

## HOMEGARDENS AND AGROBIODIVERSITY CONSERVATION IN SABATA TOWN, OROMIA REGIONAL STATE, ETHIOPIA

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**ABSTRACT:** Homegardens are repositories of biocultural assets of communities, the hub of plant-based resources and the microcosms of agrobiodiversity hotspots. The homegardens of Sabata, a peri-urban town located in the tepid-humid mid highland agroecological zone of southwest Shewa of Oromia Regional State (Ethiopia), were investigated using standard methods of ethnobotany with the aim of elucidating their diagnostic features and significance in agrobiodiversity conservation. Semi-structured interviews, observations, discussion with key informants and guided garden tour with plant specimen collection and identification constituted the main study methods. The resulting data were subjected to matrix ranking, descriptive statistical analysis and calculations of diversity and similarity indices. One hundred thirty-five plant species of different use categories and life forms, distributed in 110 genera and 58 families were recorded. Each homegarden had an average of 33 species. *Ensete ventricosum*, represented by 18 locally identified landrace clones, was the most frequent (91.60%) species. Among 240 randomly sampled households, 78% had attached homegardens. These homegardens provide sizeable returns in terms of plant material for home use and income generation on top of their ecological and aesthetic values. *Cupressus lusitanica* had the highest relative density (0.02%) among the tree species. An average Shannon-Wiener diversity index of 4.301 indicated the richness of Sabata homegardens in plant agrobiodiversity. These homegardens represent rich compositional, structural and functional diversity playing key roles for on-farm conservation and ensuring environmental well-being while contributing to livelihood support. This rich agrobiodiversity together with the local biocultural knowledge and management skills, backed by household decision-making and information networks of the multiethnic communities are the regulators of the homegarden dynamics. Key desirable actions relevant to Sabata homegardens include enhancement and development programmes that would facilitate climate adaptation efforts and optimize provision of resources with conservation of agrobiodiversity while preserving the local biocultural knowledge.

**Key words/phrases:** Agrobiodiversity, homegardens, local knowledge, Sabata

### INTRODUCCION

Environmental crisis manifests itself in various ways including global warming, desertification and loss of biodiversity, which constrain human livelihoods. The current threats facing biological diversity call for investigations on the aspects of conservation of the natural resources of an environment (FAO, 1983) and in this, agrobiodiversity has a great significance. The term agrobiodiversity specifies the variety and variability of plants, animals and microorganisms that are indispensable for sustaining key functions of the agroecosystem, comprising of its structure and processes for, and in support of food production and security (FAO, 2004). The term homegarden refers to the traditional land

use system around a homestead, where several species of plants are grown and maintained by household members and their products are primarily intended for consumption by the family (Shrestha *et al.*, 2002). The last couple of decades have testified an increasing worldwide interest in homegardens, bringing to light their potential for sustained subsistence farming and biodiversity conservation (Christanty, 1990). At present, homegardens are wide-spread in the tropical and subtropical regions of Asia (Godbole, 1998), Africa (Okigbo, 1990) and Central and South America (Padoch and De Jong, 1991).

In parts of Ethiopia, homegardens and other traditional agroforestry systems are found in a complex state like in the enset-based homegar-

dens (Zemedede Asfaw, 2004) and the homegarden agroforestry systems of southern and south-western Ethiopia (Tesfaye Abebe, 2005; Tesfaye Abebe *et al.*, 2010). One of the most vital functions that homegardens serve is intergenerational preservation and perpetuation of agrobiodiversity and indigenous knowledge on farming and useful plants (Zemedede Asfaw and Zerihun Woldu, 1997). The pivotal role of indigenous knowledge in the management of agrobiodiversity (Martin, 1995; Grenier, 1998) has brought about the realization that conservation of agrobiodiversity leads to preservation of indigenous knowledge promoting the well-being of indigenous local communities (Martinet and McNeely, 1992).

The homegardens in Ethiopia were earlier covered in studies of agricultural systems (Westphal, 1975), which alluded to their contributions to food production and maintenance of species. Limited studies are available that directly focus on Ethiopian homegardens (e.g. Zemedede Asfaw and Ayele Nigatu, 1995; Zemedede Asfaw, 1997, 2001a, b) and their specific aspects in certain localities of the country viz., Wolaita and Gurage (Zemedede Asfaw and Zerihun Woldu, 1997), Bonga (Feleke Woldyes, 2000), Arbaminch area (Belachew Wassihun *et al.*, 2003), Sidama (Tesfaye Abebe, 2005) and Wolaita (Talemos Seta, 2007). Zemedede Asfaw and Ayele Nigatu (1995) elaborated that traditional homegardens of Ethiopia demonstrate a sustainable agricultural practice that is environmentally friendly and allows the harvesting of diverse products in response to the needs of farming families and urban dwellers. Various researches have shown that homegardens and other traditional agroforestry systems share similar attributes and can best be studied through application of qualitative and quantitative ethnobotanical research approaches. The homegardens of Sabata have not been ethnobotanically investigated. The general trend in the loss of and threat to agrobiodiversity in Ethiopia and the prevailing research gaps were the driving factors that initiated this study on plant diversity and conservation practices in Sabata town. The study was particularly designed to make inventory of the various plant species in the homegardens, and to see how households conserve agricultural biodiversity in this farming system.

## MATERIALS AND METHODS

### *The study area*

The study was conducted between November 2007 and March 2008 in Sabata, a peri-urban township and the capital of Sabata Awas District (formerly called Alamganaa District) in Southwest Shewa Zone, Oromia Regional State, Ethiopia (Fig.1). It is located within the geographic co-ordinates of 08°41'54"N (961500 m N) to 09°1'9"N (997000 m N) latitude and 038°27'15"E (440000 m E) to 038°43'38"E (470000 m E) longitude and at a distance of 24 km southwest of Addis Ababa between the altitudinal ranges of 2195 and 2300 m.a.s.l. The town is posited within the range of the afro-montane forest and the tepid-humid mid highland agro-ecological zone (MOA, 2002) with a mean annual rainfall of 955 mm, the highest and lowest records being in July and November, respectively. The mean maximum and minimum temperatures are 22°C and 10°C, respectively. The soils of the study area, as reported in OUPI (2008), are basically derived from Mesozoic sedimentary and Cenozoic volcanic rocks; the major soil types are Chromic and Pellic Vertisols (76.1%) and Chromic and Orthic Luvisols (23.9%). Elements of the natural vegetation are merely noticeable from the limited remnant trees of *Ficus* spp. and *Olea europaea* ssp. *cuspidata* left for shade, on fences and in some secluded places. *Eucalyptus* trees/plantations are observed on hilly areas, in open spaces and in homestead compounds as also reported by OUPI (2008). Sparsely scattered naturally growing vegetation consisting of shrubs, bushes, woody riverine species are found along with planted trees and protected government and community forests in the Sabata Awas District (RSIC, 2006).

In 2007 the population of the town was 56,131 (49.64% male, 50.36% female) belonging to different ethno-linguistic groups including the Oromo, Amhara, Gurage, Silte, Tigrie, Wolaita, Dorzie, Gamo, Goffa, Konta, Dawro and others (CSA, 1994; 2008). In this relatively small town, such diverse groups are living together in harmony under dynamic transfer and mix of local knowledge and traditional practices relevant for maintenance of homegarden agrobiodiversity.

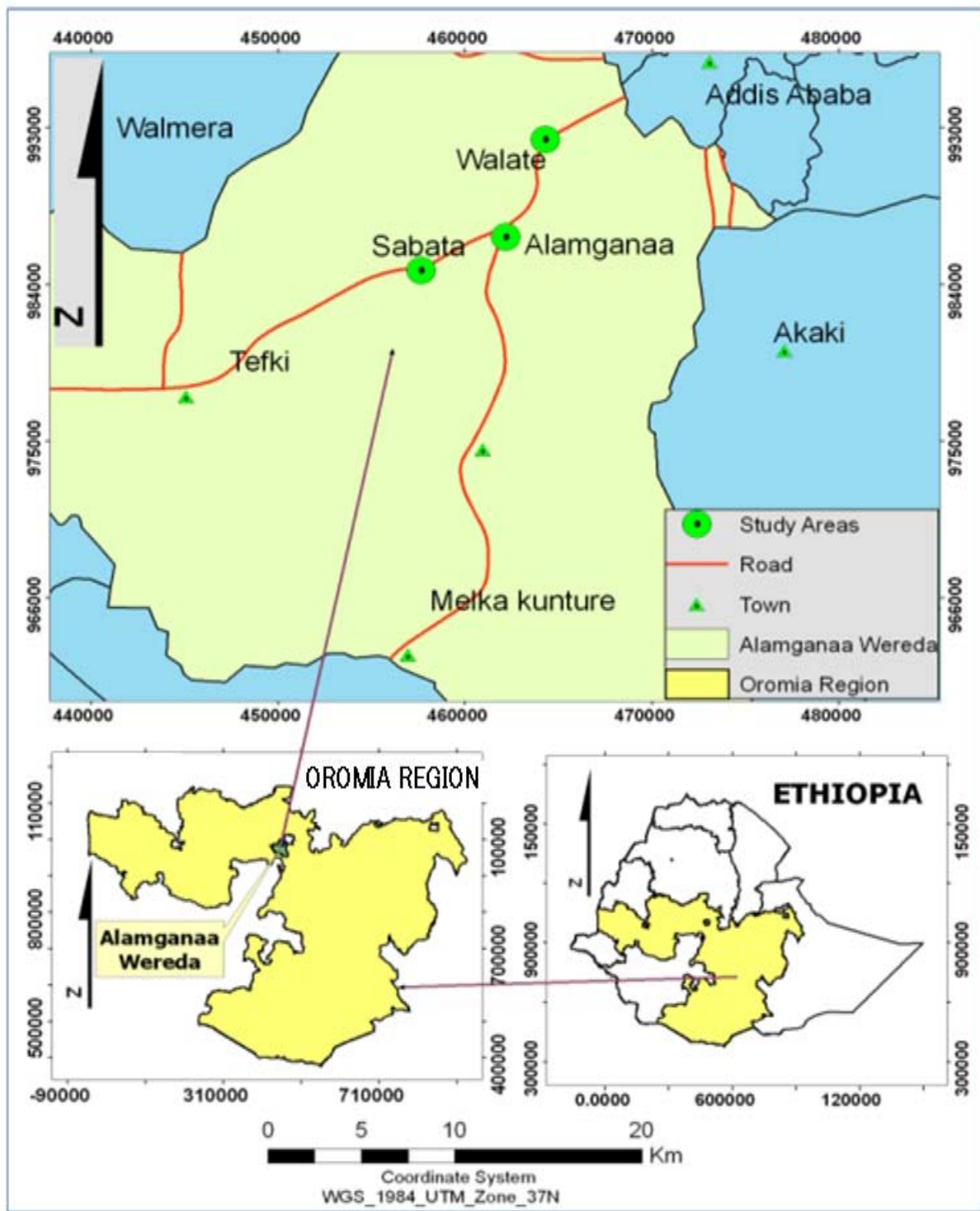


Fig. 1. Location map of the study area (drawn from Ethio GIS Data).

*Selection of homegardens*

A reconnaissance survey was undertaken in Sabata town during which six research sites were identified in three Kebeles namely, Kebele-01, Kebele-02 and Kebele-03. This was followed by observation of randomly picked households and

scoring 240 (80 houses in each Kebele) for presence or absence of associated gardens. Based on a preliminary survey of the homegardens, which indicated that 78% of the households practiced homegardening, 24 well-managed homegardens (eight in each Kebele, four each

from the north-western and south-eastern parts of the town crossing the Addis Ababa-Jimma highway) were preferentially selected for detailed study. Permission of the owners of homegardens was secured after explaining the purpose of the study and assuring them of the ethical use of the results for academic matters.

#### *Sampling and data collection*

Sample plots of 10 m x 10 m (100 m<sup>2</sup>) were delimited in the study area giving a total of 24 quadrats (2400 m<sup>2</sup>). Plant specimens collected from the homegardens were identified with reference to the volumes of the "Flora of Ethiopia and Eritrea" and by comparing them with the authenticated specimens housed at the National Herbarium (ETH), Addis Ababa University (AAU) and further confirmation by taxonomic experts. Ethnobotanical techniques were employed for data gathering using semi-structured interviews, observations, discussion, guided garden tour with key informants, informants' consensus and direct matrix ranking following standard ethnobotanical methods (Martin, 1995; Alexiades, 1996; Phillips, 1996). Ten key informants were asked to prioritize six tree species based on six use criteria applying the procedure for direct matrix ranking.

#### *Data analysis*

Data analysis followed descriptive statistical methods, frequencies, relative frequencies, densities, relative densities, Shannon and Wiener (1949) index of species diversity, and Sørensen's similarity coefficients (Kent and Coker, 1992). Shannon and Wiener (1949) index was applied to quantify species diversity and richness using the formula:  $H' = -\sum (P_i \ln P_i)$ , where "H" is the Shannon-Wiener Diversity Index, "P<sub>i</sub>" is the ratio of a species average to the total species average and "ln" is the natural logarithm. The diversity of each cluster was calculated using this index based on the frequency of species as input source. Sørensen's coefficient of similarity (S<sub>s</sub>) is defined using the formula:  $S_s = 2a / 2a + b + c$ , where S<sub>s</sub> = Sørensen's similarity coefficient, a = number of species common to quadrats, b = number of species in quadrats 1 and c = number of species in quadrat 2. This similarity index was used to measure the degree to which the species composition of quadrats in a cluster of homegardens are alike. The possible coefficient

values range from 0 (complete dissimilarity) to 1 (total similarity) (Kent and Coker, 1992).

## RESULTS AND DISCUSSION

### *Agrobiodiversity of Sabata homegardens*

A total of 135 plant species belonging to 110 genera and 58 families were recorded from homegardens of the study area. In terms of the number of plant species that homegardens contain, the Fabaceae constituted the largest number with 13 species (Appendix 1); the Lamiaceae and Asteraceae had 9 each, Rutaceae, Rosaceae and Solanaceae 6 each, and Moraceae and Myrtaceae 5 each ranking second, third and fourth respectively. The data on plant composition of homegardens indicated that the area has floristic richness and included plant species from diverse genera and families. This fits well with the assertion that homegardens are valuable sources of plant agrobiodiversity (Brookfield, 2001).

Plant species with the highest relative frequencies of occurrence included *Ensete ventricosum* followed by *Rosa hybrida* and *Vernonia amygdalina* (Table 1). The sustainable use of plant genetic resources in agriculture is inseparable from agrobiodiversity conservation. Homegardens are vivid examples of production systems with rich diversity that serves both development and conservation functions (Eyzaguirre and Watson, 2002). Das and Das (2005) further advocated that homegardens are the sites of conservation of a large diversity of plants both wild and domesticated, because of their uses to the households. *Ensete ventricosum* is an indigenous root crop cultivated and processed for human food as a principal carbohydrate source only in Ethiopia (Brandt, 1996); it has key position in some homegardens in the country as a dominant species (Tesfaye Abebe, 2005). It is the most frequently maintained crop in the homegardens of the study area for being culturally popular as food source. Other than cultivating crops for their food values, homegarden owners also grow ornamental plants like *Rosa hybrida* for their recreational and aesthetic uses and utility plants such as *Vernonia amygdalina* for household services. Such miscellaneous uses of homegarden plants have positive implications for maintaining the agrobiodiversity of the area.

**Table 1. Plant species with the highest frequencies of occurrence in the homegardens of Sabata.**

Scientific name	% Frequency	Relative frequency (%)
<i>Ensete ventricosum</i>	91.60	2.71
<i>Rosa hybrida</i>	87.50	2.59
<i>Vernonia amygdalina</i>	87.50	2.59
<i>Cupressus lusitanica</i>	75.00	2.22
<i>Cyperus alternifolius</i>	70.83	2.09
<i>Nephrolepis undulata</i>	70.83	2.09
<i>Ruta chalepensis</i>	70.83	2.09
<i>Dovyalis caffra</i>	66.60	1.97
<i>Lippia adoënsis var koseret</i>	66.60	1.97
<i>Persea americana</i>	62.50	1.85
<i>Rhamnus prinoides</i>	62.50	1.85

From the total of 39 tree species identified in this study from 24 sample quadrats (2400 m<sup>2</sup>), *Cupressus lusitanica* came out as the most represented with 1500 individuals (1.6 plants per m<sup>2</sup>) and has the highest relative density (0.02) followed by *Eucalyptus camaldulensis* with a total number of 1125 individuals and relative density of 0.01. *Cupressus lusitanica* is the most represented, but it is not placed in farmers ranking because of minimal relative benefits obtained from it. The reasons behind its being frequent could be related to availability of free or cheap seedlings for planting in addition to promotion by agricultural development agents. The species is one of the most widely propagated exotic trees in government forestry research during the past

years. Some tree species had high number of individuals (Table 2) while the others had from 1–34 individuals.

Computation of homegarden species diversity revealed a Shannon-Wiener diversity index greater than 4.00 in the six sites. Sites S<sub>1</sub> and A<sub>4</sub> are the most diversified with diversity indices of 4.357 next to site W<sub>5</sub> (H' = 4.394). Relatively smaller diversity indices were found in the cases of S<sub>2</sub> and W<sub>6</sub> sites with H' = 4.290 and H' = 4.234, respectively, the lowest of all being in A<sub>3</sub> (H' = 4.174). Sites W<sub>5</sub> and A<sub>3</sub> have the highest and smallest number of species, respectively (Table 3). In addition, the results show very little (<50%) floristic similarity coefficients (Table 4).

**Table 2. Tree species with the highest number of individuals, densities and relative densities of occurrence in Sabata homegardens.**

Scientific name	Number individuals	Density	Relative Density (%)
<i>Cupressus lusitanica</i>	1500.000	0.625	0.019
<i>Eucalyptus camaldulensis</i>	1125.000	0.469	0.014
<i>Persea americana</i>	63.000	0.026	0.001
<i>Eucalyptus globulus</i>	58.000	0.024	0.001
<i>Casimiroa edulis</i>	53.000	0.022	0.001
<i>Juniperus procera</i>	41.000	0.017	0.001

**Table 3. Shannon-Wiener Diversity Index (H') for the six study sites in Sabata town.**

Research sites	Species richness	Shannon's index (H')
S <sub>1</sub>	78	4.357
S <sub>2</sub>	73	4.290
A <sub>3</sub>	65	4.174
A <sub>4</sub>	78	4.357
W <sub>5</sub>	81	4.394
W <sub>6</sub>	69	4.234
Mean	74	4.301

S<sub>1</sub> and S<sub>2</sub> are study sites in Kebele 01, A<sub>3</sub> and A<sub>4</sub> in Kebele 02 and W<sub>5</sub> and W<sub>6</sub> in Kebele 03.

**Table 4. Sørensen's similarity index for plant species composition in the cluster of homegardens.**

Cluster of homegardens	S <sub>1</sub>	S <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	W <sub>5</sub>	W <sub>6</sub>
S <sub>1</sub>	1.00					
S <sub>2</sub>	0.40	1.00				
A <sub>3</sub>	0.38	0.39	1.00			
A <sub>4</sub>	0.40	0.41	0.41	1.00		
W <sub>5</sub>	0.38	0.40	0.38	0.43	1.00	
W <sub>6</sub>	0.35	0.38	0.37	0.40	0.42	1.00

S<sub>1</sub> and S<sub>2</sub> are study sites in Kebele 01, A<sub>3</sub> and A<sub>4</sub> in Kebele 02 and W<sub>5</sub> and W<sub>6</sub> in Kebele 03.

According to Shaw (2003), the first and most obvious measurement to make is the species richness (*i.e.*, the count of the total number of species within the sample) which is a valid index of diversity in its own right. The lower species diversity indices that were recorded at sites S<sub>2</sub>, A<sub>3</sub> and W<sub>6</sub> may be related to the on-going trend of shifting the polycultural gardening practices towards few income generating food crops including cabbage, carrot, lettuce, garlic, onion and tomato. Similarity values above 0.40 may indicate slight similarity in agroecology and transfer of knowledge while lower values indicate uniqueness and localized identities among gardens and households.

#### *Factors that influence plant composition in Sabata homegardens*

The composition of plant species in the homegardens of the study area is affected by different factors. The seven major ones are given in Table 5 along with the frequencies for 51 homegarden owners who identified on average more than two factors, which they considered relevant in affecting plant composition in their gardens. The results also show that availability of water, socio-economic conditions and homegarden size are the top three factors. The low availability of water or a decreasing rainfall pattern during the dry spell is the major factor affecting off-season production of their garden crops and for the reduction of plant diversity in general. This finding directly corroborates with those of Padoch and de Jong (1991), Zemedu Asfaw (1997) and Talemso Seta (2007) who found that the diversity of plant species in homegardens and in many environments is limited by the availability of adequate water.

In contrast to the polycultural cropping nature of homegardens, the emphasis being given by some households to the production of income generating sole vegetable crops could be the second major factor (socio-economic factor) for

waning plant diversity in some homegardens of the area. This finding agrees with an earlier report by Talemso Seta (2007) who indicated that homegarden plants/crops were being replaced by some cash crops in order to get better cash income in return. As Sabata is a peri-urban town situated near a cosmopolitan centre with very large population (Addis Ababa), the demand for fresh vegetables is very high and the sizes of most gardens are relatively large but production is concentrating on few cash crops. However, some gardeners complained about the smaller sizes of their gardens that limit cultivation of diverse taxa of food and non-food crops. Moreover, there is a declining trend in garden size as land is taken for construction of additional houses for renting. The demand for houses is increasing because of population growth, urbanization and intensification of investment activities and this could be another constraint on the richness of plant diversity. In this regard, Zemedu Asfaw (1997) described that garden space tends to reduce due to urbanization and population growth.

**Table 5. Factors that affect homegarden plant diversity as reported by homegarden owners in Sabata town.**

Factors	Frequency	% of respondents
Water availability	31	60.8
Socio-economic condition	22	43.1
Homegarden size	19	37.3
Agricultural input support (seed/seedling provision)	15	29.4
Homegarden handling	11	21.6
Crop pests	8	15.7
Lack of awareness	3	5.9

Even though there are some efforts being undertaken in promoting homegardening in the area, the agricultural input support (seed/-seedling provision) dispensed by governmental or non-governmental sectors is minimal. These agencies provide some indigenous and alien

plant species, which would enrich the diversity of homegarden plants. Though dependence on donations from the government and NGOs is not a viable and sustainable solution, intermediate forms such as the purchase of inputs (high quality vegetable seed, fencing material) at subsidized prices from government agencies may be preferable (Frankenberger *et al.*, 1989). The occurrence of pests, which destroy the seedlings of edible and non-edible plant species that are used for market and home consumption, is also another detrimental factor. Since chemical pest control is not a viable alternative in smallholder cropping systems (homegardens), information is required on crop and species combinations with a greater potential to reduce pests, diseases and weeds. Investigation of the effectiveness of the plant species with anti-pest properties used by the Chagga people in Tanzania (Fernandes *et al.*, 1984) showed that they were used as a first step protection, indicating potential uses of indigenous knowledge. Households in Sabata and beyond can apply plants such as *Croton macrostachyus* used in traditional protection against insects, mites, ticks, and nematodes.

#### Local homegarden management practices

A number of local management practices are carried out in the homegardens of the study area and the maintenance of diverse taxa of plants is one among the major endeavours. From a total of 135 species identified in the present study, the maximum number of species per garden was 57, the minimum 13, and the average 33 (23.61 %). Rich diversity of plant species in the homegardens has been made possible by cultivating and protecting a mixture of herbs, lianas, shrubs and trees based on the need and decision of the family members. Belachew Wassihun *et al.* (2003) reported similar findings. Management activities are carried out with minimal ecological cost due to the low utilization of chemical inputs. Soil enrichment is maintained by including leguminous species among the crops cultivated and by incorporating organic fertilizers such as house refuses, animal manures and crop residue. This observation goes in line with findings reported by previous researchers (Zemedu Asfaw, 1997; Belachew Wassihun *et al.*, 2003; Talemoss Seta, 2007). Garden pests like termites that damage tuber crops such as *Solanum tuberosum* are controlled by the application of wood ash to the soil according to garden owners. Sprinkling a little wood ash around the base of young plants, and also lightly on new leaf growth is known to

deter insects and fungi (FAO, 2001). Seed selection is also carried out by homegarden owners based on the colour of seeds, maturity, crop yield, quality, disease and drought resistance.

#### Indigenous knowledge on homegarden plant use

Some homegarden owners of the study area have a profound local knowledge on the classification scheme and processing of *Ensete ventricosum*. They stated that the plant is a multipurpose crop that is used for food, medication, cordage and wrapping of materials. Talemoss Seta (2007) captured similar perception with regards to the functions of this valuable crop. The corm (the swollen underground stem base) of a mature plant is chopped, cooked and eaten. Leaf sheaths (pseudostems) are scraped by skilled women and are used for Bulla porridge; the chopped and grated pulp of the corms and leaf sheaths is fermented and used as flour in making Kocho bread (as baked flat cake). Some gardeners of the area, particularly those of the Gurage community, suggested that there are about 70 landrace varieties (clones) of *Ensete ventricosum*. Eighteen landrace clones (farmers' varieties) of this nutritionally and culturally valued crop plant identified by the owners of homegardens are given in Table 6 along with their uses.

**Table 6. Landraces (farmers' varieties/clones) of *Ensete ventricosum* recognized by the households interviewed in Sabata town, Walate 03 Kebele.**

Local variety name in Ežhe (Gurage) language	Use
Agadie	Food, Fibre, Fodder
Ankefye	Food, Fibre, Fodder
Astara	Food, Fibre, Fodder, Medicinal
Badediet	Food, Fibre, Fodder
Beneshe	Food, Fibre, Fodder
Chehuye	Food, Fibre, Fodder
Cheswe	Food, Fibre, Fodder
Deriye	Food, Fibre, Fodder, Medicinal
E'herye	Food, Fibre, Fodder
E'kuafye	Food, Fibre, Fodder
Fereziye	Food, Fibre, Fodder
Guariye	Food, Fibre, Fodder, Medicinal
K'ebben	Food, Fibre, Fodder, Medicinal
Kembat	Food, Fibre, Fodder
Netch'we	Food, Fibre, Fodder
Shertye	Food, Fibre, Fodder, Medicinal (for cattle)
Yehereye	Food, Fibre, Fodder
Yehirafereye	Food, Fibre, Fodder

Ežhe is the language spoken by the Sebatbet Gurage ethnolinguistic community of the Gurage people in Ethiopia.

Households in Sabata reported using all these clones for human food, fibre source and as fodder for domestic animals while using five of these additionally as traditional medicines (Table 6). Some of these varieties are included in the list of clones from Sodo and Butajira Districts in the paper by Asnaketch Woldetensaye and Linden (1997).

#### *Local perception and uses of trees around homesteads*

In addition, people of the study area have the tradition of using various tree species found in their homegardens for different purposes viz., construction, implements, firewood, shade, compound enclosures and for their therapeutic use. The results of 10 key informants direct matrix ranking for six tree species based on six use criteria is given in Table 7. Accordingly, *Eucalyptus globulus* with a total score of 240 (19.05%) ranked first. *Acacia abyssinica* and *Juniperus procera* with 233 (18.49%) and 226 (17.94%) constituted the second and third positions, in that order. The maximum scores per use criterion were given to *Eucalyptus globulus* and *Cordia africana* (59 each) concerning their uses for construction and implements, respectively followed by *Croton macrostachyus* with the score of 58 for its medicinal use. Indigenous trees ranked at the top except *Eucalyptus globulus*, which is an introduced but very useful tree species, albeit claims that it exerts negative ecological impacts on the undergrowth of other plant species and on soil water availability, especially in dry areas (Poore and Fries, 1985). Regardless of this, it is a

widely used tree in the study area as well as in many parts of the country for construction since it is a fast growing tree with desirable bole. Moreover, *Cordia africana* is also the most preferred tree species for implements/tools as it can be shaped and carved easily into different forms.

#### *Environmental contributions of Sabata homegardens*

Observations made in the area during the fieldwork brought up the tremendous environmental contributions of the homegardens. They render the environment suitable for life by reducing the deleterious effects of extreme wind, temperature, dust and improving the quality of life in general. Trees in the homesteads also provide good services by intercepting dust and other undesirable visitors. The contributions of homegardens of the study area to the sustenance of the general environment cannot be overemphasized. In this connection, Kuchelmeister and Braatz (1993) underlined that garden plants help to remove pollutants from the air through absorption by the leaves or the soil surface, deposition of particulates and aerosols on leaf surfaces and fallout of particulates on the leeward (downwind) side of the vegetation because of the slowing of air movement. Parallel to this assertion, the homegardens of Sabata are offering and will continue to offer relevant environmental services on top of their values in the provision of needed resources and aesthetic values. Homegardening deserves encouraging and promoting in Sabata and beyond.

**Table 7. Results of ten key informants' direct matrix ranking for six tree species encountered in homegardens (6, best; 1, least).**

Use criteria	Tree species					
	<i>Cordia africana</i>	<i>Croton macrostachyus</i>	<i>Eucalyptus globulus</i>	<i>Juniperus procera</i>	<i>Acacia abyssinica</i>	<i>Acacia mearnsii</i>
Construction	32	15	59	49	21	34
Implements	59	30	18	37	45	21
Fuel wood	30	18	48	17	55	42
Shade	50	31	14	30	53	32
Live fence	27	20	49	53	30	31
Medicine	19	58	52	40	29	12
Total score	217	172	240	226	233	172
Rank	4	5	1	3	2	5



## CONCLUSION

The floristic composition of Sabata homegardens showed that the homegardens are rich (135 species) in plant diversity. Local management practices are customarily performed in the homegardens where households endeavour to maintain diverse plant taxa. They cultivate and protect a mixture of herbs, lianas, shrubs and trees depending on the need and decision of households. Different factors including availability of water, socio-economic conditions and homegarden size affect plant composition of Sabata homegardens. A deep-rooted local knowledge is also apparent from the practices of homegarden owners on taxonomic schemes applied to *Ensete ventricosum* and processing of its products. The local knowledge and management practices shaped over centuries can be lost unless thoughtful attention is given and proper documentation is put in place. Homegarden system, as practiced traditionally, is organic in nature and its environmental soundness is well recognized. However, to safeguard agricultural biodiversity of Sabata and beyond a timely intervention should be undertaken against the threat of commercialization and the trend in pondering on high value crops utilizing high chemical inputs (fertilizers and pesticides). There is a clear need for drawing attention to the biodiversity resources of the area and the maintenance and enhancement of homegardens.

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Appendix 1. List of plant species of Sabata homegardens. (Note: O=Afan Oromo, A=Amharic, G=Gurage, T=Tigrigie, NLN=No local name)

Scientific name	Family	Vernacular Name (Language)	Habit	Number of individuals of tree species
<i>Acacia abyssinica</i> Hochst.ex Benth.	Fabaceae	Lafto (O)	Tree	15
<i>Acacia meurnsii</i> De Willd.	Fabaceae	Yetmja-zaf (A)	Tree	12
<i>Acacia melanoxylon</i> R.Br.	Fabaceae	Omedlla (A)	Tree	1
<i>Agave americana</i> L.	Agavaceae	Qacha (A)	Herb	
<i>Ajuga integrifolia</i> Buch.-Ham. ex D. Don	Lamiaceae	Armaguusaa (O, A)	Herb	
<i>Albizia schimperiana</i> Oliv. var. <i>schimperiana</i>	Fabaceae	Mukka-arba (O)	Tree	1
<i>Allium cepa</i> L.	Alliaceae	Qullubbi-diiimaa (O)	Herb	
<i>Allium sativum</i> L.	Alliaceae	Quulubii-adii (O)	Herb	
<i>Aloe pubescens</i> Reynolds	Aloaceae	E'ret (A)	Herb	
<i>Annona cherimola</i> Mill.	Annonaceae	Gishta (A)	Tree	10
<i>Artemisia absinthium</i> L.	Asteraceae	Arrittii (O)	Herb	
<i>Artemisia afra</i> Jacq. ex Willd.	Asteraceae	Jukkum (O)	Herb	
<i>Arundo donax</i> L.	Poaceae	Shambako (O)	Herb	
<i>Asparagus africanus</i> Lam.	Asparagaceae	Seriti (A)	Herb	
<i>Begonia cucullata</i> Willd.	Begoniaceae	NLN	Herb	
<i>Begonia rex-cultorum</i> Hort.	Begoniaceae	NLN	Herb	
<i>Beta vulgaris</i> L.	Chenopodiaceae	Qosta (A)	Herb	
<i>Bidens nueppellii</i> (Sch. Bip. ex Walp.) Sherff	Asteraceae	Kello (O), Adey-abebe (A)	Herb	
<i>Bougainvillea x buttiana</i> Holtum and Standl.	Nyctaginaceae	Bugambe (A)	Liana	
<i>Bougainvillea glabra</i> Choisy	Nyctaginaceae	Bugambe (A)	Liana	
<i>Brassica carinata</i> A. Br.	Brassicaceae	Yeguragie gomen (A)	Herb	

Appendix 1 (continued)

Scientific name	Family	Vernacular Name (Language)	Habit	Number of individuals of tree species
<i>Brassica oleracea</i> L.	Brassicaceae	Goommana (O)	Herb	
<i>Brassica oleracea</i> L. var. <i>capitata</i>	Brassicaceae	Tql-gomen (A)	Herb	
<i>Buddleja davidii</i> Franch.	Loganiaceae	Necho (A)	Shrub	
<i>Caesalpinia decapetala</i> (Roth) Alston	Fabaceae	Arangamaa (O)	Liana	
<i>Callistemon citrinus</i> (Curtis) Skeels	Myrtaceae	NLN	Tree	
<i>Calpurnea aurea</i> (Ait.) Benth.	Fabaceae	Ceekaa (O)	Shrub	
<i>Canna indica</i> L.	Cannaceae	Siet-akuri (A)	Herb	
<i>Capsicum annuum</i> L.	Solanaceae	Barbaree (O)	Herb	
<i>Carissa spinarum</i> L.	Apocynaceae	Hagama (O)	Liana	
<i>Casimiroa edulis</i> La Llave	Rutaceae	Shasho (A), Kazmir (O, A)	Tree	53
<i>Catha edulis</i> (Vahl) Forssk. ex Endl.	Celastraceae	Cati (O)	Shrub	
<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	NLN	Shrub	
<i>Citrus aurantifolia</i> (Christm.) Swingle	Rutaceae	Lomii(O)	Shrub	
<i>Citrus aurantium</i> L.	Rutaceae	Komtatie (A)	Shrub	
<i>Citrus medica</i> L.	Rutaceae	Trngo (A)	Shrub	
<i>Citrus sinensis</i> (L.) Osb.	Rutaceae	Burtukana (O)	Shrub	
<i>Coffea arabica</i> L.	Rubiaceae	Buna (O, A, G)	Shrub	
<i>Colocasia esculenta</i> (L.) Schott	Araceae	Godaaree (O)	Herb	
<i>Commelina</i> sp.	Commelinaceae	Hoolaa-gabbis (O)	Herb	
<i>Cordia africana</i> Lam.	Boraginaceae	Wedecha (O)	Tree	12
<i>Crinum abyssinicum</i> Hochst. ex A. Rich.	Amarylidaceae	Yejb-shnkurt (A)	Herb	
<i>Croton macrostachyus</i> Del.	Euphorbiaceae	Bakkannisa (O)	Tree	14
<i>Cucurbita pepo</i> L.	Cucurbitaceae	Dabaaqula (O)	Climber	
<i>Cupressus lusitanica</i> Mill.	Cupressaceae	Gatira (O)	Tree	1500

Appendix 1 (continued)

Scientific name	Family	Vernacular Name (Language)	Habit	Number of individuals of tree species
<i>Cymbopogon citratus</i> (Dc.) Stapf	Poaceae	Tej-sar (A)	Herb	
<i>Cyperus alternifolius</i> L.	Cyperaceae	Quietema (A)	Herb	
<i>Cyperus</i> sp.	Cyperaceae	Qunnii (O)	Herb	
<i>Dahlia pinnata</i> Cav.	Asteraceae	NLN	Herb	
<i>Datura stramonium</i> L.	Solanaceae	Asangiraa (O)	Herb	
<i>Daucus carota</i> L.	Apiaceae	Kaarota (O)	Herb	
<i>Dodonaea angustifolia</i> L. f.	Sapindaceae	Ktkkta (A, G)	Shrub	
<i>Dovyalis caffra</i> (Hook. f. and Harv.) Hook. f.	Flacourtiaceae	Koshommii (O)	Shrub	
<i>Dracaena steudneri</i> Engl.	Dracaenaceae	Yuka (A)	Yuka (A)	15
<i>Ensete ventricosum</i> (Welw.) Cheesman.	Musaceae	Kocho (A), Aset (G)	Herb	
<i>Erythrina brucei</i> Schweinf.	Fabaceae	Korch (A)	Tree	6
<i>Eucalyptus camaldulensis</i> Dehnh.	Myrtaceae	Baarzaafii diimaa (O)	Tree	1125
<i>Eucalyptus globulus</i> Labill.	Myrtaceae	Tree	Tree	58
<i>Euphorbia inaequilatera</i> Sond.	Euphorbiaceae	NLN	Herb	
<i>Euphorbia milii</i> Des Moulins	Euphorbiaceae	Ye' aklil-eshoh (A)	Shrub	
<i>Ficus elastica</i> Roxb.	Moraceae	Yegoma-zaf (A)	Tree	4
<i>Ficus populifolia</i> Vahl	Moraceae	Yekebrit-inchet (A)	Tree	4
<i>Ficus sur</i> Forsk.	Moraceae	Harbu (O)	Tree	2
<i>Ficus thonningii</i> Blume	Moraceae	Dembi (O)	Tree	2
<i>Foeniculum vulgare</i> Mill.	Apiaceae	Insilaala (O)	Herb	
<i>Gomphocarpus fruticosus</i> (L.) Ait. f.	Asclepiadaceae	NLN	Herb	
<i>Grevillea robusta</i> R. Br.	Proteaceae	Gravillia (O, A, G)	Tree	26

## Appendix 1 (continued)

Scientific name	Family	Vernacular Name (Language)	Habit	Number of individuals of tree species
<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	NLN	Shrub	
<i>Hagenia abyssinica</i> (Bruce) J. F. Gmel.	Rosaceae	Heexoo (O)	Tree	5
<i>Hyphaene thebaica</i> (L.) Mart.	Areaceae	Peakcock-zenbaba (A)	Tree	17
<i>Iresine herbstii</i> Hook. f.	Amaranthaceae	NLN	Herb	
<i>Jacaranda mimosifolia</i> D. Don.	Bignoniaceae	Yetemnja zaf (A)	Tree	20
<i>Juniperus procera</i> Hochst. ex Endl.	Cupressaceae	Gaattiraa (O), Ye' Abesha tseed (A)	Tree	41
<i>Justicia schimperiana</i> (Hochst. ex Nees) T. Anders.	Acanthaceae	Dhummugaa (O)	Shrub	
<i>Lactuca sativa</i> L.	Asteraceae	Selata (A)	Herb	
<i>Lepidium sativum</i> L.	Brassicaceae	Feechoo (O)	Herb	
<i>Leucanthemum vulgare</i> Lam.	Asteraceae	NLN	Herb	
<i>Lippia adoënsis</i> Hochst. ex Walp. var. <i>koseret</i> Sebsebe	Verbenaceae	Kusaye (O), Koserete (A)	Shrub	
<i>Liqustrum vulgare</i> L.	Oleaceae	Yeterse-mefakia (A)	Shrub	
<i>Lycopersicon esculentum</i> Mill.	Solanaceae	Timatimi (O)	Herb	
<i>Malus sylvestris</i> Miller	Rosaceae	Applii / Pomii (O)	Tree	27
<i>Mangifera indica</i> L.	Anacardiaceae	Mango (O, A, G)	Tree	28
<i>Melia azedarach</i> L.	Meliaceae	Neem (A)	Tree	1
<i>Mentha longifolia</i> (L.) Hudson	Lamiaceae	Samhal (T)	Herb	
<i>Mentha spicata</i> L.	Lamiaceae	Nana (A)	Herb	
<i>Milletia ferruginea</i> (Hochst.) Bak.	Fabaceae	Hortessa (O)	Tree	1
<i>Morus alba</i> L.	Moraceae	Njorie (A)	Tree	5
<i>Musa x paradisiaca</i> L.	Musaceae	Muzii (A)	Herb	
<i>Myrtus communis</i> L.	Myrtaceae	Ades (A, G)	Shrub	
<i>Nephrolepis undulata</i> (Afz. ex Sw.) J. Sm.	Nephrolepidaceae	Zenbaba abeba (A)	Herb	

Appendix 1 (continued)

Scientific name	Family	Vernacular Name (Language)	Habit	Number of individuals of tree species
<i>Nicotiana tabacum</i> L.	Solanaceae	Timibo (O)	Herb	
<i>Ocimum basilicum</i> L.	Lamiaceae	Besobilla (A)	Herb	
<i>Ocimum lamifolium</i> Hochst. ex Benth.	Lamiaceae	Koricha-michii(O), Yeken-damakese	Shrub	
<i>Ocimum urticifolium</i> Roth	Lamiaceae	Qoricha-michi (O), Yelelit-damakese	Shrub	
<i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall. ex G. Don) Cif.	Oleaceae	Ejersa (O)	Tree	15
<i>Opuntia cylindrica</i> (Lam.) D. C.	Cactaceae	Qulqwal (A)	Shrub	
<i>Opuntia stricta</i> (Haworth) Haworth	Cactaceae	Qulqwal (A)	Shrub	
<i>Passiflora edulis</i> Sims	Passifloraceae	Yezenjero-Kolet (A)	Liana	
<i>Pelargonium glechomoides</i> Hochst. ex A. Rich.	Geraniaceae	NLN	Shrub	
<i>Persca americana</i> Mill.	Lauraceae	Abukado (O, A, G)	Tree	63
<i>Phaseolus lunatus</i> L.	Fabaceae	Adengwarrie (A)	Climber	
<i>Phaseolus vulgaris</i> L.	Fabaceae	Boloqqie (A)	Climber	
<i>Phoenix reclinata</i> Jacq.	Arecaceae	Zenbaba (A)	Tree	12
<i>Phytolacca dodecandra</i> L.	Phytolaccaceae	'Ndod (A)	Shrub	
<i>Pinus patula</i> L.	Pinaceae	Shew-shewwie (A)	Tree	34
<i>Plectranthus</i> sp.	Lamiaceae	NLN	Herb	
<i>Podocarpus falcatus</i> (Thunb.) Mirb.	Podocarpaceae	Birbirssa (O)	Tree	4
<i>Prunus x domestica</i> L.	Rosaceae	Prim (A)	Tree	7
<i>Prunus persica</i> (L.) Batsch	Rosaceae	Koki (O)	Tree	3
<i>Psidium guajava</i> L.	Myrtaceae	Zeyitunnaa (O)	Tree	26
<i>Punica granatum</i> L.	Punicaceae	Romaana (O)	Shrub	
<i>Rhamnus prinoides</i> L' Herit.	Rhamnaceae	Gesho (O, A)	Shrub	

Appendix 1 (continued)

Scientific name	Family	Vernacular Name (Language)	Habit	Number of individuals of tree species
<i>Rhamnus stado</i> A. Rich.	Rhamnaceae	Teddo (O)	Shrub	
<i>Ricinus communis</i> L.	Euphorbia	Qobboo (O)	Herb	
<i>Rosa abyssinica</i> Lindley	Rosaceae	Qega (O, A)	Shrub	
<i>Rosa hybrida</i> Hort.	Rosaceae	Tsgiereda (A)	Shrub	
<i>Rosmarinus officinalis</i> L.	Lamiaceae	Siga-metibesha (A)	Shrub	
<i>Ruta chalepensis</i> L.	Rutaceae	Ciraakkota (O)	Shrub	
<i>Saccharum officinarum</i> L.	Poaceae	Shenkora-ageda (A)	Herb	
<i>Salvia microphylla</i> Kunth.	Lamiaceae	NLN	Shrub	
<i>Salix mucronata</i> Thunb.	Salicaceae	Aleltu (O)	Shrub	
<i>Schinus molle</i> L.	Anacardiaceae	Kundo-berberie zaf (A)	Tree	12
<i>Senna didymobotrya</i> (Fresen.) Irwin and Barneby	Fabaceae	Akayi-warabessa (O)	Shrub	
<i>Sesbania sesban</i> (L.) Merr.	Fabaceae	NLN	Shrub	
<i>Solanum tuberosum</i> L.	Solanaceae	Dinichaa (O)	Herb	
<i>Spathodea campanulata</i> P. Beauv. sub sp. nilotica (Seem.) Bidgood	Bignoniaceae	Espathoda (O, A) derived from its Latin name)	Tree	21
<i>Tagetes patula</i> L.	Asteraceae	Yeresa-abeba (A)	Herb	
<i>Thuja orientalis</i> L.	Cupressaceae	Shimelese tised (A)	Tree	14
<i>Verbena hybrida</i> Voss.	Verbenaceae	NLN	Herb	
<i>Vermonia amygdalina</i> Del.	Asteraceae	Eebicha (O)	Shrub	
<i>Vicia faba</i> L.	Fabaceae	Baqiela (A)	Herb	
<i>Vitis vinifera</i> L.	Vitaceae	Weyn (A)	Liana	
<i>Withania somnifera</i> (L.) Dunal in Dc.	Solanaceae	Gizawa (A)	Herb	
<i>Xanthium strumarium</i> L.	Asteraceae	Deha-nikel (A)	Herb	
<i>Zantedeschia aethiopica</i> (L.) K.P.J. Sprengel	Araceae	Yetumba abeba (A)	Herb	