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Assessment of wild edible fruit plants in east Oromia region, Ethiopia

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ABSTRACT

Wild edible fruit plants are essential standing in all parts of the world as a subsidiary food basket on daily basis. They are means of survival for rural communities with food and feed consumption, especially during times of drought, famine, shocks, and risks. This study intended to identify, and document scientific data, to get the constraint and opportunity potential of Wild edible fruit plants. Implementation through assessed species, partly used, habitat, mode of uses, flowering months, fruiting months, and factors of threats of wild edible fruits plants. Structured and semi-structured questionnaire interviews, key informant guided, and species quantification along 18 transact lines on 60 sampled quadrants were used to collect data in the west Hararghe zone at Daro-Lebu, Chiro, and Gumbi Bordode Weredas on six PAs. A total of 120 randomly selected sample households were interviewed for data collection. Both quantitative and qualitative data analyses were made. Descriptive analyses were made to analyze the data using SPSS version 16.0. The study embraced a total of 55 Wild edible fruit plants In addition to food values, these plants provide diverse benefits to the existing community including income, fuel wood, fencing, construction, medicine, and fodder. The top five highly impersonated wild edible fruit plant species by respondents were *Psidium guajava*, *Mimusops kummel*, *Carissa spinarum* L., *Rosa abyssinica*, *Ficus sycomorus*, and *Oncoba spinosa* forssk. However, most of them were threatened by anthropogenic factors through misconception utilities. The threat factors such as land degradation and grazing, clearing of forests for agriculture, fire, timber and charcoal, Stem, leaves, root, and bark harvest. To alleviate, the entire threat of wild edible fruit plant species; a community-based forest management system, awareness creation, and growing of wild edible fruit plant species at farms and homesteads level, is mandatory for any forest resource users. The other point is the absence of seedlings and saplings under wild edible fruit plant species in its habitat is an indicator of a regeneration problem. Therefore; the most threatened and unregenerated wild edible fruit plant species of the study areas priority should be given to the critical collection, domestication, in-situ and ex-situ conservation, and promotion of on-farm cultivation in the form of agroforestry systems. Further investigation should be considered on the collection, nutrient content analyses, in-situ and ex-situ conservation, wise utilization, and popularization of Wild edible fruit plants through forest management. These are vital points to be deliberated forward.

KEY WORDS: *Threat factors*; *Forest*; *Anthropogenic effect*; *Wild edible fruit plant*

1. Introduction

Wild edible fruit plants refer to species that are neither cultivated nor domesticated, which are available from their wild natural habitat and used as sources of food (Beluhan and Ranogajec,

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2010). Even though the primary dependence of most agricultural societies on staple crop plants such as wheat, maize, and rice, the conventional eating of wild edible plant products is used as food. In human history continues until the present day observed over worldwide are more than 7,000 wild edible plant species (Grivetti and Ogle, 2000). Wild edible fruit plants are closing food gaps and play an important role in maintaining livelihood security for many people in developing countries during seasonal food shortages, as emergency food aid (Afolayan and Jimoh, 2009). Moreover, the indigenous Wild edible fruit plants are adapted to the local culture and environment welfare through natural growing manner with a minimum requirement of external inputs and maintenance such as management, fertilizer, and pesticides are the main advantage (Ruffo *et al.*, 2002).

Even though Wild edible fruit plants can easily be integrated into sustainable farming systems by the majority of the rural population, they are still not treasured as cultivated fruit trees, such as mango, avocado, Papaya, and orange due to lack of scientific support. Many countries have given priority to the documenting of Wild edible fruit plants and the associated indigenous knowledge. Countries such as India, Mexico, Bolivia, Spain, and Turkey have in-depth Ethnobotanical information on Wild edible fruit plant's utility. By contrast, in Ethiopia conducted on Wild edible fruit plants utilities and dietary analyses were shallow and addressed only an insignificant portion of the country (Ermias *et al.*, 2011).

Therefore; traditional knowledge of wild plants, generally in Africa and particularly in Ethiopia is endangered of being lost, as habits, value systems, and the natural environment change (Ruffo *et al.*, 2002). This study also reflected that the endangered of Wild edible fruit plants is due to more anthropogenic factors, such as land degradation and grazing, clearing of forest for Agriculture, fire, timber and charcoal, Stem, leaves, root, and bark harvest. These factors might be occurred as a result of care failure knowledge especially among the new generations, modernization, and urban dwellers to preserve Wild edible fruit plants to be valuable for future generations. So it needs to be conserved and maintained through sustainable utilization without jeopardizing it for future generations (Demel *et al.*, 2010).

In general, regardless of their importance, Wild edible fruit plants are faced with serious threats of anthropogenic and environmental factors in the country due to agricultural expansion, overgrazing/overstocking, deforestation, and urbanization (Addis, 2009; Asfaw, 2009; Tilahun and Mirutse (2010). In Ethiopia, where more than 80% of the population is rural, the people have depended on their traditional knowledge of the utility of Wild edible fruit plants with shallow form without exhaustive documentation of their contribution, management, and utilization in their surroundings. This is particularly true in study areas and in the rural population of West Hararghe Zone, where rural communities of the area depend on Wild edible fruit plants for various purposes such as supplementary food, feed during bad times, and income and medicine with barely.

However, there are no any researches so far done, on Wild edible fruit plants in the study area to be as the impetus for policymakers, NGOs, and end users to sustain utilization and management without jeopardizing the future generation. Therefore; the study intended to identify and document Wild edible fruit plants associated with Ethnobotanical knowledge of indigenous

communities on part used, habitat, perception, threat factors, related to utility and management as well as constraint and opportunity potentials as to be input for West Hararghe community and other related areas of the country.

General Objective

- To assess Wild edible fruit plants in the West Hararghe zone, Oromia Region.

Specific objectives

- To identify Wild edible fruit plants in the study area.
- To document scientific information and utilization of commonly used Wild edible fruit plants.
- To know the constraint and opportunity potential of Wild edible fruit plants in combating food insecurity for rural communities.

2. Material and Methods

2.1 Selection of the study area

Before the socio-economic survey, all Weredas' of the Zone which have the potential on growing edible fruit trees and shrub species could be identified. Based on the information gathered, three potential Weredas from each agroecology zones could be selected. From three selected Weredas (Daro-Lebu, Chiro, and Gumbi-Bordode), from each Wereda, two PAs were selected (Fig. 1). A total of six kebele (Metegudesa and Jilbo PA from Daro-Lebu Wereda, Halewagora, and Nejabas PA from Chiro Wereda and Burqaberkele and Legarba PA from Gumbi-Bordode Wereda could be selected and used for the socio-economic survey.

2.2 Description of the study areas

All The study was carried out in the west Hararghe zone, at three Weredas (Namely Daro-Lebu, Chiro, and Gumbi-Bordode). From each of the selected Weredas; 2 PAs and over 6 PAs were selected to obtain all necessary information about edible fruit tree and shrub species of the study areas.

Daro-Lebu Wereda is one of Wereda of West Hararghe zone in Oromia Regional State. It is located at 80 15'00" N-80 43'00" N latitudes and 400 17'00" E- 400 45'00" E longitudes. The Wereda is bordered by Habro in the northeast, East Arsi Zone, in the south-west, Hawi Gudina Wereda, in the north, Anchar Wereda, in the north, and Boke Wereda in the east. Daro-Lebu Wereda located at a distance of 118km and 478km from the Zonal town is Chiro and Addis Ababa; respectively. The average altitude is (1147-2300 m.a.s.l.).

The basic agro-climatic conditions are Weyina-dega (44%) and Kola (56%). Mechara Agricultural Research Center receives on average during the belg rainy season (February 26, March 90, April 157, and May 128mm) and the kiremt rainy season (June 101, July 144, August 158, and September 127mm). The mean annual temperature is 21°C with a mean annual minimum temperature of 15°C and a maximum of 28°C Mechara Agricultural Research Center. The farming system of Daro-Lebu Wereda is mixed farming. The main types of crops grown were Cash and cereal crops such as chat, coffee and teff, barley, maize, sorghum, etc. respectively.

Daro-Lebu had rapid population changes which demanded expanding of agricultural land, fuel wood consumption, and residential area. The

woreda had a total human population of 364613 of which 186097 (51.04%) are male and 178514.04 (48.96%) are female. Out of the total population, 13.56 % are urban dwellers. Population density is 82.53 persons per square kilometer and had a total area of 441788.7 hectares (4417.95/km^2). The land use pattern of Wereda that cultivable land 86.8 %, pasture (1.8%), forest (4.14%), and remaining (7.26%) is considered mountainous and swampy.

Chiro Wereda is located in the West Hararghe Zone of the Oromia National Regional state at about 324 km East of Finfinne, the capital city of the Oromia regional state. The capital town of the Wereda is Chiro, which is also the capital town of the Zone. Normally the Wereda is divided into three major agro-ecological zones. These are Lowland with 22 kebele, Midland with 13 kebele, and highland altitude with 4 kebele. The Wereda bordered Mieso in the North, Gemechis in the South, Guba-koricha in the West, and Tulo in the East. Mixed farming is the dominant practice in the Wereda (98%) and the rest is of the pastoral production system (2%).

The Wereda is founded at an average altitude between (1100-2500 m.a.s.l.). From the total land area/topography of the Wereda, 45% is plain and 55% is a steep slope. The Wereda is mainly characterized by steep slopes and mountains with rugged topography, which is highly vulnerable to erosion problems.

The Wereda has a maximum and minimum temperature of 23 ^{o}C and 12 ^{o}C respectively and maximum and minimum rainfall of 1800 mm and 900 mm respectively. The rainfall type is bimodal and erratic. The main rainy season is from June to September for the highland and midland areas and from March to April for the lowland. The short rainy season is from March to May for the highland and midland and for the lowland around July. The amount of rainfall is relatively adequate in the highland and midland than in the lowland.

Soil types of Wereda are sandy soil, clay soil (black soil), and loamy soil types that are 25.5%, 32%, and 42.5%; respectively according to 2003 E.C. data from the Office of Agriculture and Rural Development. The soil types vary with the topography mainly black soils are observed in the highland and midlands, while one can see red soil in the lowland areas. The total land area of the Wereda is 70,912.8 hectares out of which 31659.1 hectares is cultivated land, 30667.4 hectares is uncultivated land, 8104.3 hectares is covered by forest, and 482 hectares is grazing land. Shortage of land is common in the Wereda. Among the main reasons is the increasing population density at a very alarming rate and land fragmentation due to the high number of children in the household. The average land holding status in the area is 4 (0.5-0.25 ha)

Gumbi-Bordode Wereda is found in the West Hararghe Zone of the Oromia National Regional state at about 300 km East of Finfinne, the capital city of Oromia regional state, and at the longitude, 09^o 13’ 05.2” North and 040^o 45’ 27.7” East. The capital town of distract is Bordode, which is located at 65 km North of Chiro, the capital town of the zone. The Wereda has only one major agro-ecological zone which is lowland. In the Wereda more of the farming community is agro-pastoralist covering 98% and 2% is pastoral community.

The Wereda is founded at an average altitude of 1310 m.a.s.l. Almost about 95% of the Wereda has plain topography (data from the Office of Agriculture).

The Wereda has a maximum and minimum temperature of 28 ºC and 16 ºC respectively and maximum and minimum rainfall of 750 mm and 500 mm respectively (data from Office of Pastoral and Agro-pastoral Development of the Wereda). The rainfall type is mono-modal and erratic. The main rainy season is from mid-June to mid-August and the amount of rainfall is inadequate.

In the Wereda there are sandy soil, clay soil (black soil), and loamy soil types covering 10%, 75%, and 15%; respectively that data from the Office of Agriculture and Rural Development.

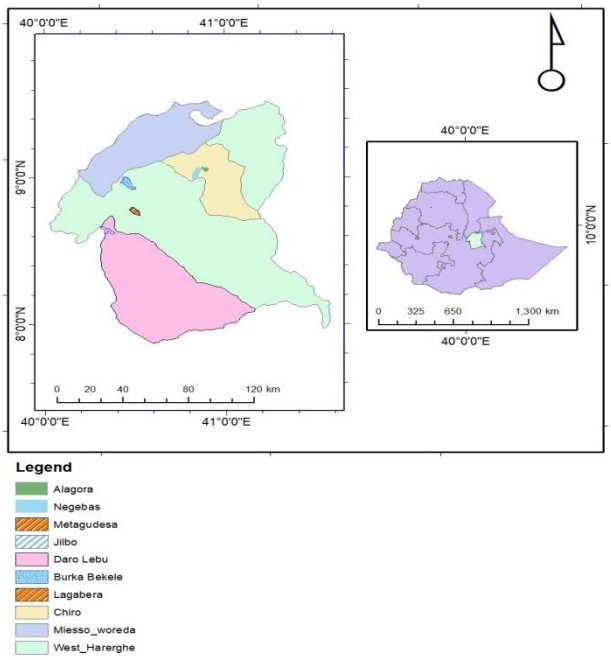

Fig. 1: Study area Map

2.3 Method of data collection

Socio-economy survey

The socioeconomic survey involved various data collection techniques, such as key informant interviews, semi-structured questionnaires, focus-group discussions, and field observations. Semi-structured interviews were used with 120 respondent households that were randomly selected from 3 selected Weredas of the zone. From each of the selected Weredas; 2 PAs were selected to obtain all necessary information about Wild edible fruit plants of the study areas. This is an effective method that can even be used with children or illiterate people. All sampled households were asked independently the same question to freely name orally all the Wild edible fruit plants they know as it comes into their memory. During the survey took place; different socio-economic factors (age, household size, sex, education, *etc*) of the respondents were identified. In addition to the household interviews, important information was collected from key informants. These key informants were those living in the study area for a long time and who have a good understanding of Wild edible fruit plants

The collected data were providing an overview of the socio-economic and biophysical environment of the study areas. As well, field visits and vegetation inventory was applied at each of the study areas/Kebele along the border of the natural forest near the study area to cross-check the reality and to observe the potential of all wild edible fruit plants for more information.

By using the above various data collection techniques, necessary data were collected to know indigenous knowledge of rural communities on utilization, role in food security, opportunity, constraints, perception, and factors of the threat of wild edible fruit plants of the study area.

Vegetation inventory

Inventories on vegetation coverage of wild edible fruit plants of the study area were carried out, to obtain information on the type, trend, and production potential based on their existence and

retrieval of sapling and seedling regeneration. The inventory was produced that 'shrub' used to describe woody perennial plants that remain low and produce multiple shoots from the base, while 'trees' refers to woody perennial plants that produce one main trunk or bole and a more or less distinct and elevated crown.

Inventories on vegetation coverage of wild fruit plants in the study area were conducted by systematic transect sampling. Two agroecology zones (midland and lowland) in each of the study areas, with 3 parallel lines, 200 m apart between each transect line and with an interval of 200m distance were laid. On each transect line, 20×20 m (400 m^2) quadrants were implemented. Therefore; in this study 18 transect lines and 60 quadrants were laid out over all the study areas. On each plot/quadrant, all Wild edible fruit plants were documented by their vernacular name, later converted to the scientific name using a tree identification manual. The density of Wild edible fruit plants on each plot/quadrant was expressed by counting stems and converting the number to a per hectare basis that over all of the study area coverage was about (2.4 ha). Data on the estimated quantity of edible fruit plants' products expected from each tree/shrub were collected by interviewing the collectors. The number of edible parts expected from each plant species of a certain size class could be estimated by asking the same question of several collectors. Following this method, in this study, 12 collectors participated from both agroecology zone, to obtain the real identification of edible parts of the various trees and shrubs on each plot.

2.4 Data analysis

The collected data were analyzed employing descriptive statistics, with Microsoft Excel and SPSS (Statistical Package for Social Sciences, version 16) to meet the objectives based on the given parameters.

3. Results and Discussion

3.1 Characteristics of Sample Household

Because of the country's cultural significance, men constituted the majority of the respondents in this study. Thus, 120 (91=76%) of the total responses were male, while the remaining (29=24%) were female. The survey result showed that the highest percentage of the respondents' age was found between 31-45 years (53%); while the lowest percentage was 66-70 years (5%) (Table 1). This indicated that the respondents were at a mature, adult age stage for data quality. The survey result showed that only 48% of the respondents were educated, while 52% were uneducated. The result of the household size of respondents indicated that the highest household size was 2-4 (59%); while the lowest household size was 10-12 (12%). The result of the agro-ecological zone of the study areas observed that (67%) was midland, while (33%) was lowland coverage.

The other main point is the result of farmland size showed that the highest percentage of farmland size was 0.13 ha (37%); while the lowest percentage was 2.5 ha (7%). This indicated that farmers suffered from farmland shortage.

Generally; socio-economic scenarios have an indirect impact on wild edible fruits neither managing nor destroying. For example; according to the respondents' responses; during the bad time, Wild edible fruit plants were eaten as food and feed. On the other hand; as a result of farmland

shortage; there is the distraction of Wild edible fruit plants for agricultural expansion.

Table 1: Socio-economics of respondents' information

Sex		Frequency	Percent
- Men		91	76
- Women		29	24
	Total	120	100
Age			
- 18-30		22	18
- 31-45		64	53
- 46-65		28	23
- 66-70		6	5
	Total	120	100
Educational status			
- Non-educated		62	52
- Primary school		56	46
- Secondary school		2	2
	Total	120	100
Average land holding (ha)			
0.025 ha		28	23
0.125 ha		11	9
0.13 ha		44	37
0.25 ha		11	9
0.5 ha		13	11
1 ha		8	7
2.5 ha		5	4
	Total	120	100
Agroecology zone			
- Mid-land		80	67
- Low-land		40	33
	Total	120	100
Household size			
10-12		14	12
7-9		35	29
2-6		71	59
	Total	120	100

3.2 Qualitative description of respondents on wild edible fruit plants

The respondents were asked crosscheck questions that were listed in (Table 2) below. The respondents were gotten from different sources those are from natural forests, river banks, farm boundaries, and postural lands.

The result of wild edible fruit plants observed that the highest percentage source of Wild edible fruit plants was collected from the natural forest (34.2%); while the lowest source was collected from postural lands (9.2%).

The infusing factors of wild edible fruit plants utilization were listed by respondents. The result of infusing factors of wild edible fruits indicated that the highest percentage (23.4%) was observed from supplementary food, feed, and income; while the lowest percentage (10%) was observed from Tradition and hunger of children during keeping of livestock (Table 2). This study in agreement with the other findings elsewhere indicates the supplemental role of wild edible fruit plants needed during food gaps and famine (Abera, 2022).

The role of wild edible fruit plants in ecological and environmental values indicated that the highest value (35.1%) was observed from maintaining weather conditions and sustaining ecological balance, while the lowest value (16.6%) was recorded from attracting rainfall and making a green environment (Table 2).

The result of opportunities in utilizing wild edible fruit plants indicated that the highest value (67.7%) was observed under the ability to grow naturally; while the lowest value (2%) was under income opportunity (Table 2).

The result of the limitation of wild edible fruit plants indicated that the highest value (37%) was observed deforestation and overgrazing; the lowest observation (8%) was obtained from

"Some of them have invasiveness manner" (Table 2).

The result of the trend of wild edible fruit plant production over the last 10 years observed that the highest value (90.8) was recorded as "decreasing"; while the lowest value (1.7) was observed as a "no change" alternative (Table 2).

The result on the perception of respondents in

Table 2: Qualitative description of respondents about wild edible fruits across the study areas

1	Source of Wild edible fruit plants	Frequency	Percent
	- Natural forests	50	34.2
	- Around river area	33	27.5
	- Around farm boundary	26	21.7
	- On pasture land	11	9.2
	Total	120	100
2	Influencing factors to use Wild edible fruit plants		
	- It is sweaty, Medicinal, and has no side effect	13	11.7
	- Supplementary food, feed& income	26	23.4
	- Supplementary food, feed& income during hanger	25	22.5
	- Tradition and hunger of children during keeping livestock	12	10.8
	Total	76	100
3	Role of Wild edible fruit plants in ecological and environmental values		
	- Attract rainfall and make a green environment	19	16.6
	- Improve soil and water conservation	34	28.3
	- Maintain climate change	24	20.0
	- Maintain weather conditions and sustain ecological balance	32	35.1
	Total	120	100
4	Opportunities in utilizing Wild edible fruit plants		
	- Ability to grow naturally	65	67.7
	- Income opportunity	2	2.0
	- Self-distribution	29	30.2
	Total	96	100
5	Constraints in utilizing Wild edible fruit plants		
	- Climate change	13	11
	- Deforestation and overgrazing	44	37
	- Some of them have an invasiveness manner	9	8
	- Lack of enough information	14	12
	- Agricultural expansion	40	33
	Total	120	100
6	The trend of Wild edible fruit plants production over the last 10 years		
	- Increasing	9	7.5
	- Decreasing	109	90.8
	- No change	2	1.7
	Total	120	1
7	Perception of respondents in utilizing Wild edible fruit plants		
	- All people should conserve those trees/shrubs	36	30.0
	- Have to be protected and sustained for future	34	28.3
	- Seedlings have to be planted on farms and reduce deforestation	50	41.7
	Total	120	10

utilizing wild edible fruit plants indicated that the highest value (41.7) was observed in "Seedlings have to be planted on farms and reduce deforestation"; while the lowest value (28.3%) was observed under "protected and sustained for future" (Table 2).

Some farmers are practiced limited management actions (growing in farms and homesteads). This is an indication of the community understands the value and brings under control wild edible fruit plants However, the management practices are limited compared to other staple food plants. Moreover, Wild edible fruit plants gathered in natural environments without care of the management and exposed to anthropogenic threats, which are deterioration of forest products, being choice/alternative food, cultural ignorance and lack of awareness about the nutritional value of the products could make them being ignored for management. This study in line with Fentahun and Hager (2008) reports a lower level of management for wild edible fruit plants (Tebkew et *al.,* 2014).

3.3 Diversity of wild edible fruit plants across the study area

The study revealed that about 55 wild edible fruit tree/shrub species were identified and documented based on important parameters. The results of the habit of wild edible fruit plants were highly dominated by shrub species and followed by tree species, and the remaining were herbaceous. Species richness observation of wild edible fruit plants in the study areas was poor based on the Shannon diversity index (0.01): A total of 55 wild edible plant species were recorded in 3 Weredas on 6 PAs (Table 3).

In Daro-Lebu Wereda at Jilbo PA; observation of wild fruit plants showed that the highest percentage (11.8, 8.5 and 7.8%) were recorded under *Mimusops kummel, Psidium guajava,* and *Vangueiria arisepala*, respectively; while the lowest percentage (0.7%) was under *Myrica salicifolia.Rich, Capparis decidua, Rubus apetalusPoir., Acokanthera schimperi, Rhus glutinosa* and *Acokanthera schimperi* with similar figures (Table 3). In Metagudesa PA; observation of wild fruit plants indicated that the highest percentage (15.9, 13.5, 13.5, and 12.7) were verified under *Mimusops kummel, Rosa abyssincia, Psidium guajava*, and *Syzygium guineense*; respectively; while the lowest percentage (0.8%) was under *Tamarindus indica, Myrica salicifolia.Rich* and *Rubus apetalus* with similar figures (Table 3).

In the other study area in Chiro Wereda at Halewagora PA; observation of Wild edible fruit plants indicated that the highest percentage (12.7, 12, and 11.7%) were under *Oncoba spinosa Forssk., Acacia seyal Del.* and *Carissa spinarum* L., respectively; while the lowest percentage (0.7%) was under *Cordia africana, Mimusops kummel, Rytigynia neglecta, Physalis micrantha, Myrica salicifolia.Rich* and *Piper nigrum* with similar figures (Table 3). In Nejabas PA; observation of wild fruit plants indicated that the highest percentage (11.4, 7.9 and 7.1) were under *Carissa spinarum* L. and *Acacia seyal Del., Oncoba spinosa Forssk* and *Rubus apetalus Poir.*; respectively; while the lowest percentage (0.7%) was under *Myrica salicifolia. Rich, Celosia anthelminthica, Rhus natalensis Krauss, Rhoicissus tridentata,* and *Albizia grandibracteata* with similar figures (Table 3).

In the other study area in Gumbi-Bordode Wereda at Burqabarkele PA; observation of Wild edible fruit plants indicated that the highest

Table 3: Observation frequency of wild edible fruit plants by study areas

Sl. No.	Scientific name	Family name	*Gumbi-Bordode Wereda*				Chiro Wereda				Daro-Lebu Wereda				Total
			Burqabarkele PA		Legarba PA		Halewagora PA		Nejabas PA		Jilbo PA		Metagudesa PA		
			F	%	F	%	F	%	F	%	F	%	F	%	
1	*Puntia ficus-indica*	*Cactaceae*			4	1.8									4
2	*Carissa spinarum L.*	*Apocynaceae*	11	5.6	15	6.6	16	11.3	16	11.4	6	3.9	7	5.6	71
3	*Hypoestes aristata*	*Acanthaceae*	9	4.6											9
4	*flavescens*	*Tiliaceae*											1	0.8	1
5	*Piper nigrum*	*Piperaceae*					1	0.7	1	0.7					2
6	*Balanites aegyptiaca*	*Balantiaceae*	2	1.0											2
7	*Toddalia asiatica*	*Rutaceae*									1	0.7			1
8	*Portulaca quadrifida.*	*Portulacaceae*									3	2.0	3	2.4	6
9	*Myrica salicifolia.Rich*	*Loganiaceae*	3	1.5	7	3.1	1	0.7	1	0.7	1	0.7	1	0.8	14
10	*Physalis micrantha*	*Solanaceae*					1	0.7							1
11	*Vangueiria arisepala*	*Rubiaceae*					10	7.0	7	5.0	12	7.8	6	4.8	35
12	*Celosia anthelminthica.*	*Amaranthaceae*	1	0.5	14	6.1			1	0.7	2	1.3			18
13	*Rhus natalensis Krauss*	*Anacardiacea*	5	2.6	17	7.5	2	1.4	1	0.7					25
14	*Rhoicissus tridentate*	*Vitaceae.*	1	0.5					1	0.7					2
15	*Grewia tenax (Forssk.)*	*Tiliaceae*	12	6.2	14	6.1									26
16	*Salvadora persica*	*Salvadoraceae*	1	0.5	1	0.4									2
17	*Annona reticulata L.*	*Annonaceae*									1	0.7			1
18	*Syzygium guineense*	*Myrtaceae*	2	1.0	1	0.4					17	11.1	16	12.7	36
19	*Capparis decidua*	*Capparidaceae*									1	0.7			1
20	*Rosa abyssincia*	*Rosaceae*	4	2.1	5	2.2	11	7.7	9	6.4	13	8.5	17	13.5	59
21	*Rubus apetalus Poir.*	*Rosaceae*			1	0.4	3	2.1	10	7.1	1	0.7	1	0.8	16
22	*Momordica foetida*	*Cucurbitaceae*									1	0.7			1
23	*Albizia grandibracteata*	*Leguminosae-*							1	0.7					1
24	*Phoenix reclinata Jacq*	*Arecaceae*	4	2.1											4
25	*Capsicum chinense*	*Solanaceae*							3	2.1					3
26	*Ficus sur (F. Capensis)*	*Moraceae*							4	2.9					4
27	*Grewia bicolour*	*Tiliacea*	6	3.1	1	0.4									7

Continued..

Sl. No.	Scientific name	Family name	*Gumbi-Bordode Wereda*				Chiro Wereda				Daro-Lebu Wereda				Total
			Burqabarkele PA		Legarba PA		Halewagora PA		Nejabas PA		Jilbo PA		Metagudesa PA		
			F	%	F	%	F	%	F	%	F	%	F	%	
28	*Ficus sycomorus*	*Anacardiacea*	18	9.2	16	7.0					10	6.5	3	2.4	47
29	*Boscia salicifolia*	*Capparidaceae*	3	1.5											3
30	*Berchemia discolor*	*Rhamnaceae*	5	2.6											5
31	*Oncoba spinosa Forssk*	*Flacourtiaceae*			4	1.8	3	2.1	1	0.7	5	3.3	3	2.4	16
32	*Dovyalis abyssinica*	*Flacourtiacea*											2	1.6	2
33	*Cordia sinensis Lam*	*Boraginaceae*	8	4.1	17	7.5									25
34	*Meriandra benegalensis*	*Verbenaceae*			4	1.8									4
35	*Lex mitis*	*Ebenaceae*	1	0.5	5	2.2	6	4.2	2	1.4	2	1.3	2	1.6	18
36	*Rytigynia neglecta*	*Rubiaceae*					1	0.7							1
37	*Grewia schweinfurthii*	*Tiliaceae*	4	2.1							1	0.7			5
38	*Grewia ferruginea*	*Tiliaceae*	7	3.6	3	1.3					1	0.7			11
39	*Mimusops kummel*	*Sapotaceae*	13	6.7	20	8.8	1	0.7	6	4.3	18	11.8	20	15.9	78
40	*Myrsine africana L.*	*Myrsinaceae*			1	0.4									1
41	*Embelia schimperi*	*Myrsinaceae*					14	9.9	9	6.4	3	2.0			26
42	*Acokanthera schimperi*	*Sterculiaceae*	2	1.0			3	2.1			1	0.7			6
43	*Euclea racemosa*	*Ebenaceae*	1	0.5	1	0.5			1	0.7	1	0.7	8	6.3	12
44	*Ziziphus spina-*	*Rhamnaceae.*	16	8.2	15	6.6									31
45	*Tamarindus indica*	*Fabaceae*	3	1.5	5	2.2			2	1.4	3	2.0	1	0.8	14
46	*Oncoba spinosa Forssk.*	*Flacourtiaceae*	1	0.5	1	0.4	18	12.7	11	7.9	6	3.9	9	7.1	46
47	*Acacia senegal (L.)*	*Fabaceae*	3	1.5											3
48	*Rhus glutinosa*	*Anacardiaceae*									1	0.7			1
49	*Combretum molle*	*Combretaceae*	19	9.7	13	5.7	13	9.2	6	4.3	9	5.9	4	3.2	64
50	*Osyris quadripartita*	*Santalaceae*					2	1.4							2
51	*Cordia Africana*	*Boraginaceae*	2	1.0	1	0.4	17	12.0	16	11.4					36
52	*Acacia seyal Del.*	*Fabaceae*	3	1.5	7	3.1	1	0.7	4	2.9	3	2.0			18
53	*Allophylus abyssinicus*	*Anacardiacea*	1	0.5	2	0.9	3	2.1	7	5.0	11	7.2	3	2.4	27
54	*Acacaia seyal del.***	*Fabaceae*	10	5.1											10
55	*Psidium guajava*	*Myrtaceae)*	12	6.2	20	8.8	14	9.9	18	12.9	18	11.8	17	13.5	99
		Total	195	100	228	100	142	100	140	100	153	100	126	100	984

F= Frequency, % = Percent, PA = Peasant Association

percentage (9.7, 9.2, and 8.2%) were noted under *Opuntia ficus-indica/cactus, Ficus sycomorus* and *Ziziphus spina-*, respectively; while the lowest percentage (0.5%) was under *Lex mitis*, *Oncoba spinosa Forssk*., *Combretum molle* and *Allophylus abyssinicus* with similar figure (Table 3). In Legarba PA; observation of wild fruits indicated that the highest percentage (8.8, 77.5.9, and 7) were illustrated under *Mimusops kummel*, *Psidium guajava*, *Cordia sinensis Lam* and *Rhus natalensis Krauss*, *Ficus sycomorus*; respectively; while the lowest percentage (0.4%) was under *Acacia seyal Del.*, *Oncoba spinosa Forssk. Euclea racemosa*, *Grewia bicolour*, *Rubus apetalus*, *Syzygium guineense* and *Physalis micrantha Link* with similar figures (Table 3).

3.4 Operational description of wild edible fruit plants on adaptation, part used, habitat, mode of use, flowering and fruiting months

The respondents were asked crosscheck questions that were listed in (Table 4) below. The respondents answered the questionnaires about wild edible fruits about habituate, part used habitat, mode of use, flowering, and fruiting months. In these processes; the adaptation result of wild fruits showed that the highest percentage (72%) was found from wild habituation; while the lowest percentage (16%) was from both wild /domestic habituation.

In terms of part used of the wild fruits revealed that the highest percentage (98.2%) of part used was got from the fruit and this result coincides with Adal *et al.* (2004), their study findings in a different part of Ethiopia reported that most of the Wild edible fruit plants' parts used were fruits; while the lowest percentage (1.8%) was got from /leaf/bark/root (Table 4). This study is in line with the work of Adal *et al.*, 2004 that fruit uses accounted for 80% of wild edible food.

Table 4: Structural descriptions of wild edible fruits in percent on habituate, part used, habitat, mode of use, flowering months, and fruiting months.

Adaptation of the species	Frequency	Percent
- Wild	46	72.0
- Wild / Domestic	9	16.1
Total	55	100.0
Part of the species used		
- Fruit	55	98.2
- Fruit/Leaf/Bark/ Root	1	1.8
Total	56	100.0
Habitat of the species		
- Herb	2	3.6
- Shrubs	41	73.2
- Tree	13	23.2
Total	56	100.0
Mode of uses		
- as it is	54	96.4
- as it is/cooked	2	3.6
Total	56	100.0
Flowering Months		
- April and July	20	35.7
- April and May	7	12.5
- February	1	1.8
- February & April	2	3.6
- January	3	5.4
- January & February	2	3.6
- June	4	7.1
- March	2	3.6
- May	15	26.8
Total	56	100.0
Fruiting month		
October & November	8	21.1
June	6	15.8
April	4	10.5
February	4	10.5
January	4	10.5
July	4	10.5
March	4	10.5
May	4	10.5
Total	38	100.0

But, this is contrasted with the finding of Tilahun, and Mirutse (2010) studied in southern Ethiopia, that most Wild edible fruit plants were used as vegetables by harvesting their leaves, young twigs, and upper parts (leaf and stem). The other disagreement finding of this study reported by (Ali *et al*., 2008) was that most of the edible plant parts were leaves that were consumed after cooking.

The result on the habitat of wild edible fruit species observed that the highest percentage (73.2%) was indicated from shrubs species; while the lowest percentage (3.6%) was got from herb species (Table 4). This study is in line with (Ameni *et al*., 2003; Balemie *et al*., 2004) that the most harvested wild edible fruits were recorded from shrubs than other categories.

The result on the mode of use of wild edible fruit plants indicated that the highest percentage (96.4%) was used fresh; while the lowest percentage (3.6%) was gotten undercooked (Table 4). This study agrees with the findings of Kebu and Fasil (2006), who reported that raw fruits contain the largest percentage of raw edible fruits.

Table 5a: Observation of species and Sapling trends of a given tees/shrubs in Daro-Lebu Wereda, from 3 transect lines and 12 quadrants in both PA

Observation of species			Sapling trends of a given tees/shrubs in *Metagudisa PA*, from 3 transect lines and 12 quadrants			
Scientific name	Frequency	Percent	Scientific name	Number of sampled trees/shrubs	Total	Percent (%)
Psidium guajava	12	30.8	*Psidium guajava*	59	95	62.1
Carissa spinarum L.	6	15.4	*Rosa abyssincia*	47	84	56.0
Oncoba spinosa Forssk.	6	15.4	*Oncoba spinosa Forssk.*	49	89	55.1
Allophylus abyssinicus	5	12.8	*Allophylus abyssinicus*	32	63	50.8
Mimusops kummel	4	10.3	*Carissa spinarum* L.	8	19	42.1
Syzygium guineense	3	7.7	*Mimusops kummel*	1	12	8.3
Vangueiria arisepala	2	5.1	Number of transacts = 3			
Total	39	100	Number of quadrants = 12			

Observation of species			Sapling trends of a given tees/shrubs *Jilbo PA*, from 3 transect lines and 11 quadrants			
Scientific name	Frequency	Percent	Scientific name	Number sampled trees/shrubs	Total	Percent (%)
Rosa abyssinica	11	26.2	*Psidium guajava*	59	95	62.1
Psidium guajava	8	19.0	*Carissa spinarum* L.	9	15	60.0
Oncoba spinosa Forssk.	7	16.7	*Rosa abyssincia*	47	84	56.0
Allophylus abyssinicus	7	16.7	*Oncoba spinosa*	49	89	55.1
Mimusops kummel	6	14.3	*Allophylus abyssinicus*	32	63	50.8
Carissa spinarum L.	2	4.8	*Mimusops kummel*	1	12	8.3
Total	42	100	Number of transacts = 3			
			Number of quadrants = 11			

Raw edible fruits might be a good source of nutrients that does not lose their nutrients fresh; while boiled or cooked, some essential nutrients might be lost. The other results on flowering and fruiting months of wild edible fruits observed that the highest percentage (35.7% and 14.4%) months were April and July, and October and November, respectively; while the lowest percentage (1.8% and 7.1%) months were flowered in February, September, July, February, and April, respectively (Table 4).

In the parameters, in which wild edible fruit plants correlated and related with adaptation, part used, habitat, mode of use, flowering, and fruiting months were well stated and counted in (Appendix Table 1).

3.5 Regeneration trend and species diversity of wild edible fruit plants in the study areas

In Daro-Lebu Wereda at Metegudesa PA, the surveillance of Wild edible fruit plants revealed that the highest percentage (30.8%) occurred under *Psidium guajava* species; while the lowest percentage (5.1%) was under *Vangueiria arisepala* species (Table 5a). On the other hand; an indicator of regeneration trend results with saplings and seedlings of wild edible fruits revealed that the highest percentage (62.1%) occurred under *Psidium guajava* species; while the lowest percentage (8.3%) occurred under *Mimusops kummel*, species (Table 5a). At Jilbo PA; in Daro-Lebu Wereda likewise; the results on observation of Wild edible fruit plants revealed that the highest percentage (26.2%) occurred under *Rosa abyssinica* species; while the lowest percentage (4.8%) occurred under *Carissa spinarum* L. species (Table 5a). Similarly; an indicator of regeneration trend results with saplings and seedlings of wild edible fruits revealed that the highest percentage (62.1%) occurred under *Psidium guajava* species; while the lowest percentage (8.3%) occurred under *Mimusops kummel*, species (Table 5a).

In Chiro Wereda at Nejabas PA; the results of observation of Wild edible fruit plants revealed that the highest percentage (24.3%) has occurred under *Carissa spinarum* L*;* while the lowest percentage (2.7%) happened under *Cactaceae* species (Table 5b). On the contrary; the indicator of regeneration trend results with saplings and seedlings of wild edible fruits revealed that the highest percentage (43.8%) was observed under *Carissa spinarum* L. species; while the lowest percentage (16.7%) occurred under *Acacia seyal del*. species. On the other hand; the species that hadn't any indicator of regeneration trend results with saplings and seedlings of wild edible fruits trees/shrubs were occurred under *Opuntia ficus-indica/cactus, Allophylus abyssinicus* and *Myrica salicifolia.Rich* species (Table 5b).

Whereas at Halewagora PA; in Chiro Wereda the same as other study areas; the results on observation of wild edible fruit plants discovered that the highest percentage (18.8%) was observed under *Carissa spinarum* L. species; while the lowest percentage (4.2%) occurred under *Oncoba spinosa Forssk.* and *Rhus natalensis Krauss* species (Table 5b). Similarly; an indicator of regeneration trend results with saplings and seedlings of wild edible fruit plants revealed that the highest percentage (57.9%) was observed under *Carissa spinarum* L. species; while the lowest percentage (37.5%) was observed under *Rhus natalensis Krauss* species (Table 5b). Likewise; the species that hadn't any indicator of regeneration trend results with saplings and

seedlings of wild edible fruits plant was observed under *Opuntia ficus-indica/cuctus* species (Table 5b).

In Gumbi-Bordode Wereda, at Legarba PA; the results of observation of wild edible fruit plants revealed that the highest percentage (14.6%) has occurred under *Rhus natalensis Krauss* and *Lex mitis* species; while the lowest percentage (2.4%) was observed under *Toddalia asiatica*, *Syzygium guineense* and *Euclea racemosa* species (Table 5c). On the contrary; the indicator of regeneration trend results with saplings and seedlings of wild edible fruit plants revealed that the highest percentage (57.1%) occurred under *Acokanthera schimperi* species; while the lowest percentage

Table 5b: Observation of species and sapling trends of a given tees/shrubs in Chiro Wereda, from 3 transect lines and 9 quadrants in both PA

Observation of species			Sapling trends of a given tees/shrubs in *Nejabas PA*, from 3 transect lines and 9 quadrants			
Scientific name	Frequency	Percent (%)	Scientific name	Number sampled trees/shrubs	Total	Percent (%)
Carissa spinarum L.	9	24.3	*Carissa spinarum L*	16	58	27.6
Lex mitis	7	18.9	Cactaceae	0	8	0.0
Cactaceae	5	13.5	*Embelia schimperi*	14	32	43.8
Acacia seyal Del.	4	10.8	*Acacia seyal Del.*	2	12	16.7
Euphorbia abyssinica / cuctus	3	8.1	*Lex mitis*	19	54	35.2
Allophylus abyssinicus	2	5.4	*Oncoba spinosa Forssk.*	1	4	25.0
Myrica salicifolia	1	2.7	*Allophylus abyssinicus*	0	3	0.0
Myrsine africana L.	1	2.7	*Myrsine africana* L.	4	10	40.0
Oncoba spinosa Forssk.	1	2.7	*Myrica salicifolia*	0	2	0.0
Total	37	100	Number of transacts = 3 Number of quadrants = 9			

Observation of species			Sapling trends of a given tees/shrubs in shrubs in, *Halewagora PA*, from 3 transect lines and 9 quadrants			
Scientific name	Frequency	Percent (%)	Scientific name	Number sampled trees/shrubs	Total	Percent (%)
Carissa spinarum L.	9	18.8	*Carissa spinarum* L.	66	114	57.9
Rhus natalensis Krauss	7	14.6	*Embelia schimperi*	83	147	56.5
Rosa abyssincia	2	4.2	*Lex mitis*	51	101	50.5
Lex mitis	6	12.5	*Acokanthera schimperi*	8	16	50.0
Embelia schimperi	6	12.5	*Rosa abyssincia*	7	15	46.7
Acokanthera schimperi	4	8.3	*Allophylus abyssinicus*	5	12	41.7
Oncoba spinosa Forssk	2	4.2	*Acacia seyal Del.*	11	29	37.9
Cactaceae	3	6.3	*Rhus natalensis Krauss*	9	24	37.5
Acacia seyal Del.	5	10.4	*Cactaceae*	0	14	0.0
Allophylus abyssinicus	3	6.3	Number of transacts = 3 Number of quadrants = 9			
Total	48	100				

(8.3%) occurred under *Mimusops kummel,* species (Table 5c).

Whereas at Burqabarkele PA; in Gumbi-Bordode Wereda similarly; the results on observation of wild edible fruit plants discovered that the highest percentage (18%) occurred under *Grewia tenax*

Table 5c: Observation of species and sapling trends of a given tees/shrubs in Gumbi-Bordode Wereda, from 3 transect lines and 9 quadrants in Both PA

Observation of species			Sapling trends of a given tees/shrubs in, *Legarba PA* from 3 transect lines and 9 quadrants			
Scientific name	Frequency	Percent	Scientific name	Number sampled trees	Total	Percent
Rhus natalensis Krauss	6	14.6	*Acokanthera schimperi*	4	7	57.1
Lex mitis	6	14.6	*Celosia anthelminthica.*	9	17	52.9
Carissa spinarum L.	4	9.8	*Rhus natalensis Krauss*	25	49	51.0
Mimusops kummel	4	9.8	*Grewia tenax (Forssk.)*	14	28	50.0
Acokanthera schimperi	4	9.8	*Lex mitis*	18	36	50.0
Grewia tenax (Forssk.)	3	7.3	*Myrica salicifolia.Rich*	17	41	41.5
Grewia bicolour	3	7.3	*Rhus natalensis Krauss*	2	5	40.0
Myrica salicifolia.Rich	2	4.9	*Vangueiria arisepala*	2	5	40.0
Vangueiria arisepala	2	4.9	*Grewia bicolour*	8	20	40.0
Celosia anthelminthica.	2	4.9	*Acokanthera schimperi*	7	18	38.9
Oncoba spinosa Forssk.	2	4.9	*Carissa spinarum L.*	11	29	37.9
Toddalia asiatica	1	2.4	*Syzygium guineense*	1	4	25.0
Syzygium guineense	1	2.4	*Mimusops kummel*	1	12	8.3
Euclea racemosa	1	2.4	Number of transacts = 3			
Total	41	100	Number of quadrants = 9			

Observation of species			Sapling trends of a given tees/shrubs *Burqaberkele PA* from 3 transect lines and 9 quadrants			
Scientific name	Frequency	Percent	Scientific name	Number sampled trees	Total	Percent
Grewia tenax (Forssk.)	8	18	*Grewia tenax (Forssk.)*	28	55	50.9
Cactaceae	6	14	*Celosia anthelminthica.*	10	22	45.5
Grewia ferruginea	5	11	*Grewia ferruginea*	11	26	42.3
Grewia schweinfurthii	4	9	*Grewia schweinfurthii*	8	19	42.1
Euclea racemosa	4	9	*Boscia salicifolia*	5	12	41.7
Celosia anthelminthica.	3	7	*Grewia bicolour*	7	17	41.2
Grewia bicolour	3	7	*Mimusops kummel*	3	13	23.1
Ficus sycomorus	3	7	*Balanites aegyptiaca*	1	5	20.0
Boscia salicifolia	3	7	*Euclea racemosa*	3	23	13.0
Mimusops kummel	3	7	*Ficus sycomorus*	0	4	0.0
Balanites aegyptiaca	2	5	*Cactaceae*	0	33	0.0
Total	44	100	Number of transacts = 3			
			Number of quadrants = 10			

species; while the lowest percentage (5%) resulted under *Balanites aegyptiaca* species (Table 5c). likewise; an indicator of regeneration trend result with saplings and seedlings of wild edible fruits revealed that the highest percentage (50.9%) occurred under *Grewia tenax* species; while the lowest percentage (13%) resulted under *Euclea racemosa* species (Table 5c). Likewise; the species those hadn't any indicator of regeneration trend result with sapling and seedlings of wild edible fruit plants /shrubs occurred under *Ficus sycomorus* and *Cactaceae* species; respectively (Table 5c).

The absence of seedlings and saplings under any wild edible plant species in its habitat is an indicator of the regeneration problem. However, this scenario might be occurred due to different factors. Relevant biotic factors can be human activities, grazing, deforestation dispersal agents, and competition. Nevertheless, the exact points of factors of threat for wild edible fruit plants in the study area are well stated in the following portion and in (Appendix 1-Table 2).

3.6 Major factors of threat for wild edible fruit plants in the study areas

High population pressure, agricultural growth, energy consumption, and inefficient natural resource utilization are the major threats to wild edible fruit plants. So the threat to wild edible fruit plants in the research areas was (land degradation and grazing, forest removal for agriculture, fuel wood, charcoal, and timber, and harvesting of stems, leaves, and bark.

The result on major threats of wild edible fruit plants showed that the highest percentage (45%) was observed with the Clearing of forest for Agriculture; while the lowest percentage (5.70%) was recorded with Stem, leaves, and bark harvest (Table 6 and Appendix 1-Table 2). Furthermore, construction, settlement, and unwise utilization are the common threat to Wild edible fruit plants The result of this study is consistent with the reports of (Tebkew *et al.*, 2014) that high population growth, agricultural land demand, lack of alternative fuel energies and plantations, resource use interest conflict between local communities.

Table 6: Major threats to wild edible fruit plants in the study areas

	Threat factors	Frequency	Percent (%)
1	Land degradation and grazing	414	42.3
2	Clearing of forest for Agriculture	440	45.0
3	Fire, timber, and charcoal	68	6.9
4	Stem, leaves, and bark harvest	56	5.7
	Total	978	100.

Generally; wild edible fruit plants gathered in the natural environments without care of management which is a deterioration of forest products, being unfamiliar food, public ignorance and nonexistence of consciousness may make them violated for exclusive. These scenarios are being exposed to threats of Wild edible fruit plants as a result of the anthropogenic effects. This study in line with (Tebkew *et al*., 2014) reported that a lower level of management and undermine were given for wild edible fruit plants

3.7 Association between socio-economic factors and wild edible fruit plants' parameter

Age correlated positively with household size ($p<0.006$) which is statistically significant, and the other negatively correlated that land hold size with

Table 7: Pearson Correlation between socio-economic factors. (N = 120), Prob > |r| under H0: Rho=0

Correlation with:	Sex	Age	Household size	Land hold size	Education status
Age	-0.006 0.949				
Household size	-0.031 0.740	0.251 0.006			
Land hold size	-0.054 0.56	-0.319 0.004	-0.06 0.514		
Education status	-0.083 0.370	0.079 0.392	-0.198 0.031	-0.02359 0.8033	

Age (p<-0.004), and Education status with household size (p <0.031) which showed statistically significant in (Table 7). A positive correlation indicated that both variables are increased with each other. In this situation, as age ranges rise or drop concurrently, household size increases or decreases (Table 7). On the other hand, a negative correlation indicates that as one variable decreases, the other increases. Therefore; when lands hold size increases; age categories decrease; and when education status increases; household size decreases (Table 7).

Shrubs correlated with fruits; direct uses correlated with trees and shrubs; food correlated with fruit, shrubs, and direct uses; feed correlated with fruit and direct uses; income correlated with fruit and direct uses; pasture correlated with fruit, trees, shrubs, direct uses, food and income; farmers correlated with fruits, shrubs, direct uses, food, income, and pasture; young collectors correlated with fruits, trees, shrubs, direct uses, food, income, pastures, and farmers; men collectors correlated with fruits, direct uses, food, income, pastures, and farmers and young; women collectors correlated with fruits, shrubs, direct uses, food, income, pastures, farmers, young and men; elder collectors correlated with feed are highly significant (P<0.0001) and positively associated under the operational description of Wild edible fruit plants based on a given parameter (Table 8).

On the other hand, Land degradation correlated with farmers; forest clear for Agriculture correlated with fruit, trees, direct uses, food, income, pastures, farmers, young and women; fire and charcoal correlated with women are highly significant (P<0.001) and positively associated under factors of threat for Wild edible fruit plants based on the given parameters (Table 8).

4. Conclusion and Recommendation

Wild edible fruit plants have a considerable character in complementary food provision, income generation, modification, and nutritional security in different parts of the country. Furthermore, the species are versatile, thus significant in supplementary food delivery, fodder, fuel-wood, income generation, biodiversity conservation, and nutritional security in various regions at the bad and good times among others. However, the species are underutilized and threatened by misconception factors of anthropogenic pressure in natural ecosystems.

The misconception factors are land degradation and grazing, clearing of forest for agriculture, fire, timber and charcoal, Stem, leaves, root, and bar

Table 8: Pearson Correlation Coefficients and relationship within the wild edible fruits variable

Variables		Part used	Habitat		Use mode	Purpose of utilization			More inspired by			Collected by			
		Fruit	Tree	Shrubs	Direct	Food	Feed	Medicine	Income	Pasture	Farmers	Young	Men	Women	Elder
Habitat	Tree	0.477**													
	Shrubs	0.681***	-0.176^{NS}												
Use mode	Direct	0.992***	0.450**	0.716***											
Purpose of utilization	Food	0.951***	0.455**	0.728***	0.952***										
	Feed	0.515***	-0.022^{NS}	0.399**	0.501***	0.322*									
	Medicine	0.112^{NS}	0.087^{NS}	-0.033^{NS}	0.111^{NS}	-0.119^{NS}	0.284**								
	Income	0.706***	0.464**	0.361**	0.680***	0.575***	0.487**	0.150^{NS}							
More inspired by	Pastures	0.971***	0.515***	0.645***	0.955***	0.952***	0.472**	0.014^{NS}	0.696***						
	Farmers	0.949***	0.493**	0.616***	0.920***	0.941***	0.421**	0.014^{NS}	0.574***	0.937***					
Collected by	Young	0.911***	0.546***	0.576***	0.904***	0.944***	0.303**	-0.081^{NS}	0.594***	0.950***	0.893***				
	Men	0.794***	0.478**	0.428**	0.801***	0.680***	0.380**	0.475**	0.488**	0.690***	0.720***	0.626***			
	Women	0.879***	0.422**	0.708***	0.923***	0.872***	0.396**	0.079^{NS}	0.559***	0.849***	0.764***	0.815***	0.719***		
	Elder	0.488**	0.122^{NS}	0.234^{NS}	0.463***	0.318*	0.524***	0.316**	0.377**	0.388**	0.462***	0.223^{NS}	0.441**	0.308**	
Factor of threat	Land degrading	0.493**	-0.162^{NS}	0.409**	0.468**	0.450**	0.313**	0.147^{NS}	0.104^{NS}	0.468**	0.515***	0.482**	0.425**	0.339**	0.260^{NS}
	F.Cr. Agriculture	0.757***	0.625***	0.428**	0.736***	0.750***	0.322*	-0.116^{NS}	0.774***	0.778***	0.736***	0.690***	0.472**	0.625***	0.391**
	Fire and charcoal	0.235^{NS}	0.019^{NS}	0.424**	0.356**	0.293*	-0.007^{NS}	0.017^{NS}	0.027^{NS}	0.183^{NS}	0.059^{NS}	0.250^{NS}	0.281*	0.610***	-0.082^{NS}

Note: Correlation is significant at the 0.001 level; **. Significant at the 0.01 level. *. Significant at the 0.05 level; ^{NS}, Not Significant

harvest. Consequently, a community-based forest management system, awareness creation, and growing of wild edible fruit plants on farms and homesteads level are mandatory for any users to save such kinds of delusion problems.

Therefore; the absence and the lowest number of seedlings and saplings under the sampled quadrant of wild edible fruit plants in its habitat is an indicator of a regeneration problem. In this study, imperfection and threatened species might be occurred due to misconceptions about utilities across Wereda. Those are *Mimusops kummel* is the lowest regeneration species in Daro-Lebu Wereda. Cactaceae */cactus, Allophylus abyssinicus and Myrica salicifolia* and *Ficus sycomorus species* are *the* absence of seedlings and saplings under the sampled quadrants in Chiro and Gumbi-bordode Weredas; respectively.

Generally; supporting and promoting indigenous knowledge of farmers towards encourage domestication, and *in-situ* and *ex-situ* conservation through awareness creation, value addition, and commercialization of wild edible fruit plants are mandatory. All these arguments should help to maximize the multidimensional advantage of communities; while contributing to the sustainable utilization of wild edible fruit plant species eco-friendly.

Specifically; the most threatened and under-regenerated wild edible fruit plant species of the study area priority should be given to the critical collection, domestication, in-situ and ex-situ conservation, and promotion of on-farm cultivation in the form of agroforestry systems.

The research gap should be focused on nutrient analysis, collection and *in-situ* and *ex-situ* conservation, genetic improvement, fruit processing, and analysis of the economic contribution of Wild edible fruit plant species.

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