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Homegarden plants in Legambo District (Chiro Kebele) South Wollo, Ethiopia: Future implication for food security and rehabilitation program

Akale Assamere Habtemariam*, Alemu Mamuye Woldetsadik and Asmamaw Meneilh Belay

Department of Biology, Faculty of Botanical Science, Mekdela Amba University, Ethiopia.

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Homegarden is a traditional farming practice that consists of growing adaptable landraces and endangered species which have been conserved. Previously, status of the homegarden has not been studied. Therefore, this study provided information about homegarden species composition, status and value of species for future food and rehabilitation program. The study was conducted in Chiro kebele, South Wollo of Ethiopia during February to May 2019. Totally 75 respondents were selected based on the possession of homegarden and data were collected using interviews, observation and group discussion. The data were analyzed using descriptive statistics, and interpreted. Totally, 20 plant species distributed in 16 families were recorded. *Fabaceae* (25%) and *Rosaceae* (17%) were leading families in numbers of individual plants. Ten (50%) fodder, seven (35%) construction, six remedies and spice (30% each) and two (10%) vegetable and fruit plant species were documented. *Malus domestica* and *Brassica carinata* were the two perennial plant species used for household consumption. *Hagenia abyssinica* is the most accepted remedial plant followed by *Solanecio gigas* (Dysentery for sheep), Kalanchoe and Aloe (Wound healing), *Acacia* (Stomach ache for horse), and *Mentha piperita* (reduced kidney pain). *Ruta chalepensis* is predominant spice plant for tea, coffee, shiro wot, and Mitmit. *Cytisus proliferus*, *Buddleja polystachya* and *Hagenia abyssinica* were commonly grown bee and animal fodder plants and relevant for household and ploughing materials including *Acacia* and *Cupressus lusitanica* in the majority of homegardeners. This ecofriendly homegarden tree plants should be implicated for future plantation program.

Key words: Homegarden species, household, indigenous, predominant plant, tree.

INTRODUCTION

Homegardens are most adaptable landraces, varieties and rare/endangered species that have been kept conserved (Regassa, 2016). They are traditional farming practices characterized by the complexity of their species diversity and conservation, structure and multiple functions (Amberber et al., 2014; Yakob et al., 2014). The

*Corresponding author. E-mail: akale1819@gmail.com.

homegarden agroecosystem is one of the major production systems that were developed during Ethiopian's early agricultural life (Bekele, 2017). Gradually, it became a common practice and plants collected from the natural ecosystem were cultivated together in the homegarden (Seta et al., 2013).

The composition of homegaden plants may comprise ornamental, fruits, food crops, vegetables, medicinal, spices, fodder, building materials and fuel woods (Regassa, 2016). The diversity of homegarden plants varies from place to place (Kumar and Tiwari, 2017). For instance, 69 species belonging to 40 families from 48 homegardens (Mekonnen et al., 2014) in Jabithenan District, North-Western Ethiopia; 78 species belonging to 35 families from 18 homegardens (Semu, 2018) in Eastern Hararghe, Kombolcha Town Oromia of Ethiopia were recorded. Similarly, 62 plant species of 35 families were recorded in Misha Woreda, Hadiya Zone of the Southern Ethiopia (Woldemichael et al., 2018); 112 plant species classified into 43 families were documented from 75 homegardens in Holeta Town, Oromia of Ethiopia (Amberber et al., 2014) and 20 plant species are documented in the present study.

Land degradation in Ethiopia is a major problem due to a number of factors (Getahun et al., 2017). Legambo District (Chiro kebele) has become highly degraded and bar lands. So, an urgent plantation program is needed for sustainable food security and rehabilitation. In such a case, it is essential to identify and study the presence of ecofriendly homegarden plants that could sustain the income of the growers. Formerly, homegarden status has not been studied. Therefore, the present study is undertaken to provide information about the composition of species, status of indigenous species and use of species in homegardens of Chiro kebele. This primary information serves as a baseline for future sustainable food security and rehabilitation program.

MATERIALS AND METHODS

Study area

The study was conducted in Legambo District (Chiro kebele), South Wollo of Ethiopia. Chiro kebele is in Legambo District and located at 480 km north from the capital of Ethiopia (Addis Ababa) and 80 km west from the capital city of South Wollo Zone (Dessie). It is situated between 3200 and 3356 m above mean sea level. The area is characterized by Dega agroecology and the community available here is known by animal rearing and barley farming practice. The most common staple foods for farmers are barley (*Hordeum vulgare* L.).

Selections of study site and informants

The study area is highly degraded, bar land, and has no vegetation other than homegarden plant species. Therefore, the site was selected based on vegetation status and cross-section guided field walks were done during selection. In the study, a total of 75 respondents (66 males and 9 females) were selected based on the presence of homegarden plants, other than *Eucalyptus globulus*, because it is the dominant plant species in the homegarden at Chiro kebele; the study was done using one local knowledgeable guide from the community.

Method of data collection

The study of homegarden plants was carried out at Chiro kebele during the period from February 2019 to May 2019. Accordingly, semi-structured interviews, observation, group discussion were done with the respondents (Getaneh et al., 2014). The primary data about the benefits of homegarden practice for the livelihood, the species composition, local name of plants and values of homegarden plants were collected according to Bekele (2017). However, *E. globulus*, the dominant exotic species found in every homegarden in the study area, was not included in the present analysis.

Data analysis

The data were analyzed through descriptive statistical analysis, and interpreted. The results are presented by using tables, percentages and figures (Bekele, 2017).

RESULTS AND DISCUSSION

Homegarden species at Chiro Kebele

In this study, a total of 20 plant species distributed into 16 families were recorded from 75 homegardens and 18 (90%) species were Angiosperms and two (10%) species were Gymnosperm plants (Cupresaceae). A similar study by Amberber et al. (2014) undertaken in Holeta Town, Oromia of Ethiopia, revealed 112 plant species in 43 families of 75 homegardens. This difference might be arising due to agroecological differences and the highly degraded environment in the present study area. This study showed that Asteraceae, Cupressaceae, Fabaceae and Rosaceae were dominant families comprising two species each. However, the remaining 12(75%) families included a single species each (Table 1). A similar report from homegardens of Holeta Town by Amberber et al. (2014), Regassa (2016) in Hawassa College of Teacher Education Campus, Southern Ethiopia and Sorecha and Deriba (2017) in Haramaya University of Ethiopia indicated that, Fabaceae was the dominant family in terms of species number. In numbers of individual plants, Fabaceae (25%) and Rosaceae (17%) were the leading plant families than others (Figure 1). However, Sapindaceae and Anacardiaceae were the least significant families to the community.

Human consumption: Homegarden plants

In this study, Rosaceae (*Malus domestica*) and *Brassicaceae* (*Brassica carinata*) were the two- perennial

Table 1. Homegarden Species documented from Chiro Kebele of South Wollo, Ethiopia.

Family name	Homegarden species	Local name	Habits
Agavaceae	*Agave americana L.*	Kacha	Herbs
Aloaceae	*Aloe sp.*	Erat	Herbs
Anacardiaceae	*Schinus molle L.*	Kundo Berbere	Shrubs
Asteraceae	*Solanecio gigas*	Yeshikoko gomen	Shrubs
	Artemisia afra Jacq.	Ariti	Herbs
Brassicaceae	*Brassica carinata A. Braun.*	Kale	Herbs
Cupresaceae	*Cupressus lusitanica Mill.*	Yeferenji-tid	Shrubs and Trees
	Juniperus procera Hochst. ex Endl.	Yehabesha-tid	Trees
Crassulaceae	*Kalanchoe sp.*	Indahula	Herbs
Euphorbiaceae	*Ricinus communis L.*	Gulo	Shrubs
Fabaceae	*Cytisus proliferus*	Tree lucerne	Shrubs and Trees
	Acacia sp.	Yeferenj Gerar	Shrubs and Trees
Sapindaceae	*Dodonea angustifolia L.F.*	Kitkita	Shrubs
Scrophulariace	*Buddleja polystachya Fresen*	Anfar	Shrubs and Trees
Lamiaceae	*Mentha piperitaL.*	Nanna Nanna	Herbs
Rhamnaceae	*Rhamnus prinoides L' Herit.*	Gesho	Shrubs
Rosaceae	*Hagenia abyssinica (Bruce) J.F. Gmel*	Kosso	shrubs and Trees
	Malus domestica Borkh.	Apple	Shrubs
Rutaceae	*Ruta chalepensis L.*	Tenadam	Herbs
Solanaceae	*Nicotiana tabacum L.*	Tobacco	Herbs

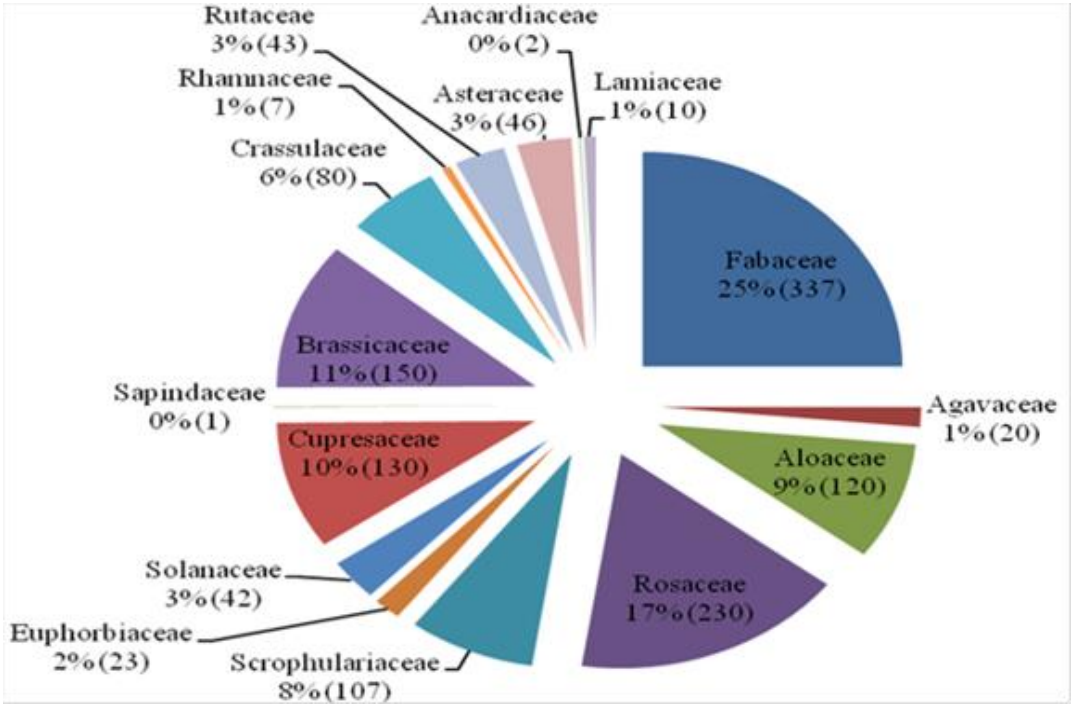

Figure 1. Abundance of plant family in the homegarden of Chiro Kebele.

plant families used for household consumption. This study showed that vegetable and fruit (one species each) were recorded in which, was lower in number compared to the study of Amberber et al. (2014) in Holeta Town,

Figure 2. Husbandry of homegarden plants at Chiro kebele, South Wollo of Ethiopia.

Oromia of Ethiopia, which accounted for 15 and 19 species, respectively. This higher variation might be due to agroecological differences. According to the respondents and field survey, the fruit of *M. domestica* has been harvested twice a year and 24% of the respondents have cultivated in their homegardens. However, water is one of the key problems in the homegarden and majority of the respondents (76%) were not cultivating those vegetables and fruits. A similar report by Mekonen et al. (2015) indicated that water is one of the important constraints in growing homegarden crops. As shown in Figure 2, two respondents (Model farmers based on fruit production in Chiro kebele) used a special type of water conservation mechanism.

Medicinal plants in the homegaden

Six remedy plant species were recorded during the study. The leaf, inflorescences, and fruits of *Hagenia abyssinica* were used to treat stomach ache. It was the most accepted medicinal plants by the community, followed by *Solanecio gigas* (to treat dysentery for sheep), *Kalanchoe* sp. (Wound healing), *Acacia* sp. (Leaf used to treat stomach ache of horse), *Aloe* sp. (Wound healing), *Mentha piperita* (Reducing kidney pain) as shown in Table 2. According to the perception of the respondents, *Hagenia abyssinica* was the leading medicinal plants in homegarden of Chiro kebele, South Wollo of Ethiopia (Figure 3).

Spice plants in the homegaden

Out of a total of 20 species, six (30%) plant species were used as spice by the community. According to the respondents, *Ruta chalepensis*, locally known as Tenadam, was one of predominant spice plants grown in the homegarden of Chiro kebele, South Wollo of Ethiopia followed by *Ricinus communis* (Figure 4) or locally known as Gulo. *R. chalepensis* belongs to the family Rutaceae and it is used as spices for Tea, Coffee, Shiro Wot, and Mitmit. This result was in line with that of Semu (2018) who reported that *R. chalepensis* is used as a spice for Coffee and Berbere processing in Hararghe, Kombolcha Town, Oromia of Ethiopia.

Fodder plant species in homegarden

In the present study, a total of 10 (50%) fodder species were documented. *Cytisus proliferus, Buddleja polystachya and H. abyssinica* were the most commonly grown Bee and Animal fodder plants in majority of homegardens (Figure 5). Similar results were reported by Kindu et al. (2009) that *H. abyssinica* is the preferable fodder plant in Highlands of Central Ethiopia due to its palatability, harmlessness to animals, and availability during the dry season. During the field study, 16 (21.33%) of the total respondents were involved in Bee farming practice with a maximum of 12 traditional Bee hives farming practice per homegarden. One female respondent scored third-rank based on Bee farming practice (six hives). Respondents stated that *Cytisus proliferus* was the key plant species for Bee fodder due to its fast growth and easily available of flowers. According to respondents, *B. polystachya* ranked next for Bee fodder to *Cytisus proliferus*. During group discussion, all respondents were interested to know Bee farming practice. However, lack of new plant seedlings and modern hives were key problems.

Plants for household and farming tools

In this study, seven plant species used for household and farming tools purposes were documented (Figure 6). *H. abyssinica, B. polystachya*, *Cupressus lusitanica*, *C. proliferus and Acacia* sp. were the dominant plant species relevant for furniture, household and farming tool

Table 2. Use of Homegarden plants documented from Chiro Kebele of South Wollo, Ethiopia.

Scientific name	Importance
Agave americana	Income generation, fencing
Aloe sp.	Bee fodder, sanitation (mucus used as washing hair), fencing, medicine
Schinus molle	Spice
Solanecio gigas	Bee fodder, fencing, medicine, fuel wood, tools for malting
Artemisia afra	Bee fodder, income generation, recreation
Brassica carinata	Bee fodder, income generation, human consumption
Cupressus lusitanica	furniture, income generation, fencing, fuel wood
Juniperus procera	furniture, income generation, fuel wood
Kalanchoe sp.	Medicine, use as a material during bread preparation
Ricinus communis	Income source, tools for malting, spice for making injera
Cytisus proliferus	Bee and animal fodder, cleaning purpose, soil additive, farming tools, fencing, fuel wood
Acacia sp.	Bee and animal fodder, furniture, income generation, recreation, farming tools (ploughing materials), fencing, medicine, fuel wood
Dodonea angustifolia	Sanitation (cleaning house)
Buddleja polystachya	Bee and animal fodder, furniture, income generation, farming tools, sanitation (cleaning house), fencing, fuel wood
Mentha piperita	Reduced kidney pain, spice for tea and coffee
Rhamnus prinoides	Spice
Hagenia abyssinica	Bee and animal fodder, furniture, income generation, soil additive, farming tools, fencing, medicine, fuel wood
Malus domestica	Bee fodder, income generation, human consumption
Ruta chalepensis	Bee fodder, income generation, spice
Nicotiana tabacum	Income generation

Figure 3. Vegetative of *Solanecio gigas* (Yeshikoko Gomen).

production. Similar results were observed from the studies of Regassa (2016) in Hawassa College of Teacher Education Campus, southern part of Ethiopia and Woldemichael et al. (2018) in Hadiya, southern part of Ethiopia indicating that *Hagenia abyssinica* is the most preferred species for timber production.

Figure 4. Spice plant (*Ruta chalepensis*).

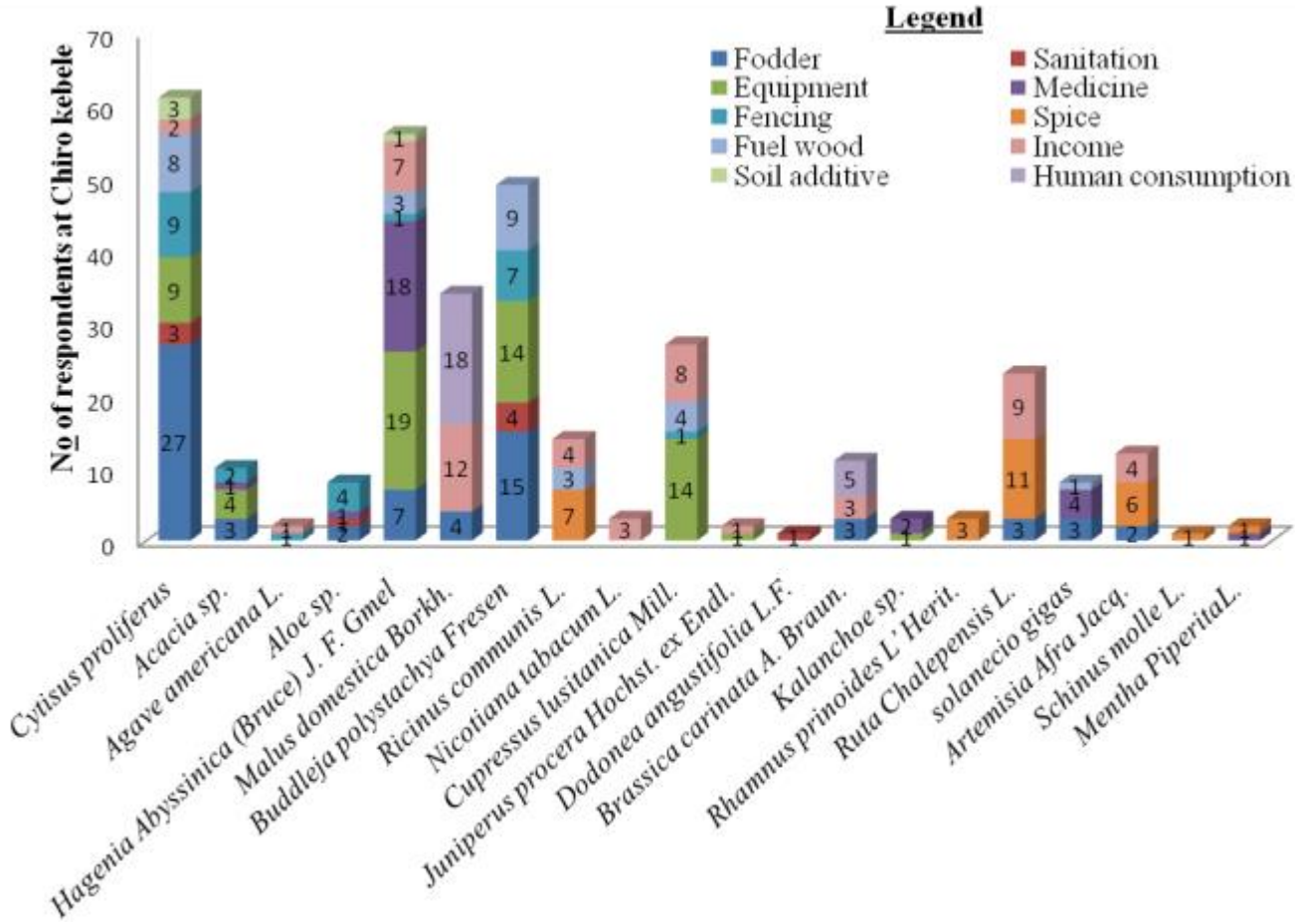

Figure 5. Use of homegarden plants in Legambo district (Chiro kebele), South Wollo, Ethiopia.

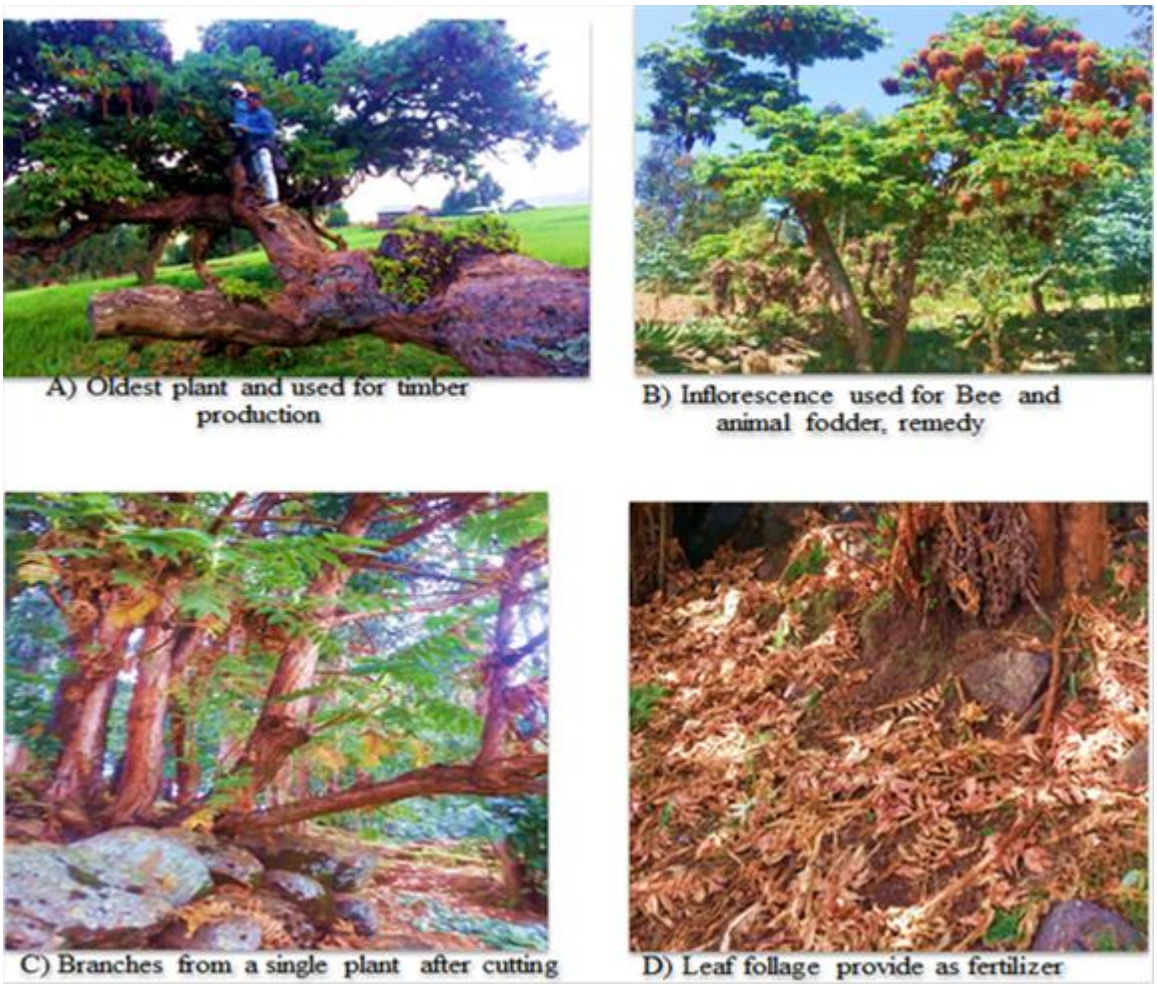

Figure 6. Status of Kosso in homegarden of Chiro kebele, South Wollo of Ethiopia.

Indigenous tree species in homegarden

In the present study, *H. abyssinica* was one of the dominant indigenous tree species next to *Junipers procera*. Out of 75 informants, 32 (42.67%) of them had *H. abyssinica* within the range of 1 to 5 individuals per homegarden. In Chiro kebele, 62 individuals of this species were recorded from 32 informants. In the study area, a maximum of five branches (Figure 6C) was recorded from single seedlings during fieldwork surveys (Figure 6C). According to respondents, the species were cultivated from Chiro nursery site; nevertheless, *H. abyssinica* seedlings were not cultivated in the past about 15 years ago. Especially with native tree species, there is a problem of shortage of seedlings and seeds for planting. The availability of seedling was one of the key problems that limited the interest of the community.

Female informants stated that the species had high marketable value than others, which accounted for around 1500 (ETB) Birr per single *H. abyssinica* stem for furniture production. Similarly, Linger (2014) stated that the homegarden plant significantly improves family financial status, and cash income can be used to buy food, cloth, etc.

Homegarden plants for food security and rehabilitation program

Out of the total informants, 24% of them cultivated the fruit plant *M. domestica* (Apple) and five informants had on average 30 *Brassica carinata* (Kale). According to the respondents, these two species were perennial plants and important for the household food security than the other annual vegetable and fruit plants. Therefore, the agricultural sectors should be creating awareness and giving short and long-term continuous training on vegetables and fruits for the sustainable food security to the majority of the kebele's community.

Similarly, an indigenous plant locally referred as Kosso

Figure 7. Some parts of degraded ecology of Chiro kebele and it needs urgent rehabilitation.

(*H. abyssinica*), and introduced plants commonly known as Tree lucerne (*C. proliferus*), were potentially income earners, adaptable to the ecology and can be successfully cultivated within the homegarden. Informants stated that Kosso and Tree lucerne is the only weapon for improving the highly degraded ecology of Legambo district (Chiro kebele). The study showed that *H. abyssinica* produced a high amount of leaf foliage, which can act as a soil additive to recover the soil fertility (Figure 6D). This indicated that, Kosso and Tree lucerne are ecofriendly tree plants to the studied for the rehabilitation of the degraded ecosystem as shown in Figure 7. The experiences of the community in the kebele clearly show that the degraded area can be easily improved through farming ecofriendly plants. Therefore, governmental sectors and NGOs should be encouraged to participate in the rehabilitation program.

CONCLUSION AND RECOMMENDATIONS

The study indicated that homegarden is a combination of vegetables, fruits and trees used for remedy, animal fodders, human consumption, household and farming tool fabrication, spice, house cleaning, and recreational value for rural families. The study showed that Fabaceae was found to be the most dominant family followed by Rosaceae. Out of the plants identified in this study, two were endemic plant species. *H. abyssinica* is adaptable and conserved in the studied area. Therefore, *H. abyssinica* can successfully meet the agroecological conditions and future use in a rehabilitation program. *M. domestica* and *Brassica carinata* were the two perennial plant families used for household consumption.

Therefore, the studied agroecology is suitable for the production of fruit and vegetable plants. This implied that farming of fruits and vegetables in this region would be desirable. The study indicated that homegardens might become too small to meet future needs. The findings presented here suggest that homegardens can serve future sustainable food security and rehabilitation programs. In future studies, such homegarden practice could be extended to the surrounding ecosystem through a rehabilitation program.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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