

Identification of Wild Edible Fruit Tree and Shrub Species in West Hararghe Zone, Oromia Region, Ethiopia

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Abstract

Wild edible fruit plants are indispensable standing in all parts of the world as a subordinate food basket on diurnal basis. They are means of endurance for rural communities with food and feed consumption, especially during times of drought, famine, shocks, and risks. Quantification along 18 transect 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 Kebele. 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. Beside to food values, these plants deliver varied profits to the prevailing community with income, fuel wood, fencing, construction, medicine, and fodder. The top five highly satirized 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 misapprehension conveniences. 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 precedence must be given to the critical collection, domestication, in-situ and ex-situ conservation, and promotion in the form of agroforestry practices. 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 energetic points to be considered frontward.

Keywords: *Factors of threat, Forest, anthropogenic value, Wild edible fruit plants.*

Introduction

In the history of human being till now there are more than 7,000 wild edible plant species (Grivetti, & Ogle, 2000). Wild edible fruit plants are substantial that are neither cultivated nor domesticated, which are available in many native societies everywhere around the world that from their wild natural territory and used as sources of food (Beluhan, & Ranogajec, 2010). Wild edible fruit plants are closing food gaps and play an significant role in keeping livelihood security for many people in developing countries during

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seasonal food shortages, as emergency food relief (Afolayan, & Jimoh, 2009). They also play an energetic role with providing nutrition and diverse nourishment that subsidize health maintenance as remedial foods (Grivetti, & Ogle, 2000). Even though outmoded abundant vegetables have the potential for revenue peers, absence of alertness may not allow Wild edible fruit plants to strive with unusual vegetable crops. So, in order to make Credentials of Wild edible fruit plants, an ethnobotanical approach must be given through assessment of diversity and availability, as well as sustainable utilization is imperative for conservation and management of the resources (Maikhuri, Rao, & Saxena, 2004; Maikhuri, et al., 2003).

Consequently; outdated acquaintance of wild plants, commonly in Africa and mainly in Ethiopia is threatened of certainty lost, as traditions, value systems, and the natural environment change. This indicates that the threatened Wild edible fruit plants is due to human caused factors, such as land degradation and grazing, Agricultural expansion, fire, timber and charcoal, above and below ground biomass harvest. These endangered of Wild edible fruit plants might be occurred due to care failure of knowledge especially among the new generations, modernization, and urban residents on conservation and sustainable utilization of Wild edible fruit plants to be treasured for upcoming partners. Therefore, Wild edible fruit plants prerequisite to be conserved and maintained through sustainable utilization without endangering for upcoming cohorts (Teketay, et al., 2010; Ruffo, Birnie, & Tengnäs, 2002; Demise, & Asfaw, 2020).

Commonly, irrespective of Wild edible fruit plants status; as worldwide they faced serious fear of anthropogenic and environmental factors in the country due to agricultural expansion, overgrazing, deforestation, and urbanization. Specifically, in Ethiopia, where more than 80% of the inhabitants are rural, they are subject to traditional knowledge on utility of Wild edible fruit plants with shallow form without comprehensive documentation on diversity, management, and utilization in their surroundings (Addis, 2009; Asfaw, 2009; Tilahun, & Mirutse, 2010) on Wild edible fruit plants for various purposes such as supplementary food, feed during bad times, and income and medicine with negligible form.

Nevertheless, there are no any researches so far done, on assessment of Wild edible fruit plant diversity 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 assess and document diversity of Wild edible fruit plants for Ethnobotanical knowledge on diversity, threat factors, utility and management aspect as to be input for West Hararghe community and other related areas of the country.

Materials and Method

Selection of the Study Area

Before socio-economic study, all Weredas' of the West Hararghe which have presumable on rising edible fruit trees and shrub species could be recognized. Depending on the collected information, 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. A total of six kebele (Metegudesu 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 required survey.

Description of the Study Areas

The study was undertaken 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 Chiromo and Addis Ababa; respectively. The average altitude is (1147-2300 m.a.s.l.).

The main 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 are chat, coffee, teff, barley, maize, sorghum, etc. respectively.

Daro Lebu have rapid population changes which demanded expanding of agricultural land, fuel wood consumption, and residential area. The woreda have a total human population of 364613 of which 186097 (51.04%) are male and 178514.04 (48.96%) are female. Out 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/km²). From the land use of the Wereda, cultivable land 86.8 %, pasture (1.8%), forest (4.14%), and the rest (7.26%) are hilly and swampy.

Chiromo Wereda is placed 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 Chiromo, which is also the capital town of the Zone. 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 °C and 12 °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 and loamy soil types that are 25.5%, 32%, and 42.5%; respectively Office of Agriculture and Rural Development (2003 E.C). 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 are 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 at about 300 km East of Finfinne, the capital city of Oromia regional state, and at the longitude, 09° 13' 05.2" North and 040° 45' 27.7" East.

The capital town of district 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 °C and 16 °C 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.

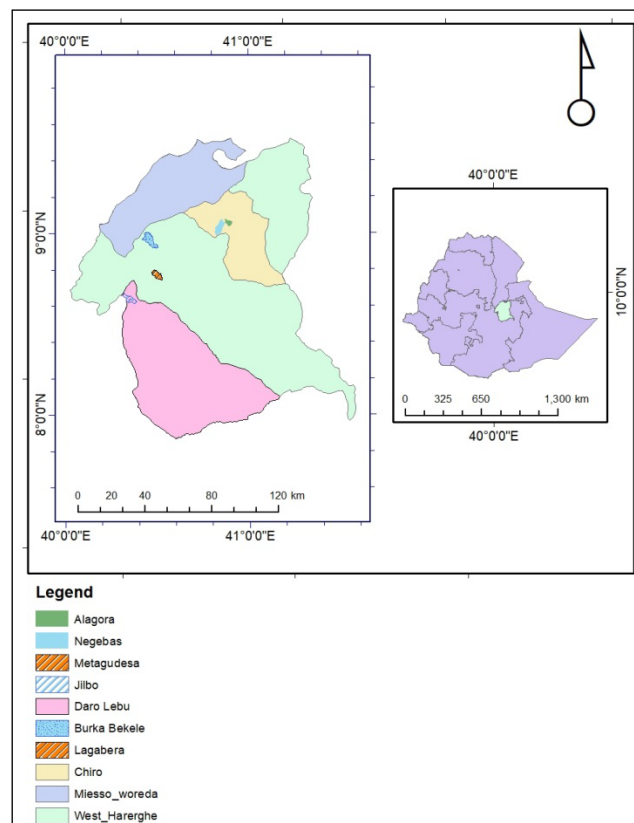


Figure 1. Study Area Map

Method of Data Collection

Socio-economic survey

The socioeconomic examination was elaborated various data collection methods, such as key informant interviews, semi-structured questionnaires and field visit. Semi-structured consultations were used with 120 household respondents that were arbitrarily selected from the 3 designated Weredas of the zone. Thus, from each of the nominated Weredas; 2 kebeles were selected to get entirely essential information about Wild edible fruit plants of the schoolwork areas. All the tested households were requested

autonomously the same query to freely designation verbally over all the Wild edible fruit plants they know as it originates into their recall. During the examination; unlike socio-economic factors (age, household size, sex, education, etc...) of the offenders were identified. Beside of household discussions, significant data was composed from the key spokespersons. These key spokespersons were those existing in the schoolwork areas for a extended time and who have a respectable thoughtful of Wild edible fruit plants.

The composed informations were provided with summary of the socio-economic and biophysical situation of the study areas. As well, field visit was implemented at each of the schoolwork areas/Kebele along the border of the natural forest near the study areas to verify the realism and to perceive the probable of all wild edible fruit plants for further information. By means of the overhead data collection performances, necessary informations were composed to know homegrown acquaintance of countryside societies on consumption, role in food security, awareness, and features of the danger to wild edible fruit plants of the schoolwork areas.

Vegetation inventory

Inventories on vegetation coverage of wild edible fruit plants of the 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 'shrub' 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 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 m²) 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, then converted to the scientific name. The density of Wild edible fruit plants on each 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 different trees and shrubs on each quadrant.

Data analysis

The composed informations were concussed and analyzed by in the form of expressive information. The descriptive tables and graphs were also used to recapitulate the information with precise form by using the software programs such as Microsoft Excel and Statistical Packages for Social Sciences (SPSS). Grading and recording methods such as preference ranking and direct matrix ranking were directed by using ten randomly selected key informant techniques.

Results and Discussion

Sampled Household Characteristics

Because of the cultural consequence, the majority of the respondents in this study were men. Thus, from the total of 120 respondents 76% was male, while the remaining 24% was female. The highest percentage of the respondents' age was originated between 31-45 years (53%); while the lowest percentage was 66-70 years (5%). This designated that the offenders were settled at mature age stage for eminence

information. The study showed that only 48% of the offenders were schooled, while 52% were unschooled. The highest household size was 2-4 (59%); while the lowest household size was 10-12 (12%).

Diversity of Wild Edible Fruit Plants across the Study Area

The study indicated 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 1,2,3).

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 *Vangueria arispala*, respectively; while the lowest percentage (0.7%) was under *Myrica salicifolia*. Rich, *Capparis decidua*, *Rubus apetalus* Poir., *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 abyssinica*, *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 1). 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 1).

In the other study area in Gumbi Bordode Wereda at Burqabarkale PA; observation of Wild edible fruit plants indicated that the highest 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 1). In Legarba PA; observation of wild fruits indicated that the highest percentage (8.8, 7.5.9, 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 bicolor*, *Rubus apetalus*, *Syzygium guineense* and *Physalis micrantha* Link with similar figures (Table A1 - Appendix).

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 *Vangueria arispala* species (Table 1). 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 1). 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 1). 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 1).

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 2). 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 2).

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 2). 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 2). 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/cactus* species (Table 2).

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 3). 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 (8.3%) occurred under *Mimusops kummel*, species (Table 3).

Whereas at Burqabarkale 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* species; while the lowest percentage (5%) resulted under *Balanites aegyptiaca* species (Table 3). likewise; an indicator of regeneration trend results 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 3). 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 3).

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 - Table A2).

Table 1. 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			
Scientific name	Frequ.	%	Scientific name	sampled trees	Total	%
<i>Psidium guajava</i>	12	31.6	<i>Psidium guajava</i>	59	95	62.1
<i>Carissa spinarum</i> L.	6	15.8	<i>Rosa abyssinica</i>	47	84	56.0
<i>Oncoba spinosa</i> Forssk.	6	15.8	<i>Oncoba spinosa</i> Forssk.	49	89	55.1

<i>Allophylus abyssinicus</i>	5	13.2	<i>Allophylus abyssinicus</i>	32	63	50.8
<i>Mimusops kummel</i>	4	10.5	<i>Carissa spinarum</i> L.	8	19	42.1
<i>Syzygium guineense</i>	3	7.9	<i>Mimusops kummel</i>	1	12	8.3
<i>Vangueria arispala</i>	2	5.3	Number of transacts=3			
Total	38	100.	Number of quadrants=12			
Observation of species			Sapling trends of a given tees/shrubs Jilbo PA , from 3 transect lines and 11 quadrants			
<i>Scientific name</i>	<i>Frequ.</i>	<i>%</i>	<i>Scientific name</i>	<i>sampled trees</i>	<i>Total</i>	<i>%</i>
<i>Rosa abyssinica</i>	11	26.8	<i>Psidium guajava</i>	59	95	62.1
<i>Psidium guajava</i>	8	19.5	<i>Carissa spinarum</i> L.	9	15	60.0
<i>Oncoba spinosa</i> Forssk.	7	17.1	<i>Rosa abyssinica</i>	47	84	56.0
<i>Allophylus abyssinicus</i>	7	17.1	<i>Oncoba spinosa</i>	49	89	55.1
<i>Mimusops kummel</i>	6	14.6	<i>Allophylus abyssinicus</i>	32	63	50.8
<i>Carissa spinarum</i> L.	2	4.9	<i>Mimusops kummel</i>	1	12	8.3
Total	41	100	Number of transacts=3			
			Number of quadrants=11			

Table 2. 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			
<i>Scientific name</i>	<i>Frequ</i>	<i>%</i>	<i>Scientific name</i>	<i>sampled trees</i>	<i>Total</i>	<i>%</i>
<i>Carissa spinarum</i> L.	9	27.3	<i>Carissa spinarum</i> L.	16	58	27.6
<i>Lex mitis</i>	7	21.2	Cactaceae	0	8	0.0
Cactaceae	5	15.2	<i>Embelia schimperi</i>	14	32	43.8
<i>Acacia seyal</i> Del.	4	12.1	<i>Acacia seyal</i> Del.	2	12	16.7
<i>Euphorbia abyssinica/cactus</i>	3	9.1	<i>Lex mitis</i>	19	54	35.2
<i>Allophylus abyssinicus</i>	2	6.1	<i>Oncoba spinosa</i> Forssk.	1	4	25.0
<i>Myrica salicifolia</i>	1	3.0	<i>Allophylus abyssinicus</i>	0	3	0.0
<i>Myrsine africana</i> L.	1	3.0	<i>Myrsine africana</i> L.	4	10	40.0
<i>Oncoba spinosa</i> Forssk.	1	3.0	<i>Myrica salicifolia</i>	0	2	0.0
Total	33	100.0	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			
<i>Scientific name</i>	<i>Frequ.</i>	<i>%</i>	<i>Scientific name</i>	<i>sampled trees</i>	<i>Total</i>	<i>%</i>
<i>Carissa spinarum</i> L.	9	19.1	<i>Carissa spinarum</i> L.	66	114	57.9
<i>Rhus natalensis</i> Krauss	7	14.9	<i>Embelia schimperi</i>	83	147	56.5
<i>Rosa abyssinica</i>	2	4.3	<i>Lex mitis</i>	51	101	50.5
<i>Lex mitis</i>	6	12.8	<i>Acokanthera schimperi</i>	8	16	50.0
<i>Embelia schimperi</i>	6	12.8	<i>Rosa abyssinica</i>	7	15	46.7
<i>Acokanthera schimperi</i>	4	8.5	<i>Allophylus abyssinicus</i>	5	12	41.7
<i>Oncoba spinosa</i> Forssk	2	4.3	<i>Acacia seyal</i> Del.	11	29	37.9
Cactaceae	3	6.4	<i>Rhus natalensis</i> Krauss	9	24	37.5
<i>Acacia seyal</i> Del.	5	10.6	Cactaceae	0	14	0.0
<i>Allophylus abyssinicus</i>	3	6.4	Number of transacts=3			
Total	47	100.0	Number of quadrants=9			

Table 3. 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			
Scientific name	Frequ.	%	Scientific name	sampled trees	Total	%
<i>Rhus natalensis</i> Krauss	6	14.6	<i>Acokanthera schimperi</i>	4	7	57.1
<i>Lex mitis</i>	6	14.6	<i>Celosia anthelminthica</i> .	9	17	52.9
<i>Carissa spinarum</i> L.	4	9.8	<i>Rhus natalensis</i> Krauss	25	49	51.0
<i>Mimusops kummel</i>	4	9.8	<i>Grewia tenax</i> (Forssk.)	14	28	50.0
<i>Acokanthera schimperi</i>	4	9.8	<i>Lex mitis</i>	18	36	50.0
<i>Grewia tenax</i> (Forssk.)	3	7.3	<i>Myrica salicifolia</i> .Rich	17	41	41.5
<i>Grewia bicolor</i>	3	7.3	<i>Rhus natalensis</i> Krauss	2	5	40.0
<i>Myrica salicifolia</i> .Rich	2	4.9	<i>Vangueria arispala</i>	2	5	40.0
<i>Vangueria arispala</i>	2	4.9	<i>Grewia bicolor</i>	8	20	40.0
<i>Celosia anthelminthica</i> .	2	4.9	<i>Acokanthera schimperi</i>	7	18	38.9
<i>Oncoba spinosa</i> Forssk.	2	4.9	<i>Carissa spinarum</i> L.	11	29	37.9
<i>Toddalia asiatica</i>	1	2.4	<i>Syzygium guineense</i>	1	4	25.0
<i>Syzygium guineense</i>	1	2.4	<i>Mimusops kummel</i>	1	12	8.3
<i>Euclea racemosa</i>	1	2.4				
Total	41	100	Number of transects=3			
			Number of quadrants=9			
observation of species			Sapling trends of a given tees/shrubs Burqaberkele PA			
Scientific name	Frequ.	%	Scientific name	sampled trees	Total	%
<i>Grewia tenax</i> (Forssk.)	8	18	<i>Grewia tenax</i> (Forssk.)	28	55	50.9
<i>Cactaceae</i>	6	14	<i>Celosia anthelminthica</i> .	10	22	45.5
<i>Grewia ferruginea</i>	5	11	<i>Grewia ferruginea</i>	11	26	42.3
<i>Grewia schweinfurthii</i>	4	9	<i>Grewia schweinfurthii</i>	8	19	42.1
<i>Euclea racemosa</i>	4	9	<i>Boscia salicifolia</i>	5	12	41.7
<i>Celosia anthelminthica</i> .	3	7	<i>Grewia bicolor</i>	7	17	41.2
<i>Grewia bicolor</i>	3	7	<i>Mimusops kummel</i>	3	13	23.1
<i>Ficus sycomorus</i>	3	7	<i>Balanites aegyptiaca</i>	1	5	20.0
<i>Boscia salicifolia</i>	3	7	<i>Euclea racemosa</i>	3	23	13.0
<i>Mimusops kummel</i>	3	7	<i>Ficus sycomorus</i>	0	4	0.0
<i>Balanites aegyptiaca</i>	2	5	<i>Cactaceae</i>	0	33	0.0
Total	44	100	Number of transects=3			
			Number of quadrants=10			

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 4 and Appendix 1). 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 Demise, & Asfaw, (2020) that high population growth, agricultural land demand, lack of alternative fuel energies and plantations, resource use interest conflict between communities.

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 Demise, & Asfaw, (2020) reported that a lower level of management and undermine were given for wild edible fruit plants.

Table 4. Major Threats to Wild Edible Fruit Plants in the Study Areas

Threat factors		Frequ.	%
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.

Conclusion and Recommendation

A total of 55 commonly growing wild edible fruit tree and shrub species belonging to 44 families were recorded in West Hararghe zone from their natural habitats in forest areas. Most of the species were tree species followed by shrubs. The species are versatile, thus significant in supplementary food delivery, fodder, fuel-wood, income generation, biodiversity conservation, and nutritional security at the bad and good times. The top six highly satirized wild edible fruit plant species by respondents were *Psidium guajava*, *Mimusops kummel*, *Carissa spinarum* L., *Rosa abyssinica*, *Ficus sycomorus*, and *Oncoba spinosa* forssk.

However, at present, there are no conservation or protection measures applied in these areas by concerning bodies as they are threatened by anthropogenic factors. Therefore, due to the misconception utilities factors such as land degradation and grazing, clearing of forest for agriculture, fire, timber and charcoal, Stem, leaves, root, and bark harvest by communities (Table 4). The misconception utilities factor resulted for absence and lowest number of seedlings and saplings trend under the sampled quadrant of Wild edible fruit plants in its habitat as to be an indicator of a regeneration problem on most species. 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 (Table 2 and 3). These endangered Wild edible fruit plants might be occurred due to care failure of knowledge especially among the new generations, modernization, and urban residents on conservation and sustainable utilization of Wild edible fruit plants to be treasured for upcoming partners.

Generally; supporting and promoting indigenous knowledge of farmers to wards encourage domestication, a community-based forest management system and 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 practices. The future research should be focused on nutrient analysis, genetic improvement, fruit processing, and economic contribution of Wild edible fruit plant species.

Abbreviations

No.	Acronyms	Meaning
1	<i>F and Frequ.</i>	<i>Frequency</i>
2	%	<i>Percent</i>
3	<i>PA</i>	<i>Peasant Association</i>
4	A	Land Degradation and Grazing
5	B	Clearing Of Forest
6	C	Fire, Timber and Charcoal
7	D	Stem, Leave and Bark Harvest
8	No.	Number

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Conflicts of Interest

There is no conflict of interest concerning to this work.

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Appendix

Table A1. Observation Frequency of Wild Edible Fruit Plants by Study Areas

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	<i>Puntia ficus-indica</i>	<i>Cactaceae</i>			4	1.8									4
2	<i>Carissa spinarum</i> L.	<i>Apocynaceae</i>	11	5.6	15	6.6	16	11.3	16	11.4	6	3.9	7	5.6	71
3	<i>Hypoestes aristata</i>	<i>Acanthaceae</i>	9	4.6											9
4	<i>flavescens</i>	<i>Tiliaceae</i>											1	0.8	1
5	<i>Piper nigrum</i>	<i>Piperaceae</i>					1	0.7	1	0.7					2
6	<i>Balanites aegyptiaca</i>	<i>Balanitiaceae</i>	2	1.0											2
7	<i>Toddalia asiatica</i>	<i>Rutaceae</i>									1	0.7			1
8	<i>Portulaca quadrifida</i> .	<i>Portulacaceae</i>									3	2.0	3	2.4	6
9	<i>Myrica salicifolia</i> .Rich	<i>Loganiaceae</i>	3	1.5	7	3.1	1	0.7	1	0.7	1	0.7	1	0.8	14
10	<i>Physalis micrantha</i>	<i>Solanaceae</i>					1	0.7							1
11	<i>Vangueria arisepala</i>	<i>Rubiaceae</i>					10	7.0	7	5.0	12	7.8	6	4.8	35
12	<i>Celosia anthelminthica</i> .	<i>Amaranthaceae</i>	1	0.5	14	6.1			1	0.7	2	1.3			18
13	<i>Rbus natalensis</i> Krauss	<i>Anacardiaceae</i>	5	2.6	17	7.5	2	1.4	1	0.7					25
14	<i>Rhoicissus tridentate</i>	<i>Vitaceae</i> .	1	0.5					1	0.7					2
15	<i>Grewia tenax</i> (Forsk.)	<i>Tiliaceae</i>	12	6.2	14	6.1									26
16	<i>Salvadora persica</i>	<i>Salvadoraceae</i>	1	0.5	1	0.4									2
17	<i>Annona reticulata</i> L.	<i>Annonaceae</i>									1	0.7			1
18	<i>Syzygium guineense</i>	<i>Myrtaceae</i>	2	1.0	1	0.4					17	11.1	16	12.7	36
19	<i>Capparis decidua</i>	<i>Capparidaceae</i>									1	0.7			1
20	<i>Rosa abyssinicia</i>	<i>Rosaceae</i>	4	2.1	5	2.2	11	7.7	9	6.4	13	8.5	17	13.5	59
21	<i>Rubus apetalus</i> Poir.	<i>Rosaceae</i>			1	0.4	3	2.1	10	7.1	1	0.7	1	0.8	16
22	<i>Momordica foetida</i>	<i>Cucurbitaceae</i>									1	0.7			1
23	<i>Albizia grandibracteata</i>	<i>Leguminosae</i> -							1	0.7					1
24	<i>Phoenix reclinata</i> Jacq	<i>Arecaceae</i>	4	2.1											4
25	<i>Capsicum chinense</i>	<i>Solanaceae</i>							3	2.1					3
26	<i>Ficus sur</i> (F. <i>Capensis</i>)	<i>Moraceae</i>							4	2.9					4
27	<i>Grewia bicolour</i>	<i>Tiliacea</i>	6	3.1	1	0.4									7
28	<i>Ficus sycomorus</i>	<i>Anacardiaceae</i>	18	9.2	16	7.0					10	6.5	3	2.4	47



29	<i>Boscia salicifolia</i>	<i>Capparidaceae</i>	3	1.5											3
30	<i>Berchemia discolor</i>	<i>Rhamnaceae</i>	5	2.6											5
31	<i>Oncoba spinosa</i> Forssk.	<i>Flacourtiaceae</i>			4	1.8	3	2.11		0.7	5	3.3	3	2.4	16
32	<i>Doryalis abyssinica</i>	<i>Flacourtiaceae</i>											2	1.6	2
33	<i>Cordia sinensis</i> Lam	<i>Boraginaceae</i>	8	4.1	17	7.5									25
34	<i>Meriandra benegalensis</i>	<i>Verbenaceae</i>			4	1.8									4
35	<i>Lex mitis</i>	<i>Ebenaceae</i>	1	0.5	5	2.2	6	4.2	2	1.4	2	1.3	2	1.6	18
36	<i>Rytigynia neglecta</i>	<i>Rubiaceae</i>					1	0.7							1
37	<i>Grenvia schweinfurthii</i>	<i>Tiliaceae</i>	4	2.1							1	0.7			5
38	<i>Grenvia ferruginea</i>	<i>Tiliaceae</i>	7	3.6	3	1.3					1	0.7			11
39	<i>Mimusops kummel</i>	<i>Sapotaceae</i>	13	6.7	20	8.8	1	0.7	6	4.3	18	11.8	20	15.9	78
40	<i>Myrsine africana</i> L.	<i>Myrsinaceae</i>			1	0.4									1
41	<i>Embelia schimperi</i>	<i>Myrsinaceae</i>					14	9.9	9	6.4	3	2.0			26
42	<i>Acokanthera schimperi</i>	<i>Sterculiaceae</i>	2	1.0			3	2.1			1	0.7			6
43	<i>Euclea racemosa</i>	<i>Ebenaceae</i>	1	0.5	1	0.5			1	0.7	1	0.7	8	6.3	12
44	<i>Ziziphus spina-</i>	<i>Rhamnaceae.</i>	16	8.2	15	6.6									31
45	<i>Tamarindus indica</i>	<i>Fabaceae</i>	3	1.5	5	2.2			2	1.4	3	2.0	1	0.8	14
46	<i>Oncoba spinosa</i> Forssk.	<i>Flacourtiaceae</i>	1	0.5	1	0.4	18	12.7	11	7.9	6	3.9	9	7.1	46
47	<i>Acacia senegal</i> (L.)	<i>Fabaceae</i>	3	1.5											3
48	<i>Rhus glutinosa</i>	<i>Anacardiaceae</i>									1	0.7			1
49	<i>Combretum molle</i>	<i>Combretaceae</i>	19	9.7	13	5.7	13	9.2	6	4.3	9	5.9	4	3.2	64
50	<i>Osyris quadripartita</i>	<i>Santalaceae</i>					2	1.4							2
51	<i>Cordia Africana</i>	<i>Boraginaceae</i>	2	1.0	1	0.4	17	12.0	16	11.4					36
52	<i>Acacia seyal</i> Del.	<i>Fabaceae</i>	3	1.5	7	3.1	1	0.7	4	2.9	3	2.0			18
53	<i>Allophylus abyssinicus</i>	<i>Anacardiaceae</i>	1	0.5	2	0.9	3	2.1	7	5.0	11	7.2	3	2.4	27
54	<i>Acacia seyal</i> del.**	<i>Fabaceae</i>	10	5.1											10
55	<i>Psidium guajava</i>	<i>Myrtaceae)</i>	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

Table A2. The Major Factors of Threat for Wild Edible Fruits

species name	Family name	A=42.3%	B =45%	C=6.9%	D=5.7%	Total
<i>Puntia ficus-indica</i> (L.)	Cactaceae	4	0	0	0	4
<i>Carissa spinarum</i> L.	Apocynaceae	1	11	0	59	71
<i>Hypoestes aristata</i>	Acanthaceae	9	0	0	0	9
<i>flavescens</i>	Tiliaceae	1	0	0	0	1
<i>Piper nigrum</i>	Piperaceae	2	0	0	0	2
<i>Balanites aegyptiaca</i>	Balanitaceae	2	0	0	0	2
<i>Toddalia asiatica</i> (L.)	Rutaceae	1	0	0	0	1
<i>Portulaca quadrifida</i> .	Portulacaceae	0	7	0	0	7
<i>Combretum molle</i>	Loganiaceae	1	13	0	0	14
<i>Physalis micrantha</i>	Solanaceae	3	0	0	0	3
<i>Vangueria arispala</i>	Rubiaceae	45	1	0	0	46
<i>Celosia anthelminthica</i>	Amaranthaceae	18	0	0	0	18
<i>Rhus natalensis</i> Krauss	Anacardiaceae	0	25	0	0	25
<i>Rhoicissus tridentate</i>	Vitaceae.	2	0	0	0	2
<i>Grewia tenax</i>	Tiliaceae	11	15	0	0	26
<i>Salvadora persica</i>	Salvadoraceae	2	0	0	0	2
<i>Annona reticulata</i> L.	Annonaceae	1	0	0	0	1
<i>Syzygium guineense</i>	Myrtaceae	0	34	0	0	36
<i>Capparis decidua</i>	Capparidaceae	1	0	0	0	1
<i>Rosa abyssinica</i>	Rosaceae	56	3	0	0	59
<i>Rubus apetalus</i> Poir.	Rosaceae	16	0	0	0	16
<i>Momordica foetida</i>	Cucurbitaceae	1	0	0	0	1
<i>Albizia grandibracteata</i>	Leguminosae-	1	0	0	0	1
<i>Phoenix reclinata</i> Jacq	Arecaceae	4	0	0	0	4
<i>Capsicum chinense</i>	Solanaceae	3	0	0	0	3
<i>Ficus sur</i> (F. capensis)	Moraceae	4	0	0	0	4
<i>Grewia bicolor</i>	Tiliaceae	1	6	0	0	7
<i>Ficus sycomorus</i>	Anacardiaceae	29	18	0	0	47
<i>Boscia salicifolia</i> Oliv.	Capparidaceae	3	0	0	0	3
<i>Berberia discolor</i>	Rhamnaceae	0	5	0	0	5
<i>Oncoba spinosa</i> Forssk	Flacourtiaceae	4	10	0	0	16
<i>Doryalis abyssinica</i>	Flacourtiaceae	1	1	0	0	2
<i>Cordia sinensis</i> Lam	Boraginaceae	5	20	0	0	25

<i>Lantana camara</i> L.	<i>Verbenaceae</i>	4	0	0	0	4
<i>Ilex mitis</i>	<i>Ebenaceae</i>	17	1	0	0	18
<i>Rytigynia neglecta</i>	<i>Rubiaceae</i>	1	0	0	0	1
<i>Ximenia americana</i>	<i>Tiliaceae</i>	2	3	0	0	5
<i>Grewia ferruginea</i>	<i>Tiliaceae</i>	11	0	0	0	11
<i>Mimusops kummel</i>	<i>Sapotaceae</i>	1	74	0	0	79
<i>Myrsine africana</i> L.	<i>Myrsinaceae</i>	1	0	0	0	1
<i>Embelia schimperi</i>	<i>Myrsinaceae</i>	25	0	0	1	26
<i>Acokanthera</i>	<i>Sterculiaceae</i>	3	3	0	0	6
<i>Euclea racemosa</i>	<i>Ebenaceae</i>	1	2	9	0	12
<i>Ziziphus spina</i>	<i>Rhamnaceae.</i>	1	0	30	0	31
<i>Tamarindus indica</i>	<i>Fabaceae</i>	0	14	0	0	14
<i>Oncoba spinosa</i>	<i>Flacourtiaceae</i>	4	42	0	0	46
<i>Acacia senegal</i> (L.)	<i>Acacia senegal</i> (L.)	3	0	0	0	3
<i>Rhus glutinosa</i>	<i>Rhus glutinosa</i>	0	1	0	0	1
<i>Combretum molle</i>	<i>Combretum molle</i>	1	0	0	0	1
<i>Osyris quadripartita</i>	<i>Osyris quadripartita</i> Decn	2	0	0	0	2
<i>Cordia Africana</i>	<i>Cordia africana</i>	0	36	0	0	36
<i>Acacia seyal</i> Del.	<i>Acacia seyal</i> Del.	0	0	17	0	17
<i>Allophylus abyssinicus</i>	<i>Allophylus abyssinicus</i>	27	0	0	0	27
<i>Acacia seyal</i> Del.**	<i>Acacia seyal</i> del.	10	0	0	0	10
<i>Psidium guajava</i>	<i>Psidium guajava</i>	5	94	0	0	99
Total		351	439	56	60	914