trees by ax or ingot (tegera) or any other material they hold when they go for any other off-farm activities. On the other hand, the production processes of communities in Borana different practices and have not exercised artificial tapping unlike those in the northern parts of Ethiopia; they collect only the naturally oozed (Worku *et al.,* 2011). Moreover, the collection efforts of Borena are not as well organized as in the northern parts of the country, since collections are individualistic and/or fragmented (Worku *et al.,* 2011). This study is similar in the collection effort and the collection method with study in Borena Zone Southern Ethiopia (Worku *et al.,* 2011) but in their habit of biting the trees by ax or any other material differ. The sampled households associated that the lack of clear ownership, lack of cooperatives, lack of coordinated and organized collection with the lack of appropriate tapping and post-harvest technologies as well as attractive markets.

In the group discussion after they are informed about the use and benefit of gum arabic they are interested to be a member of cooperatives and they need clear boundaries of gum arabic collection area by cooperative or community kebele and they are interested to participate in gum arabic collection, production and marketing sustainably.

V. CONCLUSION

The result has shown and confirmed the results of other researches, that the supply chain is currently under-developed. Harvesters do not collect sufficient quantities and qualities of gum arabic because they are not linked to buyers, and when they are the low prices they receive discourage them from developing that income-generating activity. Pastoralists currently only collect gum once they see it and don't use modern harvesting techniques. They stand to benefit from that activity if they are more organized and if that business was more developed in the country.

Recognizing the unmet international demand for gum arabic and the largely untapped reserves growing in the wild and abundance all over the country suggests that improvements can be made to harvesting and marketing. Through training, with specific attention to quality issues and international requirements, the constitution of stocks in collection areas, and the development of direct links with traders, like other countries, Ethiopia can penetrate the international market of Gum Arabic and improve its market share. Improved gum production and quality with direct market linkage (a fair price to harvesters) will lead to poverty alleviation, improvement of livelihoods diversification and security, a positive impact on natural resources management, and preventing the area from climate change and expansion of desertification.

In the study area establishment of cooperatives, financial accesses like credit, support in creating awareness to the rural households by training (on production, harvesting, and processing) and materials support for tapping and storing, commercialization of gum arabic, provisioning market access to the rural households by different institutions and companies and proper forest access determination for the use and management of the forest is needed. Therefore, the promotion and commercialization of gum arabic in Amibara and Liben districts of Ethiopia both for the economic benefit of the community and sustainable management of the fragile ecosystem is recommended with applicable policy articulation, research and development interventions.

ACKNOWLEDGEMENTS

This study was conducted with the financial support from Ethiopian Environment and Forest Research Institute (EEFRI). The materials and facility support from Central Ethiopia Environment and Forest Research Center (CEE-FRC) is highly acknowledged. We are very grateful to staff members of Amibara and Liben districts administrative offices and household's in districts involved in the survey for their help and assistance during the study. We are very grateful to Mr. Nesibu Yahya for his assistance in preparing the map.

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